Characteristics of Market Trading in Exchange-Traded Funds: 2009-2010

Antti Petajisto[*]

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[*] NYU Stern School of Business, 44 W 4th St, Suite 9-190, New York, NY 10012-1126, tel. +1-212-998-0378, http://www.petajisto.net/, antti.petajisto@stern.nyu.edu.

Key Findings

In the U.S. market, closing prices of exchange-traded funds (ETFs) generally occur farther from an ETF's net asset value (NAV) than either the 1) closing bid-ask midpoint, or 2) prices in continuous trading immediately preceding the close. Authorized participants react to positive premiums by creating more ETF shares and to negative premiums by redeeming shares, which pushes premiums back toward zero. Bid-ask spreads are low for the median ETF but are positively skewed in the cross-section with some funds having spreads of several percent; spreads are generally correlated with trading volume as well as the underlying asset class of the ETF.

I. Data

A. Sources

I combine four main sources of ETF data. The first source is CRSP, which I use for daily prices and trading volume. The second source is Bloomberg, which covers daily NAV data for essentially all live funds as of April 2010 or later, going back to the inception of each fund. During 2009-2010 (our main focus of analysis), the Bloomberg data include anywhere from 91-98% of all ETFs and 99% of all ETF assets.

The third data source is Morningstar, which I use for style categories. The data were downloaded in March 2010 and November 2010 for live ETFs, which account for 94-100% of my cumulative fund sample and 100% of their assets in 2009-2010. Survivorship bias is not an issue here since I do not study the performance of individual ETFs.

The fourth data source is the consolidated NYSE TAQ data, which has been aggregated from individual transactions and quotes to 5-minute intervals. I use it for intraday calculations, including bid-ask spreads, prices, and trading volume.

Figure 1 shows the explosive growth of the ETF sector in the last few years. The sample includes both ETFs registered under the Investment Company Act of 1940 as well as other ETFs that are not registered under the 1940 Act; the latter invest

primarily in commodities, currencies, and futures. Exchange-traded notes (ETNs) are not included.

B. Sample Statistics

Table I describes my sample of ETFs in 2010, showing the whole distribution of some key characteristics. The median fund has $91 million in assets, but the distribution is heavily skewed in terms of asset size with the largest fund (SPY) accounting for $91 billion. Dollar trading volume is even more skewed, with the median fund trading about $1 million per day and the most active fund (SPY) trading $24 billion per day. Relative to a fund's market capitalization, daily trading amounts to about 1.7% for the median fund, implying about 400% turnover per year, but the most active funds can even trade more than their market cap in a single day. The median ETF closing bid-ask spread is 14 basis points (bp), but it varies from as low as 1 bp for the most liquid funds to as high as several percent for the least liquid funds, reflecting the wide disparity in trading volume across funds. Unlike a regular stock where market makers have to post a large spread to offset the adverse selection problem they face (i.e., they may lose money trading with someone who has private information), an ETF is valued based on fully observable components, so the ETF spreads should generally be lower than they would be for a stock with similar trading volume.

The median fund is generating a 29% annual turnover by its own trading. Some turnover is unavoidable even for passive funds because of changes in the underlying index. Especially funds holding front-month futures positions need to trade often as they roll over their positions regularly, whereas a diversified large-cap equity index requires little turnover if the fund uses only in-kind creations and redemptions. The annual expense ratio of a median fund stands at 54 bp of net assets, varying from 7 bp to 150 bp across funds.

Four years earlier in 2006, the median fund was almost 40% bigger, it had 50% greater trading volume, and its bid-ask spread was slightly lower. This reflects that during the recent proliferation of ETFs, fund sponsors have been testing investor

appetite for a variety of products, including competing products in old categories as well as new products in small niche categories which have not even been intended for a broad investor base.

II. ETF Closing Price Premiums and Efficiency of MOC Orders

A. Methodology

I define the ETF price premium as the percentage deviation of the ETF price from the NAV. For simplicity I call it a premium even if it is negative, i.e., when the ETF is trading at a discount. I weed out a handful of premiums greater than 20% in absolute value, as they are all due to data errors, but in general my data sources seem relatively clean.[1]

I focus on the premiums in the period from 1/2009 to 12/2010, when all ETFs have been trading until 4:00pm Eastern time (ET). Prior to 12/2008, many large ETFs traded on Amex until 4:15pm, which would complicate inferences from the observed premiums because the NAVs are determined at 4:00pm.

The statistics on the ETF premiums are computed as follows. First I calculate the average level and time-series volatility of the premium for each fund. Then I average across funds within each category to get the average premium and the average volatility of the premium. I repeat this procedure for skewness and excess kurtosis. I show both equal-weighted and value-weighted (by market cap) averages for the mean and volatility.

I also compute percentiles for the premiums, but here I follow a slightly different procedure: I pool all observations within a fund category (across funds and across days), and I compute the percentiles for this sample. This answers the question about what the premium distribution looks like across all ETFs within a group; computing this first at

[1] In CRSP, I find 5 data points (out of about 600,000) where the daily ETF price quote is clearly incorrect (i.e., a data error of economically significant magnitude). The cutoff cannot be set much lower than 20% because there are several legitimate data points where the premium is greater than 10%.

the fund level and then aggregating the percentiles across funds would be much harder to interpret.

B. Results

Table II shows the results for the premium using both the closing price (i.e., last actual transaction up to 4:00pm) as well as the midpoint between bid and ask prices at market close. The main focus of analysis here are market-on-close (MOC) transactions, but unfortunately my data sources do not separately identify them, so I have to use a proxy for MOC prices; the best proxy I have is the closing price. However, if there are no MOC transactions, the closing price will show the last transaction price during continuous trading. In order to get a better proxy for true MOC prices, I compute trading volume between 3:45pm and 4:15pm ET, and I only pick those days when an ETF had nonzero volume in that period; the table shows the results using only these days.

In general, the average premium is close to zero across most categories of ETFs, indicating that ETFs tend to trade at neither a meaningful premium nor a meaningful discount (unlike closed-end funds). For example, the average premium across diversified U.S. equity funds is within 1-2 bp of zero for both market closing prices and closing bid-ask midpoints. The most significant exception are bond funds, which show positive average premiums because their NAVs are often computed based on bid prices for the underlying assets, so their NAVs are understated relative to bid-ask midpoints of the underlying fund assets, especially for bonds with larger bid-ask spreads. International equity funds also had positive average premiums, likely reflecting asset price appreciation between local and U.S. market closings not fully captured in reported fund NAVs.

