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Factors related to the liquidations of ETFs during 2008

Factores relacionados a las liquidaciones de ETFs durante 2008

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ABSTRACT:
The purpose of this study is to identify factors related to the closing of 50 ETFs in 2008. The study compared the sample of liquidated ETFs to a matched sample of active ETFs. The factors used as explanatory variables were: market capitalization, liquidity, ETF return, Index return, tracking error, fund age, and premium. Lower liquidity values, higher tracking errors, and higher ETF returns were associated with higher probabilities of liquidation. The researcher found evidence that ETFs' market makers were profiting from the creation of new ETFs' shares just before liquidating the ETFs' shares at a premium.

Keywords: Exchange-traded funds, ETFs, fund liquidation, fund closing

RESUMEN:
El propósito de este estudio es identificar los factores relacionados al cierre de 50 fondos cotizados (ETF's, por sus siglas en inglés) en el 2008. El estudio comparó una muestra de fondos cotizados liquidados con una muestra pareada de fondos cotizados (ETF) activos. Los factores utilizados como variables explicativas fueron las siguientes: capitalización del mercado, liquidez, rendimiento de los fondos cotizados (ETF's return), índice de rendimiento, error de seguimiento, *fund age* y primas. Los valores de liquidez más bajos, errores de rendimiento más altos y rendimiento de fondos cotizados más altos se asociaron con probabilidades más altas de liquidez. El investigador encontró que los indicadores de fondos cotizados de mercado se estaban beneficiando de la creación de nuevas acciones de fondos cotizados justo antes de la liquidación las acciones de los fondos cotizados en una prima.

Palabras clave: Fondos cotizados (ETF's, por sus siglas en inglés), ETF's, liquidación de fondos, cierre de fondos

INTRODUCTION

An Exchange-Traded Fund (ETF) is a relatively new investment product that has gained popularity among practitioners and academics. Similar to other investment companies or funds – like Open-End Funds (commonly known as Mutual Funds), Closed-End Funds (CEFs), or Hedge Funds – ETFs pool investors' assets and buy securities according to a predetermined investment objective. ETFs have similarities and differences in comparison to the other types of funds. For example, like CEFs, each ETF share issued by the fund can be traded like any other stock at market determined prices and gives the investor a proportioned participation in a portfolio of stocks, bonds or other securities. In the case of CEFs, once the initial public offering of CEF shares is finalized, investors cannot create or delete more CEF shares. In the case of ETF, anytime during the ETF's life cycle, some investors – denominated authorized participants – have the possibility to create or delete ETF shares.

An ETF is created when a sponsor, typically an independent fund adviser, defines an investment objective. In the case of index-based ETFs, or passively managed ETFs, this includes the selection of the index and the way to track the index. If the ETF is actively managed, this includes the selection of the securities to be included in the portfolio. In both cases, ETFs are required to publish daily information about their portfolio holdings (names and quantity of each security in the portfolio), also known as the creation basket. This requisite is important because authorized participants use this information to create or delete ETFs' shares. Authorized participants are investors that make an agreement with the fund sponsor in order to create or delete ETF shares. ETF shares are created when an authorized participant, typically an institutional investor, brings the creation basket to the fund. If some of the securities in the creation basket are difficult to obtain, the Fund may accept the equivalent cash needed to purchase the securities. The authorized participant brings the creation basket

to the Fund in return for a creation unit. A creation unit is a block of ETF shares, typically 50,000 shares. After this creation process, the ETF shares are listed in stock exchanges – like any other stock of a public company – where authorized participants may sell their ETF shares. Once listed in stock exchanges, retail investors can buy ETF shares through a broker or dealer. All the strategies associated with stocks, such as market orders, limit orders, stop orders, short sales, and margin buying can be used in the purchase and sale of ETF stocks. The authorized participants – also known as market makers – create the market for ETF shares. Also, authorized participants can delete ETF shares anytime during the ETF's life cycle (redemption feature of ETFs). They bring back ETF shares to the fund and receive the redemption basket – the underlying securities. They delete ETF shares to obtain profits if the ETF market price is below the ETF net asset value (NAV). The ETF NAV per share can be calculated obtaining the difference between the assets and liabilities of the fund, and then dividing the result by the number of shares outstanding.

The ETF expense ratio provides the revenues for the companies that manage the ETF. If an ETF does not attract assets or buyers, the management may determine to liquidate the fund because it is not cost efficient for the management. The process to liquidate an ETF begins when the Board of Trustees approves the closing in a meeting. ETF shareholders receive a notification of the decision to liquidate the fund. Also, the ETF sponsor makes the announcement in the media where the sponsor reveals the final trading date and provides some explanations for the closing decision. ETF shareholders can sell/buy shares of the closing ETF in a stock exchange anytime between the notification date and the final trading date. However, a significant number of investors trying to sell the closing ETF shares will force ETF stock price to decrease below ETF NAV. If this occurs, an authorized participant could obtain a profit by buying the ETF shares, and deleting it with the Fund. ETF shareholders have the alternative to hold the ETF's shares after the final trading date. Shareholders on record during the close of business on the final trading date will receive cash equal to the amount of the

NAV share. The ETF liquidation may result in a loss or gain of the invested money depending on the value of ETF NAV versus ETF stock price at the time the management converted the underlying portfolio securities into cash. During the liquidation process the management incurs in additional expenses that may increase the risk of ETF shareholders. Also, the liquidation can create a taxable event depending on the type of shareholder.

Table 1 presents the number of ETFs and mutual funds created and liquidated between 2000 and 2008. In a period of eight years, from 2000 to 2007, ETF's sponsors have closed or liquidated only eleven ETFs. In this eight-year period, the maximum number of ETFs liquidated in one year was 4 ETFs, reported in

Table 1
Number of Exchange-Traded Funds (ETFs) and Mutual funds created and liquidated from 2000 to 2008*

	Exchange-traded Funds		Mutual Funds	
Year	Created	Liquidated	Created	Liquidated
2000	50	0	1,111	275
2001	22	0	859	339
2002	14	4	555	353
2003	10	4	495	284
2004	35	2	521	289
2005	52	0	703	248
2006	156	1	651	204
2007	270	0	711	215
2008	149	50	597	289

Source: 2009 Investment Company Institute Fact Book (www.ici.org)

* ETF data exclude ETFs that primarily invest in other ETFs and include ETFs not registered under the Investment Company Act of 1940. Mutual fund data include mutual funds that do not report statistical information to the Investment Company Institute and also include mutual funds that invest primarily in other mutual funds.

two consecutive years, 2002 and 2003. In sum, the number of liquidations has been low and stable between 2000 and 2007. On the other hand, between 2000 and 2007, ETF sponsors have created a total of 609 ETFs. Approximately two thirds of the ETFs created in the aforementioned eight-year period were created in the last three years. In general, ETFs have been growing in number at year-end, asset under management, and recognition of investors and academics. However, a significant event in the ETF industry is the fact that fifty ETFs disappeared in 2008. During the 2008 year the entire financial sector experienced distress. Since ETFs and mutual funds have characteristics in common, a logical course is to review the pattern of liquidations in mutual funds. Table 1 also presents the number of funds entering and leaving the mutual fund industry. Between the years 2000 and 2007, the average number of mutual funds liquidated per year was 276. During 2008, mutual fund families liquidated 289 funds. This amount represents only 13 liquidated mutual funds, more than the average per year from 2000 to 2007, and 64 liquidated mutual funds, less than the year with the maximum number of liquidations. A reasonable conclusion is that the number of liquidations during the year 2008 represents a very unusual event for the ETF industry but not for the mutual fund industry. An interesting problem to address is the identification of the ETF's characteristics or factors that are relevant to discriminate between liquidated and non-liquidated ETFs.

