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7-31-2009

## The Effects of ETF Splits on Returns, Liquidity, and Individual Investors

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# The effects of ETF splits on returns, liquidity, and individual investors

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## Abstract

**Purpose** – The purpose of this paper is to extend the literature on the effects of stock splits from mutual funds splits and the QQQ split to 20 exchange traded funds (ETFs) that span a wide variety of indexes. The split sample is compared to a non-split control sample with similar characteristics between 2000 and 2006. The objectives of this study are to investigate whether the results are different between the split sample and the control sample; and whether these results are similar to other investment vehicles in the existing literature.

**Design/methodology/approach** – The paper examines stock excess returns, total capital, several measures of liquidity, and the premium or discount relative to net present value around the split. It also tests for increases in smaller trades after the split.

**Findings** – The results support the hypothesis that two key management objectives of splitting an ETF stock are to increase demand from retail investors and to increase the total capital under management. Support is also found for the existence of momentum in stock price indexes.

**Research limitations/implications** – The effects of splits are examined in a larger group of ETFs that includes less-heavily traded stocks than the QQQ. These smaller ETFs potentially have more to gain in terms of increased investor interest than the QQQ.

**Originality/value** – Positive excess returns were found in the split ETFs before and after the split. This is consistent with the tendency for stocks to be split following a large price run-up, and with momentum theory. Also, significant increases were found in total capital under management and shares outstanding after the splits for the splitting stocks. This is consistent with the hypothesis that a key goal of managers is to increase their compensation via higher total capital under management. Finally, significant increases were found in the number of small trades and dollar values of trades as a percentage of all trades (and of total dollar volumes) in the split sample. These results support the hypothesis that a primary objective (and result) of ETF stock splits is to make the shares more attractive to individual investors – despite possible deterioration of liquidity as evidenced by wider bid/ask spreads.

**Keywords** Stocks, Stock returns, Liquidity, Bid offer spreads, Stock exchanges

**Paper type** Research paper

## 1. Introduction

Index tracking exchange traded funds (ETFs)[1] have become very popular investment vehicles since the introduction of Standard & Poor's Depository Receipts in 1993. They offer advantages of intraday trading and low expense ratios as compared to traditional index mutual funds[2].

ETF index prices are based on the value of the underlying index. Because many of these indexes have risen so much in recent years, some ETF managers have split their stock prices. Research on splits of individual stocks is extensive and a number of



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hypotheses have been developed to help explain why firms split their stock prices. Among these are the signaling, liquidity, and preferred trading range hypotheses. Dennis (2003) extends the analysis of stock splits to the two-for-one split of the Nasdaq-100 tracking stock ETF (QQQ) effective 20 March 2000. This split reduced the price per share of the QQQ from about \$240 to half that, bringing it much closer to the average price of the component stocks of about \$82 per share. The QQQ ETF is of special interest because it is one of the most heavily traded of all ETFs. He argues that this split could not have been motivated by managers hoping to provide signals about expected future performance because this ETF's underlying asset is an index rather than a particular stock. Dennis argues that this special case offers a way of directly testing for liquidity effects of a stock split. He finds improved liquidity on small-size trades in terms of higher trading after the split. However, he also finds wider relative bid/ask spreads afterward.

Dennis' results are consistent with the fund's stated objective of making its shares more attractive to individual investors, despite higher trading costs associated with wider bid/ask spreads. For example, a senior manager of Nasdaq stated that the main objective of the QQQ split in 2000 was to attract more individual investors. An executive from Barclays Global Investor stated that the splits of 12 ETFs under their management in 2005 were also undertaken to make their ETFs more attractive to individual investors.

The objective of this study is to examine effects of splits in a larger group of ETFs that includes less-heavily traded stocks than the QQQ. These smaller ETFs potentially have more to gain in terms of increased investor interest than the QQQ. In our tests, we compare the stock returns and several liquidity measures in the split sample and a control sample of similar but non-splitting ETF stocks around the announcement and effective split periods.

We find positive excess returns in the split ETFs before and after the split. This is consistent with the tendency for stocks to be split following a large price run-up, and with momentum theory. We also find significant increases in total capital under management and shares outstanding after the splits for the splitting stocks[3]. This is consistent with the hypothesis that a key goal of managers is to increase their compensation via higher total capital under management. Finally, we find significant increases in the number of small trades and dollar values of trades as a percentage of all trades (and of total dollar volumes) in the split sample. These results support the hypothesis that a primary objective (and result) of ETF stock splits is to make the shares more attractive to individual investors – despite possible deterioration of liquidity as evidenced by wider bid/ask spreads.

The remainder of the paper is organized as follows: We review related literature on splits in mutual funds and common stocks in section 2. Section 3 describes our data and sample, while section 4 develops the hypothesis and presents our empirical tests and results. Section 5 concludes.

## 2. Literature review

### 2.1 Signaling hypothesis

The signaling hypothesis is based on the information asymmetry between firm managers and the investors. Proponents suggest that managers convey the earnings prospects of their firms through the announcement of stock splits. Fama *et al.* (1969) propose that stock split decision signals a dividend hike as well as indirect management's optimism on the firm's earnings prospects. Although signaling

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hypothesis receives much support from the empirical studies in stocks (Grinblatt *et al.* (1984), Lakonishok and Lev (1987), Ikenberry *et al.* (1996)), it cannot apply to splits of ETF stocks.

Similar to the argument on closed-end mutual funds splits in Datar and Dubofsky (1999), there is no apparent evidence to suggest that ETF managers possess inside information of the net asset values (NAV) of their ETFs. Since the NAVs are available on the fund's website, the discrepancies between ETF prices and NAVs are subject to immediate action from the market makers. Rozeff (1998) provides additional empirical evidence to support this claim on mutual fund splits. Fernando *et al.* (1999) conduct a survey on mutual fund managers and conclude that most mutual fund managers do not consider splits for signaling purposes.