Even for categories of funds with near-zero average premiums, daily premiums can move around considerably, fluctuating between a premium and a discount. The average volatility of the end-of-day premium across all ETFs is 49 bp using the bid-ask midpoint, suggesting that a 95% confidence interval for the premium is from about -1% to +1%. Using closing prices, the average volatility rises to 53 bp, implying a confidence

interval from about -1.1% to +1.1%. The value-weighted volatility is slightly lower for both the midpoint and closing prices.

The distribution of premiums is fairly symmetric, with skewness very close to zero. However, it does have extremely fat tails: the average excess kurtosis of market closing price premiums across all ETFs is 14 on an equal-weighted and 11 on a value-weighted basis. Excess kurtosis of bid-ask midpoint premiums is somewhat higher, 25 on an equal-weighted and 12 on a value-weighted basis. This indicates that there are occasional very large positive or negative premiums that deviate from the usual pattern. Data errors do not seem to be driving this results: even the largest ETF (SPY) had a few closing price premiums of about 50 bp in 2009, in spite of generally tracking the NAV very closely. The implication for investors is that regardless of the typical level of ETF price premiums, occasionally a market disruption can generate a very large deviation in either direction.

The last two panels of Table II report the same statistics when ETFs have been sorted into quintiles based on their market cap and dollar trading volume. Generally both the equal-weighted and value-weighted results for the largest and most traded funds are similar to the value-weighted averages across all funds. Although premiums tend to be more volatile for smaller and less traded funds, the premium volatility is considerable even for larger funds: e.g., an equal-weighted average volatility of 47 bp for the most traded quintile of funds, compared with an equal-weighted average of 53 bp across all funds.

Table III shows that the confidence intervals implied by a normal distribution are slightly wider than the confidence intervals implied by the actual distribution. The percentiles show a 90% confidence interval for closing price premiums across all ETFs, ranging from -66 bp to 118 bp. The discrepancy arises from large outliers, which also generate the high kurtosis numbers.

In unreported results, I compare the closing price premiums with premiums using the volume-weighted average price (VWAP) in the last 5 minutes of trading, i.e., 3:55pm-4:00pm ET. The premium volatility for closing prices is only 1 bp higher than

for the VWAP. However, we cannot conclude from this that MOC orders are executed efficiently. First, the VWAP premium volatility should always be higher because the overall market can still fluctuate nontrivially in the last 5 minutes of trading. Second, the VWAP from the last 5 minutes of trading is likely to include the MOC volume as well, meaning that any differences between continuous-trading and MOC prices will appear smaller than they actually are.

Table IV confirms that the same pattern holds for levered and inverse ETFs: volatility of premium for market closing prices is higher than it is for the closing bid-ask midpoints.

Overall, the results suggest that MOC volume is executed somewhat farther away from NAV than either the closing midpoint or the average price in continuous trading at the end of the trading day. To get more precise estimates of the additional inefficiency, we would need to find a data source that clearly distinguishes MOC volume from other end-of-day transactions.

III. Premiums and Share Creation/Redemption Activity

Any material positive premium in an ETF can be exploited by a market maker who sells shares in the market and then transacts with the ETF to create a corresponding number of creation units of shares at NAV, and vice versa for negative premiums. What do historical data suggest about how ETF market makers actually respond to premiums?

Table V shows some statistics on share creations and redemptions from 1/2009 to 12/2010. I compute the fraction of trading days when each ETF experienced share creations or redemptions, and then I compute the mean and median across all funds. On average, creations or redemptions occurred on 21% of all trading days. However, this measure is skewed by many small funds with little or no activity, so the median is only 11%.

The other columns in the table are all conditional on creations or redemptions taking place that day. The median number of shares created or redeemed was 100,000,

which is a common size for one or two creation units, while the mean was 338,000 shares. The median dollar value of these transactions was $4 million, whereas the mean was again higher at $14 million. As a fraction of a fund's total assets, the median transaction accounted for 5%, while the mean accounted for 21%. Relative to the daily ETF trading volume, these are much larger fractions, with the median and mean creation/redemption transaction accounting for 237% and 1,565% of daily volume, respectively.

Economically, these numbers indicate that the size of a creation unit is indeed large for a typical ETF. Even if an arbitrageur participates in every single trade in a fund and always on the same side, in most funds it would still need several days to accumulate a position that would be large enough to offset the creation or redemption of a single creation unit. This makes it harder to arbitrage small mispricings by using the ETF share creation/redemption process, thus making it less surprising if prices do not closely track NAVs for many funds. The fund categories most affected by infrequent creations and redemptions are the ones with the most difficult-to-trade underlying assets, including international equities as well as corporate and muni bonds, whereas funds holding U.S. equities and U.S. government bonds experience more creation/redemption activity on average.

The bottom two panels of the table show the same statistics across funds sorted into quintiles by market cap and trading volume. The larger and more traded ETFs have much more frequent creations and redemptions. In spite of the larger size of creations for larger funds, such creations account for a much smaller fraction of daily trading volume, which makes arbitrage activity easier in these funds.

Table VI shows a regression analysis of share creations and redemptions on day t as a function of lagged end-of-day premium measured relative to the closing bid-ask midpoint, with redemptions counted as negative creations. Creations are expressed as a fraction of the average daily trading volume during the same month. Standard errors are computed with double-clustered standard errors across both funds and time, and t-statistics based on them are reported in parentheses. This takes into account persistent

fund-specific effects where one fund is trading at a persistent premium, e.g. due to strong inflows combined with illiquid underlying assets, and it also allows for premiums to be correlated across similar funds within the same time period.

I find that past premiums positively predict future share creations up to about 10 daily lags (two weeks), with the strongest effect coming from the prior day. The effect is statistically highly significant and also economically somewhat significant: a 1% premium on a fund would add 8% of more shares relative to the daily trading volume. In other words, the effect occurs in the direction one would expect, and it seems that market makers respond within 1-10 days to such premiums by creating or redeeming ETF shares.

Table VII shows how the midpoint premiums respond to share creations and redemptions. Creations and redemptions in the same day immediately affect the premium, although by a very small amount: if a market maker creates enough new shares to match the daily trading volume, that reduces the premium by about 1 bp by the close of trading, which is statistically significant. Over the following two days, creations continue to reduce the premium by another 1 bp; subsequently they have no effect on the premium. This suggests that market makers offload their newly created ETF shares in the secondary market immediately before and after the creation process, and thus the price pressure from the new shares arises contemporaneously within about one day of share creation.