This study tried to identify the significant factors related to the closing or liquidation of fifty ETFs during the year 2008. To the best of the researcher's knowledge this is the first paper about this issue. The first step is the identification of the 50 ETFs liquidated and the creation of a matched sample of 50 active ETFs. For both samples, liquidated and active ETFs, there is a measurement of various characteristics or factors in three different time periods: at the month of closing, the quarter before closing, and the semester before closing. Then, there is an estimation of three logistic regression models – one for each time or period – where the following factors are used as explanatory variables: market capitalization, liquidity, ETF return, Index return, tracking error, fund age, and premium. The response variable is the probability of liquidation.

A first comparison between closed ETFs and active ETFs shows that closed ETFs are older. Also, as the final trading date gets closer, liquidated ETFs are larger in terms of market capitalization and ETF shares trade at a premium. Authorized participant (ETF market makers) could be creating ETF shares to obtain profits in the vicinity of the final trading date. Finally, the explanatory variables associated with higher probability of liquidation are liquidity, tracking errors, and ETF returns.

This paper continues with a literature review in section 2; the methodology is presented in section 3; section 4 describes the data; section 5 presents the empirical analysis; and section 6 concludes the study.

Literature review

ETFs' characteristics in comparison to other Investment Companies

The first ETF traded in a United States stock market was the Standard and Poor's 500 Depositary Receipts, also known as Spiders. Launched in January 1993, Spiders mimic the performance of the Standard and Poor's 500 Index. A large part of the first ETF's academic studies deal with Spiders. Some examples of the academic literature that provides a description of the pricing, performance, trading, taxation, and effects of Spiders in comparison to other investment instruments are: Ackert and Tian (2000); Elton, Gruber, Comer, and Li (2002); Poterba and Shoven (2002); and Boney, Doran, and Peterson (2006). First, Ackert and Tian (2000) find that unlike CEFs, Spiders do not trade at economically significant discounts from NAV. This is a direct consequence of the Spiders ability to create and delete shares – redemption feature of ETFs – which facilitates arbitrage and eliminates mispricing. In contrast, ETFs that track the MidCap 400 index and other indexes of moderate capitalization firms, exhibit a larger economically significant discount from NAV. Second, Elton et al. (2002) compare the performance of Spiders to the performance of the largest index mutual fund tracking the S&P500 Index, the Vanguard

S&P500 Index Fund. They find that the Vanguard Index Fund underperform the S&P500 Index by 10 basis points per year, but outperformed Spiders by 18.1 basis points. Elton et al. (2002) argue that the relative performance of the Spiders versus the Vanguard S&P500 Index Fund is mainly due to the fact that Spiders keep the cash in a non interest bearing account while the process of creating/deleting shares take place. Third, Poterba and Shoven (2002) mention that ETFs and mutual funds are governed by the same tax rules, but the redemption feature of ETFs substantially reduces their distribution of realized capital gains. This accounts for the historical tax advantage of Spiders over the Vanguard Index 500. Finally, since ETFs offer additional benefits over index funds, such as intraday and option trading, it is expected that certain investors should prefer ETFs, leading to a movement of investment dollars from open-ended indexed products to ETFs (Boney, Doran & Peterson 2006). Boney et al. (2006) found that the Spider has a significantly negative effect on the flow of funds into indexed mutual funds.

The investment objective of the Spiders and its immediate successors is to track broad-based domestic indexes. At the end of year 2000, ETFs managed $65.6 billion in assets, the majority of those assets were managed by ETFs tracking broad-based indexes, $60.5 billion or 92% [1]. At the end of year 2008, ETFs assets under management sum up to $531.3 billion, where broad-based ETFs participation was $266.1 billion or 50%. Between the years 2000 and 2008, ETFs' sponsors have created the following types of ETFs: sector, global/international, commodities, bond, hybrid, and actively managed ETFs. The other fifty percent of the ETFs assets under management pertain to these categories. Innovations in the ETF industry allow ETF investors the exposure to markets beyond the well-known broad-based market indexes.

As the number and asset under management of ETFs have been increasing over the last decade, the academic literature has paid more attention to these types of funds. Special interest has been

[1] According to the 2009 Investment Company Fact Book.

given to the similarities and differences between other ETFs beyond Spiders and different investment instruments (e.g. Mutual Funds, Closed-End Funds, Futures, etc.). Demaine (2002) concludes that the flexibility and low-cost of ETFs have made them attractive to retail and institutional investors. Mussavian and Hirsch (2002) characterize ETFs as a combination of the benefits of Futures and Mutual Funds into a single package. ETFs offer lower expense ratios in comparison to Indexed Mutual Funds because they are not in charge of shareholders accounting (Kostovetsky, 2003). Gastineau (2004) points out that the performance comparison between Indexed Mutual Funds and ETFs should consider the apparently higher operating efficiency of conventional Index Funds. According to Gastineau, Indexed Mutual Funds should not have problems adjusting their portfolio immediately after an index change announcement, but ETFs do, due to its creation and redemption ability. Romero and Rodriguez (2012) study a sample of index ETFs and Index Mutual Funds issued by the same mutual fund family. The authors evaluate the fund flows to each investment product and come to the conclusion that both investment vehicles are complements.

Guedj and Huang (2009) document that ETFs track more indexes than Index Mutual Funds do. There is only one ETF tracking each market index. There are few exceptions in which two ETFs track the same index. Once ETF sponsors decide to create an index ETFs they have two alternatives. The first alternative is to create an ETF that tracks an already tracked index. According to the data presented in Guedj and Huang (2008) this is not very common. A possible explanation is that two or more index ETFs – tracking the same index – compete for investor money, in most situations, only by charging lower expense rates. The second alternative is to create an ETF that tracks an index not already followed by another ETF. Not already tracked indexes are typically new indexes of a specific sector, commodity, etc. This innovation process has increased the exposure of ETF investors to other asset classes, previously inaccessible to small investors. However, not everything is good news in

the ETF industry. As recognized in the popular press, ETF sponsors have created ETFs for which the market has no interest[2].

LIQUIDATIONS IN ETFS AND OTHER INVESTMENT COMPANIES

According to the researcher's knowledge, there is no academic paper that studies any aspect of the liquidation or closing process of an ETF. There are some academic papers that deal with different aspects of the decision to liquidate other types of investment companies, like Mutual Funds or Hedge Funds. Liquidation is the process where an investment company closes some or the entire group of funds and converts it all into cash. Several studies in the mutual fund literature deal with this type of event. Zhao (2005) examines the causes of the three mutual fund exit forms: liquidation, within-family merger, and across-family merger. The study recognizes the fact that even though many funds are listed as separate funds, they are actually different share classes of the same portfolio in a fund family. The author finds that a family is less willing to liquidate a portfolio but more likely to merge a portfolio within the family if it offers more share classes. Dukes, English, and Davis (2006) find that Mutual Funds that fail or close have higher 12B-1 fees than mutual funds that do not close.