### *2.2 Liquidity hypothesis*

According to the liquidity hypothesis, firm managers may split their firm's stock to improve its liquidity. Baker and Gallagher (1980) showed that this is managers' most prominent reason for splitting their firms' stocks. Examining splits of American Depository Receipts (ADRs) that are not accompanied by splits on their corresponding domestic shares, Muscarella and Vetsuypens (1996) find evidence supporting their hypothesis that ADR "solo-splits" are motivated by a desire to enhance the ADR's liquidity in the USA. On the other hand, Conroy *et al.* (1990) and Schultz (2000) find an increase in effective bid-ask spread following stock splits.

Since the compensation for the fund managers is normally a fixed percentage of the total capital under management, this hypothesis may not apply to fund managers directly. However, the managers have the incentive to create demand for their shares insofar as to increase the total capital under management.

Rozeff (1998) argues that the liquidity theory does not explain mutual fund splits since fund investors can invest or redeem shares while the trading costs do not depend on price. As mentioned earlier, Dennis (2003) examines the liquidity changes following the two-for-one split in Nasdaq-100 tracking stock ETF (QQQ) on 20 March 2000. Although he finds improved liquidity for small trades, he finds a wider effective bid/ask spread and no evidence of higher aggregate turnover.

### *2.3 Marketability or preferred trading range hypothesis*

Fernando *et al.* (1999) finds an increase in net assets and number of shareholders after mutual fund splits. They interpret these results as offering support for the "marketability" hypothesis, in which stocks splits enhance the attractiveness of shares to investors by restoring prices to a preferred trading range. However, they find no significant post-split abnormal returns on mutual funds in 36 months after the split.

## **3. Our data and samples**

We obtain ETF split information from the Center for Research in Security Prices database (CRSP). These data include the declaration, record, and effective dates, and the factor to adjust shares (which reflects the split ratio). We verify the accuracy of the split information with Reuters, Business Wire, Market Wire, or PR Newswire. There are 24 ETFs with splits between 2000 and 2006. We limit our study to ETFs with at least one year of trade data prior to their split declaration dates[4]. Our sample selection criteria result in a final sample of 20 ETFs with splits. We also take the daily trading volume, price, and number of share outstanding data of ETFs from CRSP.

Intraday data for time, date, size, and transaction price for each (round-lot) trade are from the NYSE/AMEX Trade and Quote (TAQ) consolidated trade file. Intraday data for time, date, and bid-offer quotes are from the TAQ consolidated quote file. We collect the intraday data from 65 days before the declaration date to 65 trading days after the payment date. The categories for the selected ETFs are from <http://finance.yahoo.com>. Historical monthly premium/discounts to the NAVs are from [www.ETFConnet.com](http://www.ETFConnet.com)

As a benchmark, we form a control sample of non-splitting ETFs to account for broad trends in stock prices over time. To qualify for the control sample, the ETF must not itself have been split and must be in the same (or similar) fund category as the splitting ETF. The candidate whose returns in the 252 trading days[5] before the declaration date has the highest correlation with the split ETF is selected as that ETF's control stock.

Table I, Panel A, shows for each ETF in the split sample its name and key descriptive information. In our sample there are nine ETFs with a split factor of two-for-one; nine ETFs with a split factor of three-for-one; and two ETFs with a split factor of four-for-one. The distribution of ETF split factors is slightly different from those in Rozeff (1998). In his research on a sample of 145 mutual funds, 53.4 percent (19.3 percent) have split factors of two-for-one (three-for-one). In addition, there are multiple ETF splits by the same ETF family announced on three declaration dates: 12 ETFs on 25 May 2005, three on 6 September 2005, and four on 7 June 2006. Panel B shows relevant data for each of the matching control stocks.

The adjusted share price on the split declaration date is lower than the closing price on the first trading day in 20 ETFs with split. We conclude that the intention to bring the share price back to the closing price of its initial trading day is not the main reason for the split decision. Although not shown in Panel A, we also compute the price differentials between the first trading day and the split declaration day for the ETFs on selected declaration dates (25 May 2005, 6 September 2005, and 7 June 2006). We find that the adjusted prices of ETFs within a fund family lie within a fairly narrow range. For example, among the 12 ETFs with splits on 25 May 2005 by iShares Trust, the adjusted prices range from \$52.08 to \$69.91, with an average of \$62.41. We suggest that price conformity within a fund family is one reason behind the split decision and choice of the split factor. This is similar to the conclusion drawn on mutual fund splits in Rozeff (1998).

The returns of the control sample ETFs are highly correlated with those of the splitting ETFs. The correlation coefficients range from 0.77 to 0.97. In addition, 18 out of 20 of the paired-ETFs are in the same category (except funds 16 and 17). The price on the declaration date (event day) is higher than the price in the trading day in the entire control sample. This observation reflects the generally rising stock market in our sample period, 2000-2006.

## 4. Empirical tests and results

### 4.1 Stocks returns around split announcements

In this section, we examine returns on the splitting ETF stocks and compare them to those of the non-split control sample and three market indexes: the value-weighted returns of the CRSP market portfolio, the equal-weighted returns of the CRSP market portfolio and the S&P 500 index. We define five event periods:

- (1) The 115-day pre-announcement period ( $d_{lcrdt} - 120$  to  $d_{lcrdt} - 6$ ).
- (2) The five-day pre-announcement period ( $d_{lcrdt} - 5$  to  $d_{lcrdt} - 1$ ).