Panel B of Table VII shows the long-term relationship between creations and the level of the premium. Creations in the prior three days all very significantly predict the level of the premium. In fact, the cumulative creations over the prior one, three, and six months all significantly predict the level of the premium. One explanation for this persistence in creations and premiums is that funds experiencing steady inflows trade at a premium; presumably investor demand pushes the ETF price to a premium, which then incentivizes the APs to create more ETF shares, but not so aggressively that the APs would eliminate the premium that is generating their own arbitrage profits. Similarly, the reason an ETF is shrinking is that an AP is redeeming shares, which is a

profitable trade only when the AP has first purchased those ETF shares in the public market at a discount.

IV. ETF Liquidity and Trading Spreads

Figure 2 shows the total trading volume in all ETFs in five-minute periods throughout the day, averaged across all of 2010. ETFs exhibit the same type of clustering as other securities: most of the volume occurs at the beginning and end of the trading day. In the middle of the day, trading intensity is about 30-50% of the value near the beginning and end of day, but it is certainly still at an economically meaningful level. Anecdotal observations suggest that some ETFs tend to search for their efficient prices early in the trading day (if lack of liquidity for the underlying fund holdings prevents market participants from directly observing the fundamental value) and then become more efficiently priced toward the close, but this does not seem to hinder overall trading activity in the morning, when trading is essentially just as intense as at the end of the day. The daily average patterns on Mondays and Fridays are fairly similar to the rest of the week; Fridays tend to be busier than Mondays, with a large peak in activity at the end of the day right before the weekend.

Figure 3 shows the average bid-ask spreads across ETFs throughout the day. The volume-weighted average spread is very stable at 5-6 bp from 9:30am to 4:00pm. However, the equal-weighted spread comes down slowly from over 100 bp at 9:30am to about 50 bp during most of the day, and then it starts rising again after 3:30pm. Spreads for small ETFs also tend to be slightly wider on Fridays, perhaps when some market participants are less actively involved.

Figure 4 illustrates the depth of the ETF market by plotting the average size of the bid and ask quotes across all ETFs trading in 2010. Quote size goes up gradually over the course of the trading day, with a more pronounced spike for larger ETFs.

Figure 5 shows the average daily volume for all ETFs in 2010, plotted against their volume-weighted median intraday bid-ask spreads. More specifically, for each 5-minute interval, I have the average bid-ask spread and trading volume; I then compute

each fund's median spread across all 5-minute intervals within the trading day (9:30am-4:00pm ET) and over time, weighting the observations by dollar trading volume. I find that all funds with bid-ask spreads below 5 bp also have at least $10M in daily trading volume; conversely, the dozen funds with over $1 billion in daily trading volume all have spreads below 10 bp. More surprisingly, among the funds with a volume-weighted median intraday bid-ask spread of 100 bp or above, there are still some funds with over $1 million in trading volume; this spread seems rather large, given that these are fully transparent and passively managed investment vehicles. For the average investor, this also highlights the importance of efficient trade execution, especially if they trade actively.

Table VIII relates median time-weighted intraday bid-ask spreads of individual ETFs in the fourth quarter of 2010 to market cap, trading volume, underlying asset class, and ETF leverage. Both market cap and trading volume are very significantly related to spreads: increasing either by a factor of ten would approximately cut the spread in half, with high statistical significance. In a horse race, trading volume turns out to be more important than market cap.

Another major contributor to spreads is the underlying asset class: once dummy variables are included for the asset class, R^2 goes up by about 25%. Asset class dummies and daily volume together are sufficient to generate a high R^2 of 68.4%. Dummy variables for ETF leverage only marginally increase R^2, most of it coming from 2x and 3x inverse ETFs having slightly higher spreads.

To shed more light on this, Table IX breaks down bid-ask spreads by fund category. While the market-cap-weighted spreads average only 6 bp and are generally low across all categories, the equal-weighted spreads are larger for U.S. sector funds (30 bp), U.S. corporate bonds (29 bp), munis (22 bp), and international equity (34 bp). Again, these are among the categories of ETFs that are hardest to arbitrage relative to the underlying fund holdings, making it harder for market makers to hedge their positions.

Table I. Sample Statistics of ETFs in 2010 and 2006.

The table shows the cross-sectional distribution of various characteristics of U.S. exchange-traded funds. Daily volume and turnover represent the trading by investors in ETF shares, and they are computed as the mean throughout the year. The bid-ask spread of an ETF is computed as the time-weighted median end-of-day closing spread (with each daily observation weighted equally). Market capitalization is the last available month-end value that year. Fund turnover refers to annual turnover of securities within the ETF's portfolio (thus excluding in-kind creations and redemptions).

			Percentile							
Year	Variable	Mean	Min	5	25	50	75	95	Max	N
2010	Market cap ($M)	1,022	1.2	3.7	20	91	429	4,328	90,965	969
	Daily volume ($M)	68	0.0	0.0	0.3	1.1	7	168	23,792	1,018
	Daily turnover (%)	6	0.1	0.5	0.9	1.7	4	27	147	1,013
	Bid-ask spread (bp)	21	1	3	8	14	23	63	743	1,018
	Fund turnover (%)	51	1	4	12	29	57	169	1,232	720
	Expenses (bp)	55	7	14	35	54	71	95	150	860
2006	Market cap ($M)	1,134	5.0	9.3	29	125	671	4,529	63,725	376
	Daily volume ($M)	72	0.0	0.1	0.4	1.6	9	112	9,160	378
	Daily turnover (%)	4	0.2	0.5	0.9	1.6	4	17	80	350
	Bid-ask spread (bp)	14	1	5	10	13	17	23	153	378

Table II. ETF Price Premiums (and Discounts) Relative to NAV – Nonzero Trading 3:45pm-4:15pm.

For all ETFs traded in the U.S., this table shows the number of ETFs and their last available market capitalization within each investment category. The table also shows the average premium (or discount) of the ETF price relative to its net asset value, as well as the time-series volatility, skewness, and excess kurtosis of the premium. All results are shown for the market closing price (MC) and the closing bid-ask midpoint (MP), both equal-weighted (E) and value-weighted (V; by market cap) across ETFs. The time period is 1/2009 to 12/2010. The premiums (average and volatility) are expressed in basis points. Only days with nonzero trading volume between 3:45pm and 4:15pm are included in the calculations.