An aspect that has been widely studied in the Mutual Fund literature is the case of mutual funds that remain active, but close to new investors. Smaby and Fizel (1995) and Manakyan and Liano (1997) are the first papers that study the performance of these Mutual Funds. More recently, Zhao (2004) studies the claim made by fund families that closing a fund to new investors serves to protect its good performance and prevents it from growing too big. The author finds that fund families' closing decisions are made to signal superior performance in order to attract investors to other funds in the family. Gulen, Bris, Rau, and Kadiyala (2007) find that funds close to new investors after a period of superior performance and abnormal inflows. They also find that fund managers increase their

[2] Johnston, M. (2009). ETF Hall Of Shame: Nine Exchange-Traded Debacles. *ETF Database*. Retrieved from http://etfdb.com/2009/etf-hall-of-shame-nine-exchange-traded-debacles/.

fees after the closing decision. Chen, Gao, and Hu (2012) study a subset of these Mutual Fund families that, subsequent to the closing of a particular mutual fund to new investors, offer a clone new fund with the same investment objective. The authors explain that this strategy is used by the family in order to increase fund flows and/or charge higher fees.

Turning to liquidations in the hedge fund industry, Getmansky, Lo, and Mei (2004) use a sample of liquidated hedge funds and found that attrition rates differ significantly across investment styles. Getmansky (2004) studies industry and fund specific factors that affect the survival probabilities of hedge funds. Compared to mutual funds, hedge funds have a very large probability of liquidation. The author finds that performance and flows positively affect the survival probability. The study made by Baquero, Ter Horst, and Verbeek (2005) develops an empirical model for hedge fund liquidation. The estimation of the model indicates that historical performance is an important factor in explaining fund liquidation, where performance in the more distant past is of less importance. Ter Horst and Verbeek (2007) study the effects of different types of biases in the study of hedge fund liquidations. As mentioned before, according to the researcher's knowledge, there is no academic paper that studies the liquidation in the ETF industry.

Methodology

The purpose of this paper is to identify significant factors related to the liquidation of fifty ETFs throughout the year 2008. As mentioned before, this quantity of liquidations represents an unusual event for the ETF industry. At the end of 2008, more than 700 ETFs had active trading status. This study investigated the main problems which are the characteristics that are relevant to differentiate the liquidated and non-liquidated ETFs. There is an estimation of various cross-sectional logistic regression models where the response variable – the categorical variable *STATUS* – assumes a value of 1 for ETFs liquidated during 2008, and the value of 0 for ETFs with active

trading status during 2008. As in Zhao (2004), there is an estimation of a logistic regression model due to the fact that the response variable is a binary categorical variable. This paper circumscribes to the study of the 50 liquidated ETFs and a matched sample of 50 ETFs with active trading status at the end of 2008. The selection of the matched ETF was based on two requirements that must be satisfied at the month previous to the closing event. Matched ETFs must be in the same management style and must have the most similar market capitalization as their counterparts. For example, Claymore/LGA Green ETF was liquidated in February 19, 2008. This ETF had the following characteristics: the inception date was December 15, 2006; Fund Age in months at liquidation was 14 months; Bloomberg management style was Sector Funds - Equity funds; and Market Capitalization at the end of January 2008 (one month before closing) was $4.77 million. The active ETF matched with the Claymore/LGA Green ETF was the PowerShares FTSE RAFI Consumer Goods Sector Portfolio ETF. The characteristics of the active ETF were: the inception date was September 20, 2006; Fund Age in months at February 2009 (the liquidation date of the other ETF) was 17 months; Bloomberg management style was Sector Funds - Equity funds; and Market Capitalization at the end of January 2008 (one month before close) was $4.66 million. The same matching process was repeated for the other 49 ETFs liquidated during 2008.

The matching design for this study indicates that for each liquidated ETF there is another active trading ETF of the same management style and size. The style and size conditions for the matching process were selected based on the information published in the press by the ETF sponsors. Some of the claims that ETF's sponsors made in the liquidation announcement were: (1) "to dedicate our resources to areas of greater client interest;" (2) "factors including shareholder considerations, length of time in the market, asset levels and the potential for future growth, we proposed closing certain portfolios that have not gained sufficient acceptance with investors;" and (3) "current market conditions, the inability of

the Funds to attract significant market interest since their inception, their future viability as well as their prospects for growth in the Funds' assets in the foreseeable future." In general, the claim was that ETFs were liquidated because the specific area of the market did not attract assets to the Fund. The proxies of this study for the market area and the asset level were the management style and the size of the ETF, respectively. The inclusion of these factors as a condition in the matching process allowed their elimination as a factor in the regression estimation process.

The regression estimations were made for the following three different periods or moments just before the closing event: (1) one month previous to the closing month; (2) the quarter previous to the closing month; and (3) the semester previous to the closing month. It is important to note that the measure of these periods is different for each ETF depending on the ETF final trading date, that is, there are different event dates. For example, in the case of monthly returns for an ETF liquidated in July, the measurements of the monthly returns for the three periods were: June monthly return (the month before closing); monthly return arithmetic mean of April, May and June (the quarter before closing); and monthly return arithmetic mean of January to June (the semester before closing). For each of these periods the researcher estimated various logistic regression models. The first model in each period or moment explained the response variable *STATUS* with the following three explanatory variables: market capitalization, ETF liquidity and ETF return. Then, this study continued the model estimation process adding additional explanatory variables one by one.

The motivation to begin with a model that included the market capitalization, the ETF liquidity and the ETF monthly return came from the article by Madura and Ngo (2008). They identified the characteristics that might affect the future performance of ETFs. The factors that were significantly related to stock prices are size (market capitalization), ETF liquidity (measured by the ETF stock trading volume)[3] and momentum (measured through the prices

[3] The precise way to measure the ETF liquidity is through the evaluation of the underlying assets liquidity.

and returns). However, when they classified ETFs according to its type (broad-based, sector or international) the stock price indicators were not as effective. The present study continued the model estimation process adding the following explanatory variables to the model: index return, tracking error, fund age and premium. The full model of this study is presented in the following equation:

$$PROB(STATUS_i = 1) = \frac{\exp(\beta_j' x_i)}{1 + \exp(\beta_j' x_i)}$$

$$\beta_j' x_i = \alpha_0 + \beta_1(MarketCap_i) + \beta_2(Liquidity_i) + \beta_3(ETFRET_i) + \beta_4(IndexRET_i) + \beta_5(TrackingError_i) + \beta_6(FundAge_i) + \beta_7 \,\mathrm{Pr}emium_i + \varepsilon_i \quad (1)$$

The response variable *STATUS* identified active ETFs with a value of 0 and liquidated ETFs with a value of 1; *MarketCap* is measured in millions and corresponds to the product of each ETF end-of month share price and the number of shares outstanding; *Liquidity* is measured as the ratio of trading volume to share outstanding; *TrackingError* is measured using as proxy the absolute difference between the index return and the ETF return; *FundAge* is measured in months (the fund age of ETFs in the matched sample is calculated at the final trading date of its corresponding liquidated ETF); *Premium* is the proportion by which the ETF share market price is over (premium) or under (discount) the ETF NAV; and the *i* subscript identify each of the 100 ETFs (50 liquidated and 50 active).