**Table I.**  
Descriptive data on the  
split and control samples

No.	ETF name	Ticker symbol	Split ratio	Date	Declaration Adj. price*	First trading Date	Price	Fund category
<i>Panel A: ETFs with split (split sample)</i>								
1	iShares MSCI Emerging Markets Index	EEM	3 for 1	05/25/05	68.23	04/11/03	99.70	Diversified Emerging Mkts
2	iShares MSCI EAFE Index	EFA	3 for 1	05/25/05	52.08	08/17/01	126.10	Foreign Large Blend
3	iShares Cohen & Steers Realty Majors	ICF	2 for 1	05/25/05	68.08	02/07/01	79.25	Specialty-Real Estate
4	iShares S&P N Amer Natural Resources	IGE	2 for 1	05/25/05	69.91	10/26/01	97.25	Specialty-Natural Res
5	iShares S&P MidCap 400 Index	IJH	2 for 1	05/25/05	66.28	05/26/00	91.38	Mid-Cap Blend
6	iShares S&P MidCap 400 Value Index	IJJ	2 for 1	05/25/05	64.00	07/28/00	71.86	Mid-Cap Value
7	iShares S&P MidCap 400 Growth Index	IJK	2 for 1	05/25/05	67.54	07/28/00	127.80	Mid-Cap Growth
8	iShares S&P SmallCap 600 Index	IJR	3 for 1	05/25/05	52.45	05/26/00	95.69	Small Blend
9	iShares S&P SmallCap 600 Value Index	IJS	2 for 1	05/25/05	58.46	07/28/00	67.06	Small Value
10	iShares Russell 2000 Index	IWM	2 for 1	05/25/05	60.30	05/26/00	91.44	Small Blend
11	iShares Russell 2000 Value Index	IWN	3 for 1	05/25/05	60.72	07/28/00	102.44	Small Value
12	iShares Dow Jones US Real Estate	IYR	2 for 1	05/25/05	60.92	06/16/00	69.80	Specialty-Real Estate
13	SPDR DJ Wilshire Small Cap Value	DSV	3 for 1	09/06/05	63.10	09/29/00	106.50	Small Value
14	SPDR DJ Wilshire Large Cap Value	ELV	2 for 1	09/06/05	69.48	09/29/00	132.00	Large Value
15	DJ Wilshire REIT ETF	RWR	3 for 1	09/06/05	69.70	04/27/01	111.90	Specialty-Real Estate
16	Rydex S&P Equal Weight	RSP	4 for 1	04/17/06	43.62	04/30/03	102.30	Large Blend
17	BLDRS Asia 50 ADR	ADRA	3 for 1	06/07/06	28.60	11/13/02	47.42	Diversified Pacific/Asia
18	BLDRS Developed Markets 100 ADR	ADRD	3 for 1	06/07/06	25.92	11/13/02	44.40	Foreign Large Blend
19	BLDRS Emerging Markets 50 ADR	ADRE	4 for 1	06/07/06	29.67	11/13/02	48.94	Diversified Emerging Mkts
20	BLDRS Europe 100 ADR	ADRU	3 for 1	06/07/06	25.98	11/13/02	44.70	Europe Stock
No.	ETF Name	Ticker symbol	Correlation # Days	Coef.	Prices DCLR**	IPO**	Category	
<i>Panel B: Non-split ETFs (control sample)</i>								
1	BLDRS Emerging Markets 50 ADR	ADRE	252	0.88	86.44	48.94	Diversified Emerging Mkts	
2	BLDRS Developed Markets 100 ADR	ADRD	252	0.78	65.89	44.40	Foreign Large Blend	
3	DJ Wilshire REIT ETF	RWR	252	0.95	187.49	111.90	Specialty-Real Estate	(continued)

No.	ETF Name	Ticker symbol	Correlation # Days	Coef.	Prices DCLR**	IPO**	Category
4	Energy Select Sector SPDR	XLLE	252	0.97	121.40	73.31	Mid-Cap Blend
6	iShares Russell Midcap Value Index	IWS	252	0.93	113.68	78.23	Mid-Cap Value
7	iShares Russell Midcap Growth Index	IWP	252	0.95	83.54	72.35	Mid-Cap Growth
8	Vanguard Small Cap ETF	VB	252	0.93	53.80	49.00	Small Blend
9	Vanguard Small Cap Value ETF	VBR	252	0.92	56.46	49.20	Small Value
10	iShares Morningstar Small Core Index	JKJ	226	0.90	65.86	59.91	Small Blend
11	iShares Morningstar Small Value Index	JKL	226	0.91	65.11	60.18	Small Value
12	Vanguard REIT Index ETF	VNQ	165	0.94	56.10	49.85	Specialty-Real Estate
13	iShares Morningstar Small Value Index	JKL	252	0.89	71.91	60.18	Small Value
14	Vanguard Value ETF	VTV	252	0.89	57.02	49.25	Large Value
15	Vanguard REIT Index ETF	VNQ	235	0.96	62.02	49.85	Specialty-Real Estate
16	Vanguard Total Stock Market ETF	VTI	252	0.97	128.33	114.80	Large Blend
17	iShares MSCI Pacific ex-Japan	EPP	252	0.77	104.85	50.20	Pacific/Asia ex-Japan Stk
18	Vanguard European Stock ETF	VGK	252	0.91	58.21	50.90	Europe Stock
19	Vanguard Emerging Mkts Stock ETF	VWO	252	0.91	61.63	50.16	Diversified Emerging Mkts
20	iShares S&P Europe 350 Index	IEV	252	0.90	88.50	76.63	Europe Stock

**Notes:** This table describes our split and control samples; there are 24 ETFs with splits between 2000 and 2006; split sample is limited to those ETFs with at least one year of trade data prior to the split declaration date; sample selection criteria results in a final sample of 20 ETFs with splits; to qualify for the control sample, the ETFs must not be split before and must be in the same (or similar) fund category; the ETF that has the highest correlation coefficient with the split ETF is then selected as its control stock; the correlation coefficient is calculated based on the daily returns of the 252 trading days (at least 126 trading days) before the date on which the split was announced; \*adj price = closing price/split factor; \*\*DCLR = Declaration day; IPO = First trading day

Table I.

- (3) The two-day announcement period ( $dclrdt$  to  $dclrdt + 1$ ).
- (4) The announcement period ( $dclrdt$  to  $paydt$ ).
- (5) The 115-day post-split period ( $paydt + 1$  to  $paydt + 115$ )[6].

We perform two-tailed  $t$ -tests and non-parametric Wilcoxon matched-pair signed rank tests to determine statistical significance of returns in these periods. Following a similar hypothesis on mutual fund splits in Datar and Dubofsky (1999), we expect positive pre-announcement run-ups in the split sample and no significant abnormal price effects in announcement and post-split periods.