Category	Market cap ($M)	N	Average premium				Volatility of premium				Skewness of premium				Kurtosis of premium			
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV
U.S. Equity - Diversified	355,421	216	-1	-1	-1	-2	16	8	23	10	-0.26	-0.46	-0.36	-0.70	23	13	16	12
Large Blend	163,291	52	0	-1	0	-1	15	7	27	8	-0.68	0.08	-0.80	-0.44	25	7	22	6
Large Growth	49,031	28	-1	-2	0	-2	17	7	22	12	-0.60	-1.13	-0.80	-1.59	27	11	21	23
Large Value	44,374	35	0	0	1	0	12	7	15	10	1.16	0.12	-0.19	-0.49	33	14	10	8
Mid-Cap Blend	32,646	21	-2	-2	-1	-2	25	9	29	11	0.34	-3.03	-0.40	-2.36	25	54	10	35
Mid-Cap Growth	8,718	19	-2	-2	-3	-2	17	7	21	11	-2.20	-0.61	-0.17	0.40	26	12	19	13
Mid-Cap Value	6,649	16	-1	-1	0	-2	11	8	20	12	0.17	-0.11	-0.09	-0.20	11	8	9	8
Small Blend	32,563	19	-3	-3	-3	-3	19	14	25	16	-0.04	-0.49	0.94	0.05	8	5	22	7
Small Growth	8,313	11	-4	-3	-4	-2	12	11	25	14	0.08	-0.26	-0.31	0.09	3	3	5	4
Small Value	9,837	15	-3	-3	-1	-3	17	14	23	17	-0.85	-0.56	-0.55	-0.55	23	11	10	7
U.S. Equity - Sectors	134,140	273	8	4	10	5	42	22	47	28	-0.13	-0.34	-0.42	0.07	25	16	15	15
Communications	1,845	9	8	3	12	3	44	21	46	25	-0.19	-0.03	-0.57	-0.55	12	3	6	5
Consumer Discretionary	5,129	16	5	0	7	0	30	8	28	16	-1.90	-0.83	-0.58	0.46	38	8	19	11
Consumer Staples	4,740	14	9	2	13	2	29	11	33	16	-1.21	-0.33	-0.58	-0.29	14	8	7	5
Energy	20,476	38	4	0	5	1	38	16	43	20	-1.32	-0.35	-1.08	0.03	44	17	33	13
Financial	17,236	35	7	-1	6	-1	50	22	55	28	0.40	0.01	-0.15	0.10	20	10	10	12
Health	10,570	25	-2	-2	-1	-1	24	10	31	16	0.74	1.05	-0.34	0.31	30	29	19	18
Industrials	8,115	26	2	1	3	0	40	20	44	27	0.06	-0.96	0.03	-0.54	17	18	11	12
Miscellaneous Sector	10,643	7	11	14	15	20	32	41	39	47	1.21	0.08	0.50	0.66	31	37	22	28
Natural Res	13,357	35	15	4	19	4	54	26	59	33	0.03	-0.12	-0.29	1.02	20	9	14	28
Precious Metals	5,717	6	28	2	31	5	78	37	84	42	-0.90	-4.82	-0.49	-2.47	13	46	8	26
Real Estate	15,016	15	6	0	5	0	46	18	53	25	1.09	0.24	-0.39	0.22	19	6	16	8
Technology	15,204	30	26	23	25	23	52	35	58	41	0.01	-0.57	-0.69	-0.11	30	12	9	7
Utilities	6,092	17	0	0	5	0	37	13	41	18	0.42	0.00	-0.13	-0.03	10	7	4	6
U.S. Bonds - Government	42,059	34	9	13	11	13	23	17	23	18	0.73	1.32	0.24	1.09	11	7	5	5
Short Government	12,315	8	0	2	-1	2	11	3	12	3	0.98	0.30	-0.14	-0.06	13	3	1	1
Intermediate Government	2,011	7	5	5	7	6	10	8	12	10	0.92	0.12	0.29	0.10	10	3	3	1
Long Government	6,877	13	14	5	19	5	40	18	39	19	0.29	0.00	0.15	0.02	14	3	11	3
Inflation-Protected Bond	20,857	6	13	22	16	23	17	26	19	26	1.07	2.48	0.82	2.22	4	10	3	8
U.S. Bonds - General	73,674	43	33	71	36	72	54	77	55	78	1.12	1.70	0.74	1.66	5	8	6	8
Ultrashort Bond	1,013	1	1	1	1	1	2	2	3	3	0.26	0.26	0.16	0.16	4	4	2	2
Short-Term Bond	14,062	10	42	79	43	80	38	73	32	74	1.16	1.77	0.55	1.73	6	7	12	7
Intermediate-Term Bond	29,010	16	8	43	11	44	50	40	56	42	1.40	2.12	1.12	2.09	6	12	5	12
Long-Term Bond	14,369	8	47	83	52	84	51	95	54	96	0.38	0.79	0.27	0.78	2	1	2	1
Multisector Bond	686	4	25	47	30	50	32	35	38	39	0.65	1.76	0.01	1.30	1	4	3	4
High Yield Bond	14,003	3	105	114	108	116	158	146	163	148	2.28	1.78	2.25	1.80	11	9	11	8
Convertibles	530	1	78	78	63	63	110	110	69	69	1.28	1.28	-0.62	-0.62	3	3	2	2

Table II (continued).