This study presents one hypothesis for the sign (positive or negative) and significance of each coefficient of explanatory variables included in the model, which accounts for seven hypotheses. Market capitalization was one of the factors that Madura and Ngo (2008) find to be effective as indicators of future performance. They find that market capitalization is inversely related to the performance of ETFs. However, as previously discussed, one of the criteria to create the matched sample was that the market capitalization of the

liquidated and active ETF should be as similar as possible. So, the first hypothesis is that the market capitalization coefficient should not be significantly different from zero. It is important to point out that the tendency of market capitalization of active ETFs was to be greater than market capitalization of liquidated ETFs. The second hypothesis is that the liquidity of active ETFs should be higher than the liquidity of closed ETFs. In other words, the coefficient of the liquidity variable should be negative. Higher values of the ETF liquidity (measured through the ETF trading volume) should be associated with a lower probability of ETF failure. This hypothesis was based on the claims that ETF sponsors made on the liquidation announcement. ETFs are not actively traded by portfolio managers because ETFs track an index in a passive manner. For the reason mentioned above, the third hypothesis is that the coefficient of the ETF return variable should not be significantly different from zero.

In addition to the factors mentioned in the research conducted by Madura and Ngo (2008) – the market capitalization, the liquidity and the return – the present study included other factors in the model to explain the probability of closure. Lin and Mackintosh (2010) measured the tracking error using the standard deviation of the daily return differences between the index and the ETF. The present study measured tracking error using as proxy the absolute difference between the index return and the ETF return. The fourth hypothesis in the present study is that liquidated ETFs should have higher tracking error than active ETFs. The expectation is that liquidated ETFs track less liquid indexes. So, it is logical to think that tracking an illiquid index resulted in a higher tracking error. The fifth hypothesis is that the tracking error coefficient should be positive. The next hypothesis is that the age of liquidated ETF is greater than the age of active ETFs. This hypothesis appeared to be nonsense if the criterions used in the matched sample creation process are not taken into consideration.

The criteria that took into consideration the similarities between liquidated and active ETF's market capitalization had an effect in the fund age of ETFs in the matched sample. Active ETFs of comparable size to liquidated ETFs, should result in younger active ETFs. As

previously mentioned, one of the claims that ETF sponsors made on the liquidation announcement was the inability of the funds to attract significant market interest since their inception. If the ETF does not attract investors then the market capitalization decreases or does not increase. Accordingly, the coefficient of the fund age should be positive. The researcher also hypothesized that index returns of active ETFs should be higher than the index returns of liquidated ETFs. A low index return is a strong reason to avert an investor. The coefficient of the index return variable should be negative. The last hypothesis of the present study is about the ETF premium. The researcher expected liquidated ETFs to have higher premium than active ETFs. ETFs premiums are low in comparison to CEFs premium. The ETF share creation/redemption feature allows authorized investors to arbitrage any differences between the share price and the NAV. Anytime ETF share prices are higher than NAVs, the authorized participants create ETF shares in order to obtain a profit from the transaction. The hypothesis is that liquidated ETFs did not attract investors' attention. This hypothesis is based on the claim that ETFs sponsors made in the liquidation announcement. Thus, the premium coefficient should be positive. Higher ETF premiums should be associated with a higher probability of liquidation.

In sum, the hypotheses are based on the literature review, the claims ETFs sponsors made in the liquidation announcement, and the criterions used to create the matched sample. The coefficients of Market Cap and ETF Return should not be significantly different from zero. The coefficients of Tracking Error, Fund Age, and Premium should be positive. Finally, the coefficients of Liquidity and Index Return should be negative.

DATA SOURCES AND DESCRIPTIVE STATISTICS

The idea for this paper originated from the fact that 50 ETFs trading in US stock exchanges were liquidated during 2008. This section describes how the researcher obtained the relevant data to implement the methodology described in the previous section.

The initial step was to use Bloomberg to obtain the name and other characteristics of the fifty liquidated ETFs. For this task, the researcher first obtained a list of all the ETFs in Bloomberg with inactive trading status at the beginning of 2009. This list was filtered by market status to get only the liquidated ETFs (other market statuses are: delisted, ticker change, inactive, pending, unlisted, and price not available). Then, the researcher obtained other ETF characteristics like the Inception Date, the Last Trading Date, the Bloomberg Management Style, among others, from Bloomberg and the Center for Research and Security Prices (CRSP). Using these characteristics we identified the 50 ETFs liquidated during 2008.

In order to obtain the matched sample the author of the present study first obtained a list of all active ETFs at the end of 2008. According to Bloomberg there were 731 active ETFs at the end of 2008. From CRSP, the researcher obtained the monthly prices and the number of shares outstanding for all active ETFs found in Bloomberg. The monthly market capitalization was calculated multiplying the price times the number of shares outstanding. Then, the data of the 731 active ETFs was grouped by the Bloomberg management style. There were 12 different Bloomberg management styles for these active ETFs. However, the fifty liquidated ETFs pertain to only 8 different style categories. For each liquidated ETF, the researcher found an active ETF with the closest possible market capitalization at the month previous to the ETF closing and with the same management style.

Table 2 presents the 50 ETFs liquidated during year 2008 and the 731 active ETFs at the end of year 2008 distributed by the Bloomberg Management Style. The most frequent style is the same for active and liquidated ETFs, the Sector Funds - Equity Funds style with 33 (66%) liquidated ETFs and 263 (36%) active ETFs. The next four styles with the most frequency of liquidations are: Total Return (Debt funds) with 5 (10%) ETFs; Growth with 4 (8%) ETFs; Value with 3 (6%) ETFs; and N.A[4] with 2 (4%) ETFs. In the case of active

[4] The term N.A. is used by Bloomberg in funds where management style information is not available.

Table 2
Bloomberg Management Style for closed and active ETFs

Bloomberg Management Style	ETFs Closed		All Active ETFs		ETFs Closed / (ETFs Closed + All Active ETFs)
	Number	Percent	Number	Percent	
Sector Funds - Equity funds	33	66.00%	263	35.98%	11.15%
Total Return - Debt funds	5	10.00%	37	5.06%	11.90%
Growth	4	8.00%	96	13.13%	4.00%
Value	3	6.00%	53	7.25%	5.36%
N.A.	2	4.00%	75	10.26%	2.60%
Geographically Focused - Equity funds	1	2.00%	123	16.83%	0.81%
Growth and Income	1	2.00%	13	1.78%	7.14%
Current Income	1	2.00%	1	0.14%	50.00%
Contrarian	0	0.00%	32	4.38%	0.00%
Aggressive Growth	0	0.00%	21	2.87%	0.00%
Emerging Markets - Equity funds	0	0.00%	15	2.05%	0.00%
Index Fund - Equity funds	0	0.00%	2	0.27%	0.00%
Total	**50**	**100.00%**	**731**	**100.00%**	**6.40%**

ETFs, the styles below the Sector Funds in terms of frequency are: Geographically Focused - Equity funds with 123 (17%); Growth with 96 (13%) ETFs; N.A with 75 (10%) ETFs; and Value with 53 (7%) ETFs. However, if the percentages are calculated within the different Bloomberg management styles there is a different frequency order. In the Current Income style, one of two ETFs was liquidated during 2008. It is important to note that the ETF that remained active during 2008 in the Current Income style – the WisdomTree U.S. Short Term Government Income Fund (ticker: USY) – was closed in January 2010. The next four styles with the most frequency of closings were: Total Return (Debt funds) with 11.90% of its ETFs closed; Sector Funds - Equity funds with 11.15% of its funds closed; Growth and Income with 7.14% of it ETFs closed; and Value with 5.36% of its ETFs closed during 2008.