Table II presents the raw and various excess returns of the split sample in each of the five event periods. All but the average (median) raw returns in the two-day announcement period exhibit significant positive returns. The average raw returns of split sample outperforms the three market indexes at significant level in the 115-day pre-announcement and the 115-day post-split period by a margin of 2.60 percent ( $= (2.36 \text{ percent} + 1.87 \text{ percent} + 3.56 \text{ percent})/3$ ) and 3.19 percent ( $= (2.79 \text{ percent} + 2.13 \text{ percent} + 4.64 \text{ percent})/3$ ). Similar results are found when we compare the median raw returns with the market indexes. The raw return of the split sample also outperforms the value-weighted CRSP portfolio and the S&P 500 portfolio in the second announcement period (between declaration date and payment date). However, we find negative average excess returns in the five-day pre-announcement period and the two-day announcement period. This suggests the existence of a mild reversal effect around the announcement period.

The positive excess return for the split sample in the 115-day pre-announcement period provides additional evidence to the pre-announcement run-up theory by Datar and Dubofsky (1999)[7]. These results are consistent with the well-known tendency for stock splits to take place following a period during which the stock has experienced a strong price run-up. After the splits, differences between the splitting ETFs and the other benchmarks tend to reflect differences in the returns on the various indexes employed. The positive excess returns after the split can also be interpreted as consistent with momentum theory.

#### 4.2 Total capital and split-adjusted shares outstanding

ETF managers usually charge a management fee based on a fixed percentage of total capital under their management, so their compensation is directly affected by the changes in total capital. Therefore, managers may have strong incentives to split their ETF stocks to increase total capital.

We test for the effects of ETF stock splits on total capital and in the number of split-adjusted shares outstanding for our samples in the pre-announcement period ( $dclrdt - 120$  to  $dclrdt - 1$ ), the announcement period ( $dclrdt$  and  $paydt$ ); and post-split period ( $paydt + 1$  to  $paydt + 115$ )[8]. The results are summarized in Table III. Overall, the split sample shows an increase in total capital (adjusted shares outstanding) by 16.7, 3.9, and 21.7 percent (13.7, 4.5, and 10.4 percent) in the three periods, respectively. This evidence is consistent with the expectation that managers split their ETF stocks to increase total capital under management.

When we compare the capital changes for the splitting stocks to those in their control stocks, we do not find a relative increase. The control stocks actually experience larger increases in total capital (adjusted shares outstanding) in each of the periods. In particular, the differences between the split and non-split control sample are significant in the pre-announcement and post-split periods. Although the non-split control sample



	Return on split sample	Control sample	Excess returns vs		S&P 500
			VW CRSP	EW CRSP	
<i>Panel A: Pre-announcement period #1 (dclrdt -120 to dclrdt -6)</i>					
Average (%)	3.32	-0.37	2.36	1.87	3.56
<i>p</i> -val ( <i>t</i> -test)*	0.0230	0.3836	0.0272	0.0484	0.0023
% Positive	70	55	75	65	75
Median (%)	2.26	0.16	2.49	2.57	3.74
<i>p</i> -val(Wlcn)*	0.0479	0.7089	0.0674	0.0620	0.0090
<i>Panel B: Pre-announcement period #2 (dclrdt -5 to dclrdt -1)</i>					
Average (%)	1.35	-0.13	-0.03	-0.12	0.16
<i>p</i> -val ( <i>t</i> -test)*	0.0003	0.2273	0.8736	0.5134	0.4620
% Positive	75	45	60	60	60
Median (%)	2.13	-0.06	0.32	0.24	0.64
<i>p</i> -val(Wlcn)*	0.0017	0.4115	0.8519	0.7089	0.3135
<i>Panel C: Announcement period #1 (dclrdt to dclrdt +1)</i>					
Average (%)	-0.34	-0.05	-0.65	-0.62	-0.73
<i>p</i> -val ( <i>t</i> -test)*	0.4142	0.7389	0.0311	0.0295	0.0231
% Positive	65	45	40	40	45
Median (%)	0.34	-0.03	-0.04	-0.12	-0.08
<i>p</i> -val(Wlcn)*	1.0000	0.9405	0.1454	0.1084	0.1454
<i>Panel D: Announcement period #2 (dclrdt to paydt)</i>					
Average (%)	1.29	-0.12	0.93	0.29	1.27
<i>p</i> -val ( <i>t</i> -test)*	0.0004	0.4979	0.0021	0.4112	0.0001
% Positive	90	55	85	45	90
Median (%)	1.57	0.04	1.00	-0.15	1.50
<i>p</i> -val(Wlcn)*	0.0072	0.5755	0.0072	0.5257	0.0019
<i>Panel E: Post-split period (paydt +1 to paydt +115)</i>					
Average (%)	10.88	-0.27	2.79	2.13	4.64
<i>p</i> -val ( <i>t</i> -test)*	0.0000	0.6289	0.0084	0.0510	0.0000
% Positive	100	50	75	70	85
Median (%)	8.90	0.09	1.51	0.60	3.88
<i>p</i> -val(Wlcn)*	0.0001	0.9108	0.0100	0.1169	0.0004

**Notes:** The compounded rate of return is examined in the split sample and this return is compared to those of the non-split control sample and three market indexes: the value-weighted returns of the CRSP market portfolio, the equal-weighted returns of the CRSP market portfolio and the S&P 500 index; five periods in this study are adopted; these periods are defined relative to the declaration date (*dclrdt*) and the payment date (*paydt*); \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcn) matched-pair signed rank test

**Table II.**  
Stocks returns  
around ETFs split  
announcements

appears to exhibit a superior ability to expand the total capital under management, it may be the result of other factors, such as more investor interest in the particular indexes covered by those ETFs. We conclude that the most meaningful evidence is consistent with the expectation that splits enable ETF managers to increase their capital under management.