Category	Market cap ($M)	N	Average premium				Volatility of premium				Skewness of premium				Kurtosis of premium			
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV
U.S. Bonds - Munis	6,603	27	36	21	40	23	54	46	57	49	0.18	-0.69	-0.52	-1.03	9	12	14	24
Muni Short	2,450	9	41	21	44	23	39	33	43	36	0.61	-0.28	-1.19	-2.65	9	12	18	34
Muni National Interm	210	7	37	28	42	33	47	40	48	40	0.38	0.56	-1.24	-1.42	8	11	4	5
Muni National Long	3,404	4	7	14	10	16	43	47	49	50	-1.45	-1.21	0.35	-0.09	16	13	29	20
Muni California Long	320	3	26	42	33	50	61	77	69	84	0.33	0.00	1.20	0.72	11	7	15	10
Muni New York Long	133	3	44	74	51	80	102	123	106	123	0.55	1.38	0.41	1.21	7	8	6	8
High Yield Muni	86	1	113	113	103	103	117	117	105	105	-0.30	-0.30	-0.94	-0.94	3	3	4	4
International Equity	250,595	204	36	17	37	18	88	78	91	80	0.11	-0.43	-0.21	-0.27	8	7	6	8
World Stock	3,989	14	28	21	30	21	63	52	65	48	0.34	0.27	-0.09	0.13	4	4	6	6
Foreign Large Blend	51,071	17	14	16	14	16	68	75	71	77	-0.43	-0.52	-0.80	-0.64	10	5	9	6
Foreign Large Growth	1,352	2	5	12	10	12	55	88	59	89	-0.91	-0.24	-0.57	-0.26	2	2	1	2
Foreign Large Value	8,161	13	14	9	16	10	78	64	84	66	-0.08	0.11	-0.73	0.13	10	7	9	5
Foreign Small/Mid Growth	1,732	5	30	40	26	32	77	102	75	87	0.41	1.07	-0.21	-0.37	6	12	4	4
Foreign Small/Mid Value	2,078	5	42	34	42	38	107	98	106	100	0.18	-0.40	-0.44	-0.61	2	1	2	1
Latin America Stock	19,305	17	75	26	79	26	65	74	67	75	0.76	0.06	0.43	-0.04	7	7	6	6
Europe Stock	11,677	30	18	14	19	14	97	81	97	83	0.34	-3.39	-0.21	-3.10	18	68	12	61
Diversified Pacific/Asia	1,804	3	9	7	9	7	62	43	59	43	-0.90	-0.80	-0.88	-0.76	24	4	7	2
Japan Stock	5,243	9	5	3	-2	2	117	127	121	128	-0.01	-0.16	-0.33	-0.20	2	2	2	2
China Region	15,568	21	75	9	77	10	99	131	101	133	-0.41	0.02	-0.17	0.33	4	4	2	5
Pacific/Asia ex-Japan Stk	21,042	23	27	14	30	15	93	119	96	121	-0.11	-0.42	-0.22	-0.22	4	2	3	3
Diversified Emerging Mkts	105,153	34	48	19	50	21	97	62	102	66	0.28	-0.34	0.09	0.05	8	4	6	6
Global Real Estate	2,419	11	33	34	34	37	103	106	100	109	0.47	0.05	-0.34	-0.15	6	5	4	4
International Bonds	6,440	11	52	69	54	68	68	100	66	92	1.18	2.65	0.87	1.81	9	24	5	16
World Bond	2,723	7	29	23	33	23	53	61	52	58	0.61	0.70	0.42	0.11	3	4	1	2
Emerging Markets Bond	3,717	4	92	103	92	101	95	129	90	117	2.18	4.09	1.65	3.05	18	39	13	26
Allocation	1,008	25	16	17	8	9	79	63	68	49	2.13	1.89	0.98	0.29	13	17	22	24
Conservative Allocation	67	3	11	26	-13	-4	92	95	55	47	1.56	2.16	2.93	3.60	6	7	29	36
Moderate Allocation	255	2	24	16	14	12	52	36	36	28	-0.12	-1.16	1.89	0.40	9	11	20	15
Aggressive Allocation	55	1	38	38	9	9	94	94	27	27	2.03	2.03	0.73	0.73	5	5	41	41
Target Date	181	11	14	10	10	6	89	114	92	133	1.53	1.44	0.36	0.76	6	5	11	7
World Allocation	450	8	15	15	13	11	64	50	51	31	3.73	3.74	0.90	-0.52	26	29	31	32
Commodities	95,165	31	12	15	13	16	100	91	100	92	0.11	-0.25	0.16	-0.13	23	12	21	11
Agriculture	2,754	2	3	1	6	4	81	62	84	65	-0.18	-3.39	0.04	-2.98	46	42	42	37
Broad Basket	7,684	5	19	17	21	19	57	57	55	58	0.46	-2.35	0.51	-1.12	30	53	23	36
Energy	5,876	10	6	52	6	52	92	176	92	176	-0.60	1.06	-0.48	1.18	24	19	22	18
Industrial Metals	513	1	13	13	14	14	99	99	100	100	-1.60	-1.60	-1.81	-1.81	20	20	20	20
Miscellaneous	0	0									0.00	0.00	0.00	0.00	0	0	0	0
Precious Metals	78,339	13	15	13	16	13	125	89	125	90	0.70	-0.02	0.68	-0.03	16	7	16	7
Miscellaneous	25,696	131	3	1	2	1	41	36	43	37	0.38	1.18	0.09	1.06	23	23	22	21
Currency	5,073	22	10	5	6	5	66	46	55	44	1.05	2.75	0.54	2.61	62	54	52	53
Long-Short	205	3	25	11	21	12	89	69	80	59	1.23	2.84	0.79	2.44	20	36	12	21
Bear Market	18,812	90	1	0	1	0	30	32	39	35	0.23	0.73	-0.04	0.63	15	15	15	13
(Dead Funds)	1,606	16	-6	0	0	0	75	0	0	0	-0.21	0.00	0.00	0.00	0	0	0	0
All	990,803	995	14	12	15	13	49	43	53	45	0.13	-0.12	-0.16	-0.12	18	12	14	11

Table II (continued).

Fund size quintile	Market cap ($M)	N	Average premium				Volatility of premium				Skewness of premium				Kurtosis of premium			
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV
Large	898,943	198	12	12	12	12	43	42	45	44	0.04	-0.13	0.10	-0.12	13	11	13	10
4	64,690	199	14	18	15	18	52	58	54	60	-0.06	0.06	-0.22	-0.10	24	21	17	14
3	18,749	200	14	15	15	17	48	48	51	51	-0.35	-0.18	-0.41	-0.19	24	24	16	18
2	5,966	200	23	19	23	19	54	52	57	54	0.53	0.36	-0.31	-0.26	21	21	14	16
Small	1,504	198	8	9	10	14	50	52	57	56	0.56	0.44	0.05	-0.06	9	9	7	6
All	989,852	995	14	12	15	13	49	43	53	45	0.13	-0.12	-0.16	-0.12	19	12	14	11

Trading volume quintile	Market cap ($M)	N	Average premium				Volatility of premium				Skewness of premium				Kurtosis of premium			
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV
Large	876,650	206	8	12	9	12	43	42	47	44	0.13	-0.11	0.20	-0.10	19	11	19	11
4	82,519	209	22	21	23	22	50	56	52	58	-0.07	-0.25	-0.24	-0.29	15	14	11	11
3	23,072	209	16	14	18	16	48	48	52	52	0.18	0.09	-0.27	-0.31	20	24	13	16
2	6,897	207	13	13	13	12	46	44	49	45	0.08	-0.72	-0.44	-0.67	24	32	13	20
Small	1,665	164	8	11	11	14	63	67	69	73	0.39	0.09	-0.01	-0.41	13	24	10	20
All	990,803	995	14	12	15	13	49	43	53	45	0.13	-0.12	-0.16	-0.12	18	12	14	11

Table III. ETF Price Premiums (and Discounts) Relative to NAV – Nonzero Trading 3:45pm-4:15pm.

For all ETFs traded in the U.S., this table shows the number of ETFs and their last available market capitalization within each investment category. The table also shows the percentiles of the premium (or discount) of the ETF price relative to its net asset value both for the market closing price and the closing bid-ask midpoint. The time period is 1/2009 to 12/2010. The premiums (average and volatility) are expressed in basis points. Only days with nonzero trading volume between 3:45pm and 4:15pm are included in the calculations.