The sample of liquidated ETFs and the matched sample data were summarized in three cross-sectional data sets. The three data sets

correspond to three different periods previous to the closing event. The characteristics included in this data set for active and liquidated ETFs are: market prices, NAV, number of shares outstanding, market capitalization (in millions of dollars), total net assets (TNA, in millions of dollars), liquidity (measured as the ratio of trading volume to shares outstanding), ETF end of month return, index end of month return, tracking error (absolute value of the difference between the ETF return and Index return), ETF age in months, and premium (the percentage that the ETF price is over the ETF NAV). The first data set contains the ETFs characteristics for the month previous to the closing month. Two additional data sets were created by calculating arithmetic means of the characteristics previously described for various months before the closing event. The second data set averages the characteristics for the three months (quarter) previous to the closing month. The third data set takes the mean of the characteristics for the six months (semester) previous to the closing month.

As previously mentioned, there are various sources for the study's data. The researcher did not have access to daily index return data for every index included in this study. The implication of this limitation was to calculate the tracking error using the proxy described above. Also, in order to measure to ETF liquidity in a precise way, underlying portfolio securities data was needed for every ETF included in the sample. Since the researcher did not have access to this data, the ETF liquidity was measured through the trading volume.

The data sets described in this section were used to identify the factors related to the liquidation of 50 ETFs during 2008. The next section implements the methodology previously described.

EMPIRICAL ANALYSIS

UNIVARIATE ANALYSIS

In order to analyze the factors related to the closing of 50 ETFs during year 2008, the researcher first performed an univariate analysis. Table 3 presents descriptive statistics for various characteristics of the

Liquidated ETFs and the Active ETFs Samples. Panel A in Table 3 presents statistics of the fund age (in months). The mean age of liquidated and active ETFs is 14 and 10, respectively. Active ETFs are younger in average. At the extreme, there is one active ETF with only one month of life. The older ETF across both samples pertain to the matched sample with 28 months at the time its pair ETF was closed.

Table 3 constitutes an univariate analysis of each explanatory variable that is included in the model presented in Equation 1. Panel B presents descriptive statistics of both samples at the month previous to the closing month. By design of the matched sample, the arithmetic mean of the market capitalization of both samples are very similar, the mean (median) size of ETFs closed is $22.95 million ($2.53 million) and the mean (median) size of active ETFs is $23.63 million ($4.35 million). The large differences between the arithmetic means and the medians observed across both samples denote the strong positive asymmetry (right skewed) in the market capitalization distribution. There is an ETF as small as $1 million, and an ETF as large as $942 million.

Liquidity is measured using as proxy the ratio of trading volume to number of shares outstanding. The arithmetic mean of the liquidity of closed ETFs (0.39) was lower in comparison to active ETFs (0.81), as expected in our hypothesis. The difference between the means was not statistically significant at any of the usual levels of significance. In the case of ETF returns, the arithmetic means of the closed and active samples were -0.061 and -0.064, respectively. There was no statistical significance in the difference between the mean returns. The mean return of indexes tracked by closed ETFs (-0.041) was higher than the mean return of indexes tracked by active ETFs (-0.059). The difference between the index returns was statistically significant at the 10% level. The mean tracking error of closed ETFs (0.031) was higher (not statistically significant) than the mean tracking error of the active ETFs (0.014). It is logical to think that managers of closed ETFs do not implement changes efficiently to the underlying assets in order to track effectively an index, especially when the index changes occur very close to the ETF liquidation date. ETF average Premium is higher for closed ETFs (3.403) than

Table 3
Descriptive Statistics for closed and active ETFs at different periods*

Panel A: Age in months	**ETFs Closed**						**Matched Sample**					
Variable	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**
Age in months	50	14	12	6	23	5	50	10	7	1	28	8

Panel B: Closing Month	**ETFs Closed**						**Matched Sample**					
Variable	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**
Market Capitalization	50	22.95	2.53	1.08	922.96	130.10	50	23.63	4.35	1.55	941.79	132.58
Liquidity	50	0.390	0.173	0.011	4.369	0.729	50	0.809	0.373	0.003	13.164	1.907
ETF Return	50	-0.061	-0.060	-0.694	0.079	0.108	49	-0.064	-0.051	-0.294	0.065	0.079
Index Return *	50	-0.040	-0.051	-0.156	0.122	0.062	49	-0.059	-0.049	-0.285	0.081	0.074
Tracking Error	50	0.031	0.010	0.001	0.816	0.114	49	0.014	0.005	0.000	0.149	0.026
Premium	50	3.403	-0.490	-3.726	206.504	29.365	50	0.194	0.061	-7.226	8.012	1.960

Panel C: Closing Quarter	**ETFs Closed**						**Matched Sample**					
Variable	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**
Market Capitalization	50	13.84	2.61	1.15	447.65	63.14	41	31.07	4.68	1.88	1048.97	163.01
Liquidity	50	0.349	0.210	0.015	3.964	0.577	41	0.565	0.348	0.016	5.769	0.909

ETF Return	50	-0.033	-0.021	-0.467	0.117	0.078	40	-0.056	-0.038	-0.278	0.021	0.066
Index Return ***	50	-0.023	-0.020	-0.131	0.079	0.045	40	-0.051	-0.040	-0.243	0.018	0.056
Tracking Error	50	0.025	0.009	0.001	0.546	0.077	40	0.015	0.006	0.001	0.141	0.026
Premium	50	1.885	-0.366	-7.599	123.369	17.591	41	0.279	0.135	-1.897	3.242	0.936

Panel D: Closing Semester	**ETFs Closed**						**Matched Sample**					
Variable	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**	**N**	**Mean**	**Median**	**Min**	**Max**	**Std Dev**
Market Capitalization	50	9.91	2.62	1.19	247.28	35.15	27	44.05	4.83	1.73	1029.13	196.92
Liquidity *	50	0.333	0.241	0.015	2.404	0.348	27	0.624	0.411	0.080	3.082	0.669
ETF Return	50	-0.014	-0.007	-0.257	0.091	0.043	27	-0.032	-0.013	-0.167	0.009	0.045
Index Return **	50	-0.008	-0.011	-0.064	0.064	0.024	27	-0.030	-0.016	-0.137	0.012	0.038

* This table presents descriptive statistics for various characteristics of the sample of ETFs closed during 2008 and the Matched Sample. The table presents ETF age in months (Panel A); statistics for various characteristics at the month previous to the ETF closing (Panel B); at the quarter before closing (Panel C); and at the semester before closing (Panel D). Market capitalization is measured in millions of dollars; Liquidity is the ratio of trading volume to shares outstanding; ETF Return is the end of month return; Index Return is the end of month return of the underlying index; Tracking Error is the absolute value of the difference between ETF Return and Index Return; and Premium represent the percentage that the ETF price is over the ETF NAV. ***,**, and * identify statistical significance differences between means of closed ETFs and the Matched Sample of ETFs at less than the 1%, 5%, and 10%, respectively.

for active ETFs (0.194). ETF Premium decreases when authorized participants create new ETF shares, bringing the ETF underlying assets to the fund sponsor. Apparently, these investors do not think they will obtain a profit by creating shares of these almost dead ETFs.