#### 4.3 Turnover, trades, and dollar volume

We investigate several measures of liquidity based on trading volume. These are turnover, the number of trades per day, and dollar volume per day[9]. If the purpose of

	Changes in total capital			Changes in adj. shares outstanding		
	Split sample	Control sample	Difference	Split sample	Control sample	Difference
<i>Panel A: Pre-announcement period (dclrdt -120 to dclrdt -6)</i>						
Average (%)	16.7	108.1	-91.4	13.7	106.0	-92.3
<i>p</i> -val ( <i>t</i> -test)*	0.0099	0.0338	0.0756	0.0122	0.0395	0.0740
% Positive	65	100	25	85	100	25
Median (%)	12.0	43.4	-34.5	10.2	34.2	-30.3
<i>p</i> -val(Wlcnx)*	0.0206	0.0001	0.0064	0.0124	0.0001	0.0040
<i>Panel B: Announcement period (dclrdt to paydt)</i>						
Average (%)	3.9	5.6	-1.7	4.5	6.3	-1.6
<i>p</i> -val ( <i>t</i> -test)*	0.0222	0.0009	0.3778	0.0527	0.0019	0.5280
% Positive	65	75	45	69	77	53
Median (%)	1.7	3.6	-0.3	2.0	7.8	1.3
<i>p</i> -val(Wlcnx)*	0.0620	0.0064	0.4553	0.1005	0.0107	0.6092
<i>Panel C: Post-split period (paydt +1 to paydt +115)</i>						
Average (%)	21.7	54.7	-33.0	10.4	39.2	-28.8
<i>p</i> -val ( <i>t</i> -test)*	0.0000	0.0004	0.0161	0.0037	0.0014	0.0127
% Positive	90	95	25	80	90	30
Median (%)	21.1	33.8	-23.5	8.3	22.8	-22.2
<i>p</i> -val(Wlcnx)*	0.0005	0.0001	0.0124	0.0080	0.0001	0.0137

**Table III.**

Comparison of split and non-split control samples: changes in total capital and adjusted shares outstanding

**Notes:** Changes in total capital and in the split-adjusted shares outstanding for the split and non-split control sample in the pre-announcement period, announcement period and post-split period are investigated; these periods are defined relative to the declaration date (*dclrdt*) and the payment date (*paydt*) CRSP; split-adjusted shares outstanding are defined as the daily shares outstanding adjusted by cumulative split-adjusted factors; \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcnx) matched-pair signed rank test

the split is to make the ETF stock more attractive to small or individual investors, then we expect to see increases in the number of shares traded and the dollar volume after the split. Turnover is defined as the ratio of number of shares traded divided by the number outstanding. Its direction of change depends on relative changes in trading and the number of shares outstanding. For this reason, we do not have a clear expectation of the effect of the split on this variable.

Table IV presents the daily turnover ratios and the changes in turnover ratios for the split and control samples. Panel A provides summary statistics on the average and median daily turnover ratios in three of the event periods. Both samples experience lower average and median turnover ratios from the pre-announcement period. The average turnover ratio of the split sample (non-split control sample) is 14 percent (2.41 percent), 2.68 percent (1.72 percent), and 2.64 percent (2.07 percent) in the pre-announcement, announcement and post-split periods, respectively. Even though the split sample has higher average (median) turnover ratios than the non-split control sample, the differences are not statistically significant.

We confirm the decline in turnover ratios for both samples from the pre-announcement period in Panel B. In the post-split period, there is a statistically significant decrease in the average (median) turnover ratio in the split sample. The average (median) daily turnover ratio decreases by 0.50 percent (0.28 percent). This decline suggests that the increase in number of shares outstanding is somewhat larger than the increase in actual trading volume.

	Pre-announcement period <i>dclrdt</i> -65 to <i>dclrdt</i> -1		Announcement period <i>dclrdt</i> to <i>paydt</i>		Post-split period <i>paydt</i> +1 to <i>paydt</i> +65	
	Average	Median	Average	Median	Average	Median
<i>Panel A: Daily turnover ratios</i>						
ETFs with split (%)	3.14	1.30	2.68	1.16	2.64	0.90
ETFs in control sample (%)	2.41	1.03	1.72	0.83	2.07	1.01
Difference (%)	0.73	0.27	0.96	0.33	0.57	-0.11
<i>p</i> -value	0.6994	0.1354	0.4852	0.1913	0.7150	0.7938

	Announcement Period			Post-split period		
	Split sample	Control sample	Difference	Split sample	Control sample	Difference
<i>Panel B: Changes in turnover ratios from the pre-announcement period</i>						
Average (%)	-0.46	-0.69	0.23	-0.50	-0.34	-0.16
<i>p</i> -val ( <i>t</i> -test)*	0.2073	0.1527	0.6948	0.0567	0.3130	0.7056
% Positive	35	30	45	25	45	35
Median (%)	-0.31	-0.14	-0.10	-0.28	-0.08	-0.23
<i>p</i> -val (Wlcn)*	0.0333	0.0333	0.8228	0.0045	0.5503	0.2471

**Notes:** The turnover ratio is defined as the volume to shares outstanding in the daily CRSP database; the declaration date (*dclrdt*) and the payment date (*paydt*) are used as reference points for the pre-announcement, announcement, and post-split periods; \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcn) matched-pair signed rank test

**Table IV.**  
Turnover ratios of the split and non-split control samples

Table V reports the changes in the average number of daily trades and dollar volumes for the split and control samples. Although the number of trades and dollar volumes for both samples decline after the split in both samples, this decline is not statistically significant. The split sample experiences a significant increase in the number of trades (with an average increase of 76.6 percent), but its dollar volumes fall significantly (with an average decline of 8.59 percent). Meanwhile, the control sample experiences a significant increase in its daily trade and dollar volumes. The difference in the change of average daily trades in the split and control samples is significant, as is the difference in the change in the dollar volume between them. However, the direction of the change is different. One possible explanation is that the split results in fewer large trades coupled with a significant increase in smaller trades. We test this in a later section.

#### 4.4 Relative bid-ask spread and premium/discount to NAV

In this section, we examine the impact of the split announcement on the relative bid-ask spread and the premium/discount to NAV. Following Dennis (2003), we define daily spread of an ETF as the arithmetic average of the relative spreads[10] throughout the trading day. We compute and compare the changes in the average daily relative spreads from the pre-announcement period to the announcement (and to the post-split) periods for the split and control samples.