Category	Market cap ($M)	N	Midpoint: Percentile of premium							Market close: Percentile of premium						
			Min	5	25	50	75	95	Max	Min	5	25	50	75	95	Max
U.S. Equity - Diversified	355,421	216	-1490	-20	-6	-1	3	14	870	-1869	-29	-9	0	6	23	933
Large Blend	163,291	52	-1490	-16	-5	-1	2	10	870	-1869	-23	-7	-1	4	18	323
Large Growth	49,031	28	-1271	-17	-5	-1	2	11	484	-1267	-27	-8	0	6	22	443
Large Value	44,374	35	-162	-14	-4	0	4	12	495	-174	-22	-6	2	8	21	160
Mid-Cap Blend	32,646	21	-293	-22	-7	-2	3	11	502	-324	-30	-9	-1	6	22	423
Mid-Cap Growth	8,718	19	-592	-17	-6	-2	2	9	605	-310	-30	-11	-3	4	18	520
Mid-Cap Value	6,649	16	-136	-17	-5	-1	3	13	133	-331	-29	-9	0	8	25	169
Small Blend	32,563	19	-216	-38	-11	-3	6	24	353	-221	-44	-14	-2	9	32	933
Small Growth	8,313	11	-111	-25	-9	-3	3	16	106	-432	-33	-11	-3	6	25	123
Small Value	9,837	15	-275	-30	-10	-3	5	21	316	-284	-38	-13	-2	8	29	176
U.S. Equity - Sectors	134,140	273	-780	-41	-7	0	7	67	1986	-910	-51	-10	0	13	77	1987
Communications	1,845	9	-513	-43	-8	0	9	74	411	-308	-53	-12	2	17	79	436
Consumer Discretionary	5,129	16	-341	-17	-4	0	4	26	883	-341	-27	-8	0	9	39	237
Consumer Staples	4,740	14	-276	-23	-5	0	4	41	379	-321	-34	-8	0	9	46	260
Energy	20,476	38	-765	-59	-10	-1	9	74	643	-756	-68	-15	0	15	87	612
Financial	17,236	35	-669	-37	-8	-1	7	58	762	-910	-50	-11	0	12	71	648
Health	10,570	25	-443	-20	-6	-1	2	13	628	-413	-30	-9	-1	6	24	478
Industrials	8,115	26	-455	-50	-7	0	9	79	1008	-462	-56	-11	0	16	87	657
Miscellaneous Sector	10,643	7	-310	-22	-4	6	19	60	1213	-312	-34	-4	12	27	84	1232
Natural Res	13,357	35	-704	-64	-7	2	26	93	858	-682	-68	-11	5	32	105	701
Precious Metals	5,717	6	-470	-60	-6	7	45	119	510	-465	-70	-10	11	50	129	538
Real Estate	15,016	15	-780	-30	-7	0	7	36	1126	-763	-47	-12	0	12	49	1131
Technology	15,204	30	-545	-22	-6	-1	4	40	1986	-653	-33	-9	0	9	51	1987
Utilities	6,092	17	-401	-64	-7	-1	8	77	587	-435	-66	-11	0	13	87	811
U.S. Bonds - Government	42,059	34	-846	-14	-1	4	12	53	1181	-879	-19	-1	5	15	58	1143
Short Government	12,315	8	-305	-6	0	2	4	8	273	-242	-9	0	2	5	12	211
Intermediate Government	2,011	7	-74	-7	-1	4	9	29	202	-68	-12	-2	4	13	39	96
Long Government	6,877	13	-846	-25	-4	5	17	74	1181	-879	-28	-5	6	21	83	1143
Inflation-Protected Bond	20,857	6	-52	-7	2	9	21	60	252	-55	-9	4	12	23	65	254
U.S. Bonds - General	73,674	43	-907	-14	9	37	76	230	1567	-1161	-16	10	40	79	231	1602
Ultrashort Bond	1,013	1	-9	-3	-1	0	2	4	11	-11	-4	-2	0	2	5	13
Short-Term Bond	14,062	10	-257	-1	9	29	59	236	465	-77	-2	9	31	61	233	492
Intermediate-Term Bond	29,010	16	-907	-8	11	36	70	205	833	-1161	-10	12	38	72	221	592
Long-Term Bond	14,369	8	-170	-28	14	42	83	215	418	-171	-28	14	45	87	225	434
Multisector Bond	686	4	-91	5	26	38	58	124	211	-113	4	25	42	65	127	228
High Yield Bond	14,003	3	-425	-69	22	81	147	391	1567	-435	-72	21	83	155	385	1602
Convertibles	530	1	-230	-69	29	65	101	333	512	-212	-62	31	71	107	165	287

Table III (continued).