The descriptive statistics for the quarter before closing are presented in Panel C in Table 3. The matched sample now consists of 41 active ETFs that have non-missing monthly data values for the three months previous to the closing event. The arithmetic mean of the market capitalization in this sample was $31.07 million. The arithmetic mean of sample of closed ETFs was lower, $13.84 million, but the difference with the matched sample was not statistically significant at any of the usual levels of significance. For this analysis, at the quarter before closing, the difference between the means of the index returns across both ETFs samples was statistically significant at the 1% level. Closed ETFs tracked indexes with a higher mean return (-0.023) over the quarter previous to the closing event, than the mean return (-0.051) of indexes tracked by the matched sample of active ETFs. The description of the other factors presented in Panel C in Table 3 is similar to the behavior described in the corresponding factors in Panel B.

The last panel in Table 3, Panel D, presents descriptive statistics of the factors for the six month period (semester) before the closing event. The matched sample now consists of 27 active ETFs that have non-missing monthly data values for the six months previous to the closing event. For this data, the market capitalization averages difference between liquidated and active ETFs was higher; however the difference was still statistically insignificant. The arithmetic means of the market capitalization in the active and liquidated ETF samples are $44.05 million and $9.91 million, respectively. In this case, at the semester before closing, the difference between the ETF liquidities was statistically significant at the 10% level. The liquidity of the closed ETFs (0.333) was significantly less than the liquidity of active ETFs (0.624). The difference between the index returns was statistically significant at the 5% level. The behavior of the other factors presented in Panel D is similar to the behavior described for the corresponding factors in Panel B and Panel C.

There is an intriguing fact about the sample of closed ETFs that arises when observing Table 3 across the different periods or moments (Panels B, C and D). The market capitalization quantity at the month previous to the closing event, the quarter previous to the closing event, and the semester previous to the closing event are $22.95 million, $13.84 million, and $9.91 million, respectively. These results indicate that closed ETFs were increasing in size as they approached the closing event. A possible explanation is that authorized participants were creating ETF shares close to the liquidation date in order to obtain profits from the differences between ETF prices and ETF NAVs.

Table 4 provides a better picture of what was going on with the market capitalization and premiums (differences between prices and NAVs) of the 50 liquidated ETFs. Panel A in Table 4 presents the arithmetic means for the 50 liquidated ETFs for several months previous to the closing event (from -6 months to -1 month). The market capitalization quantities for 6 months, 3 months, and 1 month previous to the closing event are $5.90 million, $7.60 million, and $22.95 million, respectively. These results show that, on average, closed ETFs were increasing in size during the six months previous to their liquidation. The increase in the number of shares outstanding was provoking the increase in market capitalization. The arithmetic mean of the number of shares outstanding increased from 217,420 shares at 6 months previous to the closing event to 1,092,420 shares at 1 month previous to the closing event. Authorized investors obtained profits by creating shares of these almost dead ETFs because the shares were offered with a premium. The means of the premium for 6 months, 3 months, and 1 month previous to the closing event are 0.38, 1.13, and 3.40, respectively.

Panel B in Table 4 confirms the strong positive asymmetry (skew to the right) of the market capitalization and premium distributions that was mentioned in the discussion of Table 3. The median market capitalization does not present an increasing trend when the ETF approached the liquidation date. The same occurred with the median premium. The results for the standard deviations presented in Panel C are consistent with the findings presented in Panel B. The

Table 4
Descriptive statistics of closed ETFs by month previous to the closing event*

Panel A: Arithmetic Mean

Months previous to closing event	Market Capitalization	Market Price	Number of Shares Outstanding	Premium
-6	5.8948	26.0549	217,420	0.3799
-5	5.7620	26.6187	207,420	0.4662
-4	6.2516	26.5744	228,420	1.5421
-3	7.5972	25.9076	306,420	1.1281
-2	10.9748	25.6625	482,420	1.1389
-1	22.9530	24.4658	1,092,420	3.4033

Panel B: Median

Months previous to closing event	Market Capitalization	Market Price	Number of Shares Outstanding	Premium
-6	2.6200	23.6850	101,000	-0.0100
-5	2.6700	24.3950	101,000	0.0000
-4	2.7100	24.6850	101,000	-0.0750
-3	2.6600	23.5275	101,000	-0.0820
-2	2.5800	23.1900	101,000	-0.2550
-1	2.5250	22.2250	101,000	-0.4895

Panel C: Standard Deviation

Months previous to closing event	Market Capitalization	Market Price	Number of Shares Outstanding	Premium
-6	9.5711	13.1784	300,923	3.8791
-5	9.2823	12.9219	296,159	6.0651
-4	10.7013	12.3106	378,306	14.1295
-3	17.7949	12.6633	759,398	12.1441
-2	43.3941	13.0258	1,656,188	11.7427
-1	130.1005	13.0200	4,683,280	29.3649

* This table presents descriptive statistics for the 50 Liquidated ETFs by each month (one to six) previous to the closing event. Panel A, B, and C presents the arithmetic mean, median, and standard deviation, respectively. Market capitalization is measured in millions of dollars; Market Price is the end of month price; Number of shares outstanding at the end of month; and Premium represent the percentage that the ETF price is over the ETF NAV.

next section presents a multivariate analysis using the same factors presented in this univariate analysis. A logistic regression model is used to explain the Status of the 50 liquidated ETFs during the year 2008 and the matched sample of 50 active ETFs.

MULTIVARIATE ANALYSIS

The analysis presented in the previous section studies the behavior of each factor or explanatory variable independently without considering the correlations or interactions among them. This section presents a multivariate analysis in which the model presented in Equation 1 was estimated for three different periods: the month previous to the closing event, the quarter previous to the closing event, and the semester previous to closing event. The results of the estimation process identified the significant factors explaining the response variable *STATUS*, which assumes the value of 0 for active ETFs and the value of 1 for liquidated ETFs. The researcher began the model estimation process with the three factors (Model 1) identified by Madura and Ngo (2008), which include the following factors: market capitalization, liquidity, and ETF return. Then the researcher continued the estimation process incrementing the number of explanatory variables used in the model (the researcher added the other factors one by one). The other explanatory variables added to Model 1 were: Tracking Error (Model 2); ETF Age (Model 3); Index Return (Model 4); and Premium (Model 5). Table 5 presents the Logistic Regression estimates for the coefficients of the five aforementioned models and the three different periods. The last three rows in Table 5 present statistic measures to discriminate between the different models being estimated. The Adjusted R-Square quantifies the proportion of the variability in the response variable *STATUS* that is explained by the model. The Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) are measures of the goodness of fit of an estimated statistical model. The AIC and the SBC are tools for model selection where the best model is the one with the lowest value. These statistic measures were the criteria used to select the order in which the additional explanatory variables were included from Model 2 to Model 5.