	Announcement period			Post-split period		
	Split sample	Control sample	Difference	Split sample	Control sample	Difference
<i>Panel A: Changes in average daily trades from the pre-announcement period</i>						
Average (%)	-4.3	-2.5	-1.9	76.6	13.0	63.6
<i>p</i> -val ( <i>t</i> -test)*	0.3227	0.6342	0.7745	0.0000	0.0634	0.0000
% Positive	40	35	35	100	70	85
Median (%)	-7.6	-4.8	-3.4	70.0	13.9	64.6
<i>p</i> -val(Wlcn)*	0.3703	0.5257	0.6542	0.0001	0.0731	0.0004
<i>Panel B: Changes in average daily dollar volume from the pre-announcement period</i>						
Average (%)	-8.91	-9.85	0.95	-8.59	19.10	-27.69
<i>p</i> -val ( <i>t</i> -test)*	0.3143	0.1650	0.9241	0.2913	0.0457	0.0336
% Positive	30	40	55	25	60	40
Median (%)	-14.29	-5.55	6.11	-12.48	17.21	-23.91
<i>p</i> -val(Wlcn)*	0.3703	0.2180	1.0000	0.1560	0.1005	0.0620

**Table V.**  
Changes in daily trades and dollar volumes of the split and non-split control samples

**Notes:** The declaration date (*dclrdt*) and the payment date (*paydt*) are used as the reference for the preannouncement period, announcement period and post-split period; daily trades are defined as the number of daily transactions (round-lots only) in the TAQ trade database; daily dollar volumes are the sum of the price and share quantity of each trade entry in the TAQ trade database; \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcn) matched-pair signed rank test

Next we compare the discount/premium from NAVs[11] for the two samples three months before the announcement month and three months after the payment month. Similar to the bid-ask spread, a higher-than-normal discount (or premium) to the NAV relative to the average cost of trading provides an incentive for market makers to try to capture the benefit of the temporary mispricing.

In Table VI, Panel A, we observe no significant differences of the relative bid/ask spreads between the split and control samples in the pre-announcement, announcement and post-announcement periods. In addition, only the split sample exhibits significant change in the daily average relative bid-ask spread from the pre-announcement to announcement periods (Panel B). Hence, we are unable to reject the null hypothesis that there is no change of the relative bid/ask spread from the pre-announcement period to the announcement period (or the post-split period).

Table VII presents the comparison on the premium/discount for the split and control samples between the three-month pre-announcement period and the three-month post-split period. Overall, the split control sample tends to trade at premium (indicating that the ETF stock price is higher than its NAV) in the pre-announcement and the post-split periods. However, we observe a shift of investors' expectation for the split sample. Before the announcement, the split sample generally trades at discount, yet in the post-split period it trades at a premium. In other words, investors express their willingness to purchase the split ETF at premium in the post-split period. This argument is confirmed in Panel B. In the post-split period, the average premium for the split sample is higher than those in the non-split control sample at significant level. Similar results (but at a smaller magnitudes) are found when we apply the same test on the six-month pre- and post-split periods.

	Pre-announcement period <i>dclrdt</i> -65 to <i>dclrdt</i> -1		Announcement period <i>dclrdt</i> to <i>paydt</i>		Post-split period <i>paydt</i> +1 to <i>paydt</i> +65	
	Average	Median	Average	Median	Average	Median
<i>Panel A: Daily relative bid-ask spreads</i>						
ETFs with split (%)	0.24	0.23	0.21	0.18	0.23	0.21
ETFs in control sample (%)	0.28	0.28	0.25	0.23	0.25	0.21
Difference (%)	-0.04	-0.03	-0.04	-0.04	-0.02	0.00
<i>p</i> -value	0.2966	0.3135	0.1561	0.1259	0.6586	0.7089

	Announcement period			Post-split period		
	Split sample	Control sample	Difference	Split sample	Control sample	Difference
<i>Panel B: Changes in daily relative bid-ask spreads from the pre-announcement period</i>						
Average (%)	-0.03	-0.03	0.00	-0.01	-0.04	0.03
<i>p</i> -val ( <i>t</i> -test)*	0.0179	0.1496	0.9381	0.4820	0.1633	0.3065
% Positive	20	45	45	40	40	65
Median (%)	-0.02	-0.01	0.00	-0.03	-0.02	0.01
<i>p</i> -val (Wlcnx)*	0.0111	0.2959	0.4781	0.2627	0.1084	0.4553

**Notes:** The declaration date (*dclrdt*) and the payment date (*paydt*) are used as the reference for the pre-announcement, announcement and post-split periods; the relative spread is defined as the absolute bid-ask difference divided by the trade price; \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcnx) matched-pair signed rank test

**Table VI.**  
Changes in relative average bid-ask spreads

#### 4.5 Retail investors – small-size trades and small-size dollar volumes

Since increasing the appeal of the ETF to a broader base of retail investors is the stated rationale behind an ETF split decision, we examine the relevance of this objective in the pre-announcement period (*dclrdt* -65 to *dclrdt* -1) and the post-split period (*paydt* +1 and *paydt* +65). For each trading day, we use trade size as the ranking variable to sort the ETF trades into four groups[12]: \$20,000 or below; above \$20,000 but below \$100,000; above \$100,000 but below \$1,000,000; and above \$1,000,000. We compute the relative trade to total trade (in percent) and the relative dollar volume to total dollar volume (in percent) for each group. We also compare the average relative trade to total trade (and the relative dollar volume to dollar volume) in the pre-announcement period and the post-split period.

We assume that retail investors are more likely to place orders with trade sizes in the smallest group in the split sample. At the same time, we do not expect any material differences in the control sample.

Table VIII reports the results. For the split sample, the percentage of trades in the smallest group increases by an average (median) of 20.9 percent (19.4 percent). This increase is statistically significant. There is also an average (median) increase of 7.4 percent (6.5 percent) in the percentage of dollar volume in the smallest group after the split. This increase is statistically significant (Panels A and C). On the other hand, we find no significant increase in percentage of trades or dollar volumes in the non-split control sample after the split (Panels B and D). We conclude that ETF splits in our sample have successfully attracted more small investors.