Category	Market cap ($M)	N	Midpoint: Percentile of premium							Market close: Percentile of premium						
			Min	5	25	50	75	95	Max	Min	5	25	50	75	95	Max
U.S. Bonds - Munis	6,603	27	-421	-42	1	15	40	165	1186	-427	-44	2	19	49	167	1120
Muni Short	2,450	9	-256	-14	1	12	32	149	522	-282	-15	1	15	39	154	586
Muni National Interm	210	7	-167	-41	0	18	33	123	419	-279	-39	5	25	45	119	396
Muni National Long	3,404	4	-274	-65	-2	11	22	69	371	-307	-66	-3	14	27	74	514
Muni California Long	320	3	-341	-64	3	19	51	167	477	-354	-60	4	25	58	192	761
Muni New York Long	133	3	-364	-46	1	18	82	254	1186	-390	-58	5	30	93	270	1120
High Yield Muni	86	1	-421	-35	51	120	168	310	594	-427	-42	52	119	153	261	375
International Equity	250,595	204	-1113	-137	-18	20	71	182	1736	-1095	-140	-20	22	75	185	1719
World Stock	3,989	14	-505	-78	-7	22	51	128	772	-652	-80	-7	24	55	129	629
Foreign Large Blend	51,071	17	-547	-114	-12	18	52	121	593	-529	-115	-17	19	54	121	784
Foreign Large Growth	1,352	2	-323	-141	-29	18	59	139	373	-336	-139	-32	21	63	137	370
Foreign Large Value	8,161	13	-625	-128	-18	13	60	138	495	-658	-130	-19	18	64	142	648
Foreign Small/Mid Growth	1,732	5	-489	-131	-8	44	82	169	950	-451	-131	-10	43	78	145	449
Foreign Small/Mid Value	2,078	5	-338	-143	-24	39	97	190	767	-538	-147	-23	43	102	204	664
Latin America Stock	19,305	17	-669	-77	-12	19	82	232	668	-657	-81	-14	23	85	233	678
Europe Stock	11,677	30	-1113	-144	-31	14	57	151	1389	-1095	-143	-33	15	59	151	916
Diversified Pacific/Asia	1,804	3	-508	-103	-12	5	32	140	384	-534	-104	-14	4	33	140	396
Japan Stock	5,243	9	-517	-215	-52	9	71	193	868	-597	-219	-61	8	71	189	606
China Region	15,568	21	-563	-171	-26	9	71	200	1549	-559	-170	-28	12	73	198	1576
Pacific/Asia ex-Japan Stk	21,042	23	-749	-172	-27	21	79	182	584	-781	-174	-29	23	83	190	768
Diversified Emerging Mkts	105,153	34	-703	-120	-8	32	93	206	1736	-738	-127	-10	34	98	209	1719
Global Real Estate	2,419	11	-567	-160	-17	38	86	185	1254	-599	-174	-17	42	92	190	891
International Bonds	6,440	11	-343	-53	0	40	86	217	1823	-309	-56	2	43	89	209	1349
World Bond	2,723	7	-343	-63	-11	23	58	121	445	-215	-66	-10	26	63	121	385
Emerging Markets Bond	3,717	4	-297	-23	30	75	146	303	1823	-309	-24	29	76	147	302	1349
Allocation	1,008	25	-525	-94	-4	2	14	227	1569	-825	-103	-8	9	20	99	1721
Conservative Allocation	67	3	-334	-93	-4	1	12	229	603	-469	-114	-13	7	15	46	326
Moderate Allocation	255	2	-86	-7	1	4	13	206	467	-75	-13	4	10	16	39	433
Aggressive Allocation	55	1	-136	-44	-2	2	19	261	537	-198	-16	2	10	18	33	269
Target Date	181	11	-525	-131	-59	-1	17	304	755	-825	-176	-64	3	28	314	836
World Allocation	450	8	-452	-35	-2	4	15	144	1569	-422	-35	-2	10	22	51	1721
Commodities	95,165	31	-1229	-123	-24	4	35	190	1940	-1219	-123	-25	5	38	192	1903
Agriculture	2,754	2	-659	-45	-17	1	19	62	803	-662	-52	-16	2	23	70	814
Broad Basket	7,684	5	-556	-43	-7	9	31	135	893	-532	-46	-9	13	36	139	541
Energy	5,876	10	-1105	-77	-26	-3	21	117	1940	-1084	-78	-27	-2	24	118	1903
Industrial Metals	513	1	-892	-110	-23	18	56	114	497	-925	-117	-27	19	59	128	488
Miscellaneous	0	0														
Precious Metals	78,339	13	-1229	-190	-34	8	58	238	1460	-1219	-190	-33	8	59	242	1437
Miscellaneous	25,696	131	-1601	-40	-7	2	12	53	1788	-1598	-50	-10	2	15	58	1393
Currency	5,073	22	-1601	-61	-14	4	22	83	1395	-1598	-62	-15	4	24	74	1393
Long-Short	205	3	-486	-91	-4	6	31	130	546	-425	-99	-8	10	36	126	403
Bear Market	18,812	90	-1471	-31	-6	2	10	41	1245	-1486	-44	-10	1	13	50	1241
(Dead Funds)	1,606	16														
All	990,803	995	-1601	-60	-7	1	17	115	1986	-1869	-66	-10	3	23	118	1987

Table III (continued).

Fund size quintile	Market cap ($M)	N	Midpoint: Percentile of premium							Market close: Percentile of premium						
			Min	5	25	50	75	95	Max	Min	5	25	50	75	95	Max
Large	898,943	198	-1113	-51	-6	1	16	101	1940	-1219	-58	-10	1	16	101	1903
4	64,690	199	-1229	-60	-7	1	17	105	1823	-1486	-62	-8	3	24	118	1987
3	18,749	200	-1490	-72	-7	1	18	120	1986	-994	-68	-10	4	27	127	1943
2	5,966	200	-1601	-56	-7	1	15	124	1879	-1869	-72	-12	4	24	127	1721
Small	1,504	198	-1471	-59	-7	2	21	157	1569	-1161	-84	-14	3	24	121	1347
All	989,852	995	-1601	-59	-7	1	17	115	1986	-1869	-66	-10	3	23	118	1987

Trading volume quintile	Market cap ($M)	N	Midpoint: Percentile of premium							Market close: Percentile of premium						
			Min	5	25	50	75	95	Max	Min	5	25	50	75	95	Max
Large	876,650	206	-1229	-53	-7	1	13	97	1940	-1219	-58	-10	1	16	101	1903
4	82,519	209	-1471	-59	-6	2	21	114	1978	-1486	-62	-8	3	24	118	1987
3	23,072	209	-1080	-62	-6	2	22	124	1986	-994	-68	-10	4	27	127	1943
2	6,897	207	-1601	-64	-7	1	16	125	1431	-1869	-72	-12	4	24	127	1721
Small	1,665	164	-1349	-72	-8	0	12	124	1788	-1161	-84	-14	3	24	121	1347
All	990,803	995	-1601	-60	-7	1	17	115	1986	-1869	-66	-10	3	23	118	1987

Table IV. ETF Price Premiums (and Discounts) Relative to NAV – Only Levered and Inverse Funds.

For all levered and inverse ETFs traded in the U.S., this table shows the number of ETFs and their last available market capitalization within each investment category. The table also shows the average premium (or discount) of the ETF price relative to its net asset value and the time-series volatility of the premium; these results are shown for the market closing price (MC) and the closing bid-ask midpoint (MP), both equal-weighted (E) and value-weighted (V; by market cap) across ETFs. The last seven columns show the percentiles of the premium (or discount) of the ETF closing price relative to its net asset value. The time period is 1/2009 to 12/2010. The premiums (average and volatility) are expressed in basis points. Only days with nonzero trading volume are included in the calculations. The methodology follows that of Table II, except that only levered and inverse funds are included.