CLOSING MONTH ESTIMATES

The data set for the month previous to the ETF closings was used for the estimates in the first five columns of Table 5. As mentioned, the explanatory variables in Model 1 are market capitalization, liquidity and the ETF return. None of the coefficients of these variables were statistically significant different from 0 and the Adjusted R-Square was 0.037. Model 2 added the Tracking Error to the three explanatory variables included in Model 1. It is important to note that the negative value of the Liquidity coefficient is statistically significant at the 5% level. The negative sign implies that lower values for the ETF liquidity are associated with higher probabilities of failure or liquidation. The Adjusted R-Square of Model 2 is 0.13. Model 3 added the ETF Age and the Adjusted R-Square was 0.263. This model presents the lowest values for the AIC and SBC statistical measures. Also, the following explanatory variables were statistically significant (sign): Liquidity (negative), Tracking Error (positive), ETF Age (positive). The sign of the estimates indicate that lower liquidity values, higher tracking errors, and older ETFs were associated with higher probabilities of liquidation. The explanatory variables added in Model 4 and Model 5, the Index Return and the Premium, were not statistically significant.

CLOSING QUARTER ESTIMATES

The data set used for the estimates in the five columns at the center of Table 5 corresponds to the closing quarter. As in the previous case, none of the estimates of the explanatory variables included in Model 1 were statistically significant. Model 2 adds the Tracking Error as an explanatory variable. In this model the following variables were statistically significant: Liquidity (negative), ETF Return (positive), and Tracking Error (positive). The results of the estimates indicate that lower liquidity values, higher returns, and higher tracking errors were associated with higher probabilities of liquidation. Model 3 adds the ETF Age as an explanatory variable. The Adjusted R-Square for Model 3 was 0.362 and this model had the lowest values for the AIC and SBC statistical measures. The explanatory variables that

Table 5
Logistic Regression estimates for various models explaining the Status of the exchange-traded funds (ETFs)*

	Closing Month					Closing Quarter					Closing Semester				
Coefficients	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept	0.174	0.525	-0.783	-0.806	-0.806	0.530	1.047	-0.420	-0.326	-0.328	1.240	1.659	0.746	1.243	1.251
	(0.515)	(0.109)	(0.136)	(0.131)	(0.131)	(0.058)	(0.007)	(0.478)	(0.588)	(0.584)	(0.001)	(0.001)	(0.331)	(0.138)	(0.137)
Market Capitalization	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.004	-0.006	-0.005	-0.006	-0.003	-0.007	-0.012	-0.005	-0.006
	(0.967)	(0.535)	(0.306)	(0.314)	(0.322)	(0.452)	(0.325)	(0.410)	(0.393)	(0.415)	(0.399)	(0.575)	(0.550)	(0.659)	(0.678)
Liquidity	-0.380	-1.040	-1.187	-1.202	-1.201	-0.225	-2.137	-2.938	-3.230	-3.288	-1.106	-2.581	-3.344	-4.001	-3.988
	(0.221)	(0.041)	(0.038)	(0.037)	(0.039)	(0.554)	(0.030)	(0.012)	(0.008)	(0.007)	(0.169)	(0.031)	(0.013)	(0.006)	(0.006)
ETF Return	-0.683	4.969	5.013	8.435	8.440	4.192	12.806	18.083	3.358	-0.229	4.785	17.209	24.065	-20.045	-25.668
	(0.780)	(0.142)	(0.172)	(0.580)	(0.580)	(0.267)	(0.016)	(0.004)	(0.829)	(0.989)	(0.540)	(0.089)	(0.043)	(0.470)	(0.569)
Tracking Error		15.320	12.993	16.416	16.254		31.325	37.381	26.307	30.897		24.730	31.095	4.083	5.298
		(0.130)	(0.098)	(0.329)	(0.394)		(0.012)	(0.002)	(0.110)	(0.102)		(0.012)	(0.006)	(0.818)	(0.787)
ETF Age			0.120	0.120	0.120			0.150	0.164	0.163			0.089	0.101	0.099
			(0.002)	(0.002)	(0.002)			(0.002)	(0.001)	(0.002)			(0.137)	(0.107)	(0.124)
Index Return				-3.379	-3.391				16.939	21.256				50.677	56.189
				(0.817)	(0.816)				(0.318)	(0.256)				(0.091)	(0.222)
Premium					0.001					-0.043					-0.029
					(0.986)					(0.607)					(0.875)
Observations	99	99	99	99	99	90	90	90	90	90	77	77	77	77	77
Adj. R-Square	0.037	0.130	0.263	0.264	0.264	0.051	0.225	0.362	0.373	0.375	0.129	0.269	0.302	0.346	0.346
Akaike (AIC)	142.47	137.11	127.48	129.43	131.43	128.17	117.12	107.31	108.31	110.07	100.20	93.00	92.67	91.50	93.47
Schwarz (SBC)	152.86	150.09	143.05	147.60	152.19	138.17	129.62	122.31	125.80	130.07	109.57	104.72	106.74	107.90	112.22

* There is a sample of 50 ETFs closed during 2008 (Status = 1), and a Matched Sample (Status = 0). We estimate each model in three different periods: (1) the month before closing; (2) the quarter before closing; and (3) the semester before closing. We present estimates and p-values (in parenthesis). The explanatory variables used in the models are: Market capitalization (measured in millions of dollars), Liquidity (ratio of trading volume to shares outstanding), ETF Return, Index Return, Tracking Error (absolute value of the difference between ETF Return and Index Return), ETF Age (in months), and Premium (the percentage that the ETF price is over the ETF NAV).

were statistically significant in Model 3 are: liquidity, ETF return, tracking error and ETF age. The values of the estimates denote that higher probabilities of failures are associated with lower liquidities, higher returns, higher tracking errors and older ETFs. Interestingly, for Model 4 and Model 5 there were only two explanatory variables that were statistically significant, liquidity and ETF age. Model 5 had the highest Adjusted R-Square, 0.375.

CLOSING SEMESTER ESTIMATES

The last columns in Table 5 present the estimates for the closing semester data set. Again, none of the estimates in Model 1 were statistically significant. Model 2 added the Tracking Error as an explanatory variable. The explanatory variables that were statistically significant in Model 2 are: the Liquidity, the ETF Return, and the Tracking Error. The results of the estimates indicate that lower liquidity values, higher returns, and higher tracking errors are associated with higher probabilities of liquidation. Here, Model 4 exhibits the highest Adjusted R-squared (0.346) and the lowest AIC (91.50). The explanatory variables that were statistically significant in Model 4 are: Liquidity and Index Return. Lower liquidity values and higher index returns are associated with higher probability of liquidations.