	Three months prior to split announcement		Three months after split payment month	
	Average	Median	Average	Median
<i>Panel A: Monthly premium/discount to NAVs</i>				
ETFs with split (%)	-0.09	-0.08	0.10	0.07
ETFs in control sample (%)	0.03	0.00	0.07	0.03
Difference (%)	-0.13	-0.05	0.02	0.11
<i>p</i> -value	0.0459	0.1169	0.7447	0.1790
	Three months after payment month			
	Split sample	Control sample	Difference	
<i>Panel B: Changes in premium/discount to NAVs in the post-split period</i>				
Average (%)	0.19	0.04	0.15	
<i>p</i> -val ( <i>t</i> -test)*	0.0000	0.4045	0.0056	
% Positive	90	63	65	
Median (%)	0.20	0.06	0.13	
<i>p</i> -val (Wlcn)*	0.0002	0.2772	0.0206	

**Notes:** The average monthly premia/discounts are compared to NAV for the split sample and non-split control sample; within each sample, its premium/discount in two periods is also compared: three months prior to the announcement month and three months after the split payment month; monthly premium/discount to NAVs is retrieved from <http://ETFConnect.com>; \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcn) matched-pair signed rank test

**Table VII.**

Premia/discounts relative to the NAV of the split and control samples

#### 4.6 Regression analysis

In the final section, we adopt multiple multivariate regressions to investigate the relationship between the post-split variable and the pre-announcement variable. In particular, we include a dummy variable to represent the split sample, the incremental effect for the split sample on the pre-announcement variable (dummy \* the pre-announcement measure) and the total capital (in terms of millions of dollars) of the ETF one day prior to the announcement period.

$$\begin{aligned}
 \text{Post-announcement variable} = & \alpha + \beta_1 \times (\text{Pre-announcement variable}) \\
 & + (\beta_2 \times (\text{Dummy}) + \beta_3 \times (\text{Dummy} \\
 & \times \text{Pre-announcement variable})) \\
 & + \beta_4 \times \ln(\text{Total capital}) + \varepsilon
 \end{aligned} \tag{1}$$

The 115-day pre-announcement period ( $dclrdt -120$  to  $dclrdt -6$ ) and 115-day post-split period ( $paydt +1$  to  $paydt +115$ ) are used when the underlying variables are excess returns (vs equal-weighted CRSP index), percentage change in split-adjusted shares outstanding and percentage change in capital value (for regressions one to three). The 65-day pre-announcement period ( $dclrdt -65$  to  $dclrdt -1$ ) and 65-day post-split period ( $paydt +1$  to  $paydt +65$ ) are used when the underlying variables are average daily turnover ratio, average daily number of trades, average daily dollar volume, average daily relative spread, average percentage of total number of trades in the small-size trade category and average percentage of total dollar volume in the small-size trade category (for regressions four to nine). Finally, a three-month average

	Trade size			
	≤\$20,000	>\$20,000 ≤ 100,000	>\$100,000 ≤ 1,000,000	≥\$1,000,000
<i>Panel A: Changes in % of trades (split sample)</i>				
Average (%)	20.9	-12.6	-7.9	-0.6
<i>p</i> -val ( <i>t</i> -test)*	0.0000	0.0000	0.0000	0.0000
% Positive	100	0	0	6
Median (%)	19.4	-12.6	-5.1	-0.4
<i>p</i> -val (Wlcn)*	0.0001	0.0001	0.0001	0.0004
<i>Panel B: Changes in % of trades (non-split sample)</i>				
Average (%)	-2.6	2.5	0.1	0.0
<i>p</i> -val ( <i>t</i> -test)*	0.1077	0.0586	0.8328	0.9861
% Positive	45	55	45	45
Median (%)	-1.4	1.2	-0.4	0.0
<i>p</i> -val (Wlcn)*	0.1672	0.1005	0.6813	0.8228
<i>Panel C: Changes in % of dollar volumes (split sample)</i>				
Average (%)	7.4	2.0	-6.4	-3.5
<i>p</i> -val ( <i>t</i> -test)*	0.0000	0.2681	0.0159	0.0021
% Positive	95	55	25	18
Median (%)	6.5	1.4	-2.6	-4.1
<i>p</i> -val (Wlcn)*	0.0001	0.4115	0.0187	0.0099
<i>Panel D: Changes in % of dollar volumes (non-split sample)</i>				
Average (%)	-1.4	2.8	-1.2	-0.2
<i>p</i> -val ( <i>t</i> -test)*	0.1262	0.0439	0.2682	0.8816
% Positive	40	65	40	50
Median (%)	-1.5	2.5	-0.8	0.0
<i>p</i> -val (Wlcn)*	0.1672	0.1169	0.2790	0.9405

**Notes:** The trade size as a ranking variable is adopted to sort the ETF trades into four groups for each trading day; small-size trades are defined as trades with transaction amounts up to \$20,000; the relative trade to total trade and the relative dollar volume to total dollar volume is computed for each group; for each group, the average relative trade to total trade (and the relative dollar volume to dollar volume) in the pre-announcement and post-split periods are compared; the pre-announcement period is the 65 trading days before the announcement date (*dclrdt*) and the post-split period is the 65 trading days after the payment date (*paydt*); \*two-tailed *t*-test and two-tailed Wilcoxon (Wlcn) matched-pair signed rank test

**Table VIII.**  
Trades of the split and non-split control samples based on trade size

premium/discount prior to the declaration date and three-month average premium/discount after the payment date are used for comparison in the pre-split and post-split periods (for regression ten).

Table IX confirms the results from the previous tables. First of all, each of the seven (out of ten) variables exhibit a significant positive relationship between the pre-announcement and post-split periods ( $\beta_1$ ). These variables are: average daily turnover ratio, average daily number of trades, average daily dollar volume, average daily relative spread, average percentage of total number of trades in the small-size trade, average percentage of total dollar volume in small-size trade, and average premium to NAV. In addition, five of these variables show stronger patterns for the split sample ( $\beta_3$ ). As compared with the control sample, average daily dollar volume and average percentage of the total number of trades in the small-size trade decline in the split sample. It is worth noting that total capital has a significant positive effect on the