Category	Market cap ($M)	N	Average premium				Volatility of premium				Market close: Percentile of premium						
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	Min	5	25	50	75	95	Max
U.S. Equity - Diversified	4,702	24	-6	-7	-7	-7	20	19	29	24	-346	-49	-19	-7	4	33	358
Large Blend	2,471	7	-5	-5	-6	-6	13	14	25	18	-346	-37	-14	-5	2	20	185
Large Growth	984	3	-4	-5	-4	-6	14	15	23	20	-154	-36	-14	-5	5	30	174
Large Value	13	1	-5	-5	-7	-7	16	16	29	29	-174	-50	-19	-7	6	39	132
Mid-Cap Blend	222	4	-5	-6	-8	-7	21	17	26	21	-248	-43	-18	-7	3	27	159
Mid-Cap Growth	14	1	-3	-3	-5	-5	17	17	30	30	-165	-52	-17	-6	7	50	120
Mid-Cap Value	8	1	-5	-5	-11	-11	17	17	38	38	-331	-62	-20	-8	4	29	169
Small Blend	937	5	-9	-11	-10	-12	30	37	37	42	-221	-64	-27	-11	6	47	358
Small Growth	29	1	-7	-7	-6	-6	26	26	29	29	-103	-48	-23	-7	9	44	102
Small Value	24	1	-8	-8	-10	-10	33	33	33	33	-158	-54	-29	-13	7	41	176
U.S. Equity - Sectors	5,735	25	-3	-4	-7	-5	35	38	41	44	-763	-54	-18	-5	8	43	1131
Communications	8	1	-4	-4	-8	-8	25	25	44	44	-284	-69	-24	-6	12	50	175
Consumer Discretionary	17	2	-2	-1	-3	-3	13	16	19	21	-90	-42	-14	-3	10	41	97
Consumer Staples	21	1	-1	-1	-1	-1	14	14	25	25	-81	-37	-13	-4	8	40	123
Energy	616	4	-4	-4	-6	-4	28	24	33	29	-170	-50	-18	-5	9	40	612
Financial	3,415	4	-2	-4	-4	-5	41	41	43	46	-381	-87	-20	-5	10	72	414
Health	53	3	-5	-4	-10	-3	42	12	41	24	-332	-42	-15	-3	7	33	108
Industrials	35	1	-3	-3	-5	-5	17	17	21	21	-119	-35	-15	-5	5	28	66
Natural Res	368	1	-5	-5	-3	-3	19	19	31	31	-140	-51	-16	-4	10	46	134
Real Estate	716	2	-2	-3	-5	-6	84	63	92	74	-763	-80	-26	-7	13	66	1131
Technology	465	5	-4	-5	-12	-6	35	20	49	26	-653	-51	-18	-6	7	34	312
Utilities	22	1	-5	-5	-7	-7	14	14	20	20	-82	-41	-17	-7	3	24	78
U.S. Bonds - Government	54	5	2	5	2	5	55	74	57	75	-879	-35	-9	1	11	48	1143
Short Government	4	1	-7	-7	-12	-12	0	0	0	0	-12	-12	-12	-12	-12	-12	-12
Intermediate Government	11	1	1	1	1	1	7	7	12	12	-33	-15	-7	0	6	17	79
Long Government	39	3	6	7	7	8	71	92	72	92	-879	-48	-13	3	16	58	1143

Table IV (continued).

Category	Market cap ($M)	N	Average premium				Volatility of premium				Market close: Percentile of premium						
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	Min	5	25	50	75	95	Max
International Equity	710	14	-2	-2	-1	-3	29	40	39	45	-529	-55	-20	-3	15	50	546
Foreign Large Blend	32	2	2	6	-4	-5	58	72	41	47	-529	-66	-23	-6	16	49	338
Latin America Stock	65	3	-2	2	1	-1	26	37	37	42	-226	-49	-23	-1	18	61	255
Europe Stock	3	1	-1	-1	6	6	21	21	55	55	-104	-58	-21	-4	22	93	253
Japan Stock	12	1	-5	-5	-9	-9	20	20	51	51	-221	-102	-34	-3	19	73	106
China Region	113	2	-4	-4	-3	-3	22	24	27	29	-84	-35	-13	-1	12	33	81
Pacific/Asia ex-Japan Stk	9	2	-1	-1	1	1	22	22	37	37	-89	-59	-23	4	24	52	111
Diversified Emerging Mkts	476	3	-4	-3	-2	-3	26	43	40	50	-184	-53	-20	-5	12	47	546
Commodities	1,066	4	15	28	17	29	158	237	162	239	-1219	-270	-55	3	73	376	1437
Broad Basket	18	1	5	5	7	7	47	47	58	58	-194	-55	-24	2	27	97	408
Energy	228	1	-17	-17	-17	-17	82	82	83	83	-440	-145	-59	-16	24	113	461
Precious Metals	820	2	37	41	38	42	252	285	253	286	-1219	-381	-99	34	168	453	1437
Miscellaneous	18,825	92	-11	0	1	0	32	32	38	35	-1486	-43	-10	1	13	50	1241
Currency	13	2	7	6	5	5	32	32	16	16	-80	-17	-6	6	15	28	149
Bear Market	18,812	90	1	0	1	0	30	32	39	35	-1486	-44	-10	1	13	50	1241
All	31,092	164	-7	-1	-1	-1	34	39	41	42	-1486	-52	-14	0	12	52	1437

Fund size quintile	Market cap ($M)	N	Average premium				Volatility of premium				Market close: Percentile of premium						
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	Min	5	25	50	75	95	Max
Large	25,731	33	-2	-2	-2	-2	28	31	31	34	-1219	-49	-13	-2	8	42	766
4	4,000	33	2	8	2	7	40	87	45	91	-1002	-59	-13	-1	10	65	1437
3	961	33	-1	-3	-3	-4	44	49	48	53	-971	-40	-13	-1	10	38	1173
2	306	33	2	2	1	2	29	32	37	41	-1017	-50	-14	0	15	51	1188
Small	95	32	-2	-3	-4	-2	25	15	43	31	-1486	-83	-16	1	19	84	1143
All	31,092	164	0	-1	-1	-1	33	39	41	42	-1486	-51	-14	0	12	51	1437

Trading volume quintile	Market cap ($M)	N	Average premium				Volatility of premium				Market close: Percentile of premium						
			MPE	MPV	MCE	MCV	MPE	MPV	MCE	MCV	Min	5	25	50	75	95	Max
Large	24,109	33	-2	-2	-3	-2	31	32	36	36	-1219	-50	-15	-3	8	44	1241
4	5,277	33	2	7	1	7	58	73	61	75	-1017	-74	-13	0	13	79	1437
3	1,203	33	1	0	0	-1	26	20	31	24	-1486	-42	-11	0	11	46	1188
2	394	33	1	0	0	0	25	29	33	36	-1047	-47	-14	0	13	47	1018
Small	109	32	-38	-3	-5	-4	30	16	43	34	-998	-58	-16	0	15	55	928
All	31,092	164	-7	-1	-1	-1	34	39	41	42	-1486	-52	-14	0	12	52	1437

Table V. Share