POSSIBLE EXPLANATIONS FOR THE FINDINGS

In the previous sections this study identified the significant factors that are associated with the liquidations of fifty ETFs during 2008. Across the different data sets (closing month, closing quarter, and closing semester) the explanatory variable with the most statistically significant estimates was the ETF Liquidity. ETFs with lower trading volume have a higher probability of liquidation. It is important to note that the liquidity is measured in terms of the trading volume. One possible explanation for the low trading volume of closed ETFs is that these ETFs were liquidated because they did not enough attract investors. Authorized participants are the market makers in the ETF industry. They create and delete ETFs shares. Once ETF shares are

created, retail investors can obtain ETF shares through stock exchanges. The low trading volume of closed ETFs in comparison to active ETFs indicate the low interest of both types of investors, institutional and retail, for closed ETF shares.

The statistically significant estimates of the Liquidity coefficient were observed when the Tracking Error was included in the models as an explanatory variable. The regression estimates indicate that higher tracking errors are associated with higher probability of liquidation. A possible explanation could be that closed ETFs follow less liquid indexes. ETFs that track less liquid indexes should exhibit higher tracking errors. The results also provide partial evidence that higher ETF Returns are associated with higher probabilities of liquidation. Finally, older ETFs are associated with higher probabilities of failures.

Throughout the different data sets and regression models, the most consistent evidence in favor of the study hypothesis is the negative sign of the Liquidity coefficient. The results of the Tracking Error estimates were consistent with the hypothesis but with partial evidence throughout the regression models. Also, as expected in the hypotheses, the estimates for Market Capitalization were not significantly different from zero. The hypothesis for ETF Return was that the coefficient should not be significantly different from zero. The results provide partial evidence that higher ETF returns are associated with higher probabilities of liquidation. There is no evidence in favor of the hypotheses for the Index Return, the Fund Age, and the Premium.

ROBUSTNESS CHECK

Baquero et al. (2005) used a probit model to evaluate liquidations in the hedge fund industry. In order to make a robustness check of the findings presented in the previous sections, there was an additional estimation of the regression models where the binary response variable assumes the cumulative normal distribution. The regression that uses the cumulative normal distribution is denominated as Probit. Table 6 shows the results of the same models estimated in Table 5, now using Probit. Again, liquidity attained a significant negative value once tracking error is included in the model. Across the different data sets used in the estimation process,

Table 6
Probit regression estimates (Robustness check)

	Closing Month					Closing Quarter					Closing Semester				
Coefficients	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept	0.104	0.324	-0.482	-0.498	-0.498	0.308	0.641	-0.260	-0.183	-0.183	0.737	1.001	0.437	0.712	0.718
	(0.523)	(0.105)	(0.130)	(0.125)	(0.126)	(0.061)	(0.005)	(0.469)	(0.618)	(0.615)	(0.000)	(0.000)	(0.349)	(0.156)	(0.154)
Market Capitalization	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.003	-0.003	-0.003	-0.002	-0.004	-0.007	-0.003	-0.003
	(0.970)	(0.546)	(0.342)	(0.350)	(0.355)	(0.452)	(0.286)	(0.368)	(0.352)	(0.388)	(0.369)	(0.619)	(0.536)	(0.675)	(0.715)
Liquidity	-0.229	-0.612	-0.694	-0.704	-0.706	-0.115	-1.311	-1.713	-1.930	-1.976	-0.629	-1.554	-1.984	-2.314	-2.307
	(0.226)	(0.028)	(0.032)	(0.031)	(0.032)	(0.604)	(0.028)	(0.010)	(0.006)	(0.006)	(0.156)	(0.033)	(0.011)	(0.005)	(0.005)
ETF Return	-0.464	3.167	2.975	5.115	5.098	2.175	7.687	10.436	1.515	-0.935	1.876	10.642	14.605	-10.087	-14.362
	(0.746)	(0.128)	(0.167)	(0.565)	(0.567)	(0.305)	(0.013)	(0.003)	(0.862)	(0.922)	(0.661)	(0.088)	(0.040)	(0.535)	(0.605)
Tracking Error		9.185	7.807	9.935	10.123		18.729	21.715	15.206	18.189		15.026	18.711	3.492	4.278
		(0.140)	(0.087)	(0.307)	(0.363)		(0.006)	(0.001)	(0.098)	(0.088)		(0.010)	(0.004)	(0.742)	(0.712)
ETF Age			0.071	0.071	0.071			0.087	0.097	0.096			0.054	0.059	0.057
			(0.001)	(0.001)	(0.001)			(0.001)	(0.001)	(0.001)			(0.132)	(0.113)	(0.131)
Index Return				-2.125	-2.099				10.740	13.705				28.070	32.279
				(0.803)	(0.807)				(0.267)	(0.209)				(0.101)	(0.249)
Premium					-0.001					-0.028					-0.021
					(0.972)					(0.575)					(0.850)
Observations	99	99	99	99	99	90	90	90	90	90	77	77	77	77	77
Akaike (AIC)	142.48	137.10	127.62	129.55	131.55	128.42	117.04	107.51	108.21	109.92	100.43	92.93	92.57	91.68	93.64
Schwarz (SBC)	152.86	150.08	143.19	147.72	152.31	138.41	129.54	122.51	125.70	129.92	109.80	104.65	106.64	108.09	112.39

the liquidity and the tracking error were the factors that have statistical significance explaining the binary response variable. ETFs with lower liquidities and higher tracking error are associated with higher probabilities of failures. Using data of the month previous to the ETF closing and data for the quarter previous to the ETF closing, the results of Model 3 have the lowest values in the two measures of the goodness of fit, AIC and SBC. Thus, Model 3 had the best fit of the five estimated models. In addition to the liquidity and the tracking error, the other factors explaining the failures were the ETF Age and the ETF Return. Older ETFs and higher ETF returns were associated with higher probabilities of failure. Notice in Table 6 that the results are consistent with the findings in previous sections.

CONCLUSION

This study identifies relevant factors associated with the liquidation or closing of fifty ETFs during 2008. There are several research papers that study some aspects of the liquidation process in the mutual fund industry and in the hedge fund industry. According to the researcher's knowledge, this is the first paper that studied liquidations in the ETF industry. The findings of this study contribute to a better understanding of the liquidations in the ETF industry.

The researcher selected a matched sample of 50 active ETFs at the end of 2008 based on two criterions: management style and market capitalization. The comparison of the liquidated ETFs and the matched samples of active ETFs revealed that closed ETFs were older in comparison to the active ETFs. An interesting result was that closed ETFs increase its size (in terms of market capitalization) in the vicinity of the final trading date. ETF market makers could be obtaining profits with these almost dead ETFs that trade with premium when they approach to the final trading date. The researcher ran various regression models in which the response variable is a categorical binary variable, Status (0 for active ETFs, 1 for liquidated ETFs). The values of the explanatory variables

associated with higher probabilities of liquidation were the lower liquidity values, higher tracking errors, and higher ETF returns. The most consistent evidence is found on the negative regression estimates of the Liquidity coefficient. A possible explanation for the low trading volume of closed ETFs is that these ETFs were liquidated because they do not attract enough investors. A possible explanation for the negative regression estimates of the Tracking Error could be that closed ETFs follow less liquid indexes.

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