**Table IX.**  
Regression analysis

Regression	Post-split measure	$\alpha$	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_4$	$R^2$
1	Excess return (vs CRSP EW)	-0.0024	0.3728	-0.0026	-0.0487	0.0030	0.1119
2	% Change in split-adjusted shares outstanding	0.7844***	-0.0142	-0.2811	0.1749	-0.0626	0.1884
3	% Change in capital value	0.9951***	-0.0196	-0.3238*	0.1521	-0.0707	0.1573
4	Average daily turnover ratio	0.0021	0.7552***	-0.0031	0.1033**	0.0001	0.9799
5	Average daily number of trades	76.99	1.1279***	86.24	0.7132***	-19.7301	0.9987
6	Average daily dollar volume	3,591.93	1.1723***	-2463.34	-0.2241***	-554.0116	0.9986
7	Average daily relative spread	0.0020***	0.5177***	-0.0001	0.1329	-0.0002**	0.6446
8	Average % of total number of trades in the small-size trade category	-0.0166	0.9963***	0.4342***	-0.4143***	-0.0012	0.7877
9	Average % of total dollar volume in the small-size trade	0.0615	0.8079***	0.0353	0.2525**	-0.0049	0.8936
10	Average premium to NAV	-0.0005	0.6568***	0.0008	-0.1672	0.0002	0.4419

**Notes:** The relationship of each of the ten variables in the post-split period with the corresponding variable in the pre-announcement period is investigated; the dummy variable to represent the split sample, the incremental effect for the split sample on the pre-announcement variable (dummy  $\times$  pre-announcement measure) and the total capital amount as of the day prior to the announcement period are included

Post-split measure =  $\alpha + \beta_1$  (Pre-announcement measure) +  $\beta_2$  (Dummy) +  $\beta_3$  (Dummy  $\times$  Pre-announcement measure) +  $\beta_4$  ln(TotCapmil)

For regressions 1-3: the 115-day pre-announcement period (*dlcrdt* -120 to *dlcrdt* -6) and 115-day post-split period (*paydt* +1 to *paydt* +115) are used; for regressions 4-9: the 65-day pre-announcement period (*dlcrdt* -120 to *dlcrdt* -6) and 65-day post-split period (*paydt* +1 to *paydt* +115) are used; for regression 10: a three-month average premium/discount prior to the declaration date and three-month average premium/discount after the payment date are used. \*\*\*, \*\*, \*, statistically different from zero at 1, 5 and 10 percent confidence levels



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average daily relative spread in the post-split period. Even though the incremental effect is not significant for the “premium/discount to NAV” variable, there is still a significant positive relationship between the pre-announcement and post-split periods.

## 5. Summary and conclusions

This paper extends the literature on the effects of stock splits from mutual funds splits (Rozeff, 1998), and the QQQ split (Dennis, 2003) to 20 ETFs that span a wide variety of indexes. We compare the split sample to a non-split control sample with similar characteristics between 2000 and 2006. The objectives of this study are to investigate

- Whether the results are different between the split sample and the control sample.
- Whether these results are similar to other investment vehicles in the existing literature.

First, we observe positive raw returns in the pre-announcement and post-split periods for both samples. These positive returns are significantly higher in the split than in the non-split sample, value-weighted CRSP index, equally-weighted CRSP index, and S&P 500 index. The positive excess returns in the split sample after the split period cannot be interpreted as support the signaling hypothesis. They are consistent with momentum, but really reflect the performance of the specific index being tracked.

In addition, there is an increase in the split-adjusted shares outstanding and total capital for the split and the control samples after the split. More importantly, the split sample exhibits a tendency to narrow its difference in the split-adjusted shares outstanding and total capital from the control sample. In brief, the split sample shows higher split-adjusted shares outstanding and total capital after the split.

There is a significant increase in the number of trades and decrease in dollar volumes in the split sample after the split. The increase in number of trades can be attributed to the success of ETF managers in enhancing the demand of the corresponding ETFs through the process of splits. However, there is no significant change in turnover and relative bid–ask spread from the split sample in the post-split period. The split sample is traded slightly above its NAVs in the first three months after splits, but this premium dissipates afterwards.

## Notes

1. An ETF can be bought and sold short just like a stock and investors can place either market or limit orders to trade the certificate any time during the trading day. Dividends from the underlying portfolio of stocks are used to offset the ETF’s annual expenses (usually 20 basis points per annum), with any amount in excess of the fund’s expenses paid to certificate holders quarterly.
2. Elton *et al.* (2002) compare S&P 500 index tracking ETF to S&P 500 index fund. They suggest that ETF’s poorer relative performance is mainly caused by the forgone reinvestment income of the dividends received by the trust and management fee. Because large investors are able to transact with actual baskets of stocks (the “in-kind” transactions), the ETF’s market price is kept closer to its net asset value than index mutual funds. Hence, ETFs are expected to continue growing in size and numbers, and to offer improved immediacy to the market.
3. The increases are absolute increases in total capital and the number of shares and are not adjusted for the control stocks.

4. This requirement eliminates four ETFs: QQQ in 2000; XTF/M and XTF/Q in 2003; and OOO in 2005.
5. There must be at least 126 trading days of daily returns to calculate a correlation coefficient.
6. These periods are defined relative to declaration date (*dclrdt*) and payment date (*paydt*).
7. Run-up is defined as the compounded rate of return during the 120 days prior to the announcement and 60 days prior to the announcement. Run-up theory suggests that a large run-up is the cause of the split in the mutual funds.
8. Total capital is defined as the product of the daily closing price for the ETF and the shares outstanding. Split-adjusted shares outstanding are defined as the daily shares outstanding adjusted by cumulative split-adjusted factors.
9. Turnover is defined as the average of daily share traded divided by shares outstanding from the daily CRSP database. Daily trades are the number of trade entries in the TAQ trade database (round lots only) in each trading day. Dollar volume is the sum of the product of the price and quantity of shares in each transaction.
10. Absolute quoted spread (the difference between the quoted ask price and quoted bid price) and effective spread (the absolute value of the difference between the trade price and the bid-ask mid-point) are inappropriate measures in this study since stock split affects the magnitude of the bid and ask prices. Relative spread is expressed in percentage. It is defined as the absolute spread/trade price.
11. Discount/premium from NAV is defined as the difference between the closing price and its NAV at the end of the month. It is expressed as a percentage of the NAV.
12. Trade size is defined as price times the number of shares purchased. These ranges are selected based on the trade size distribution of QQQ from Table V of Dennis (2003).

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**Further reading**

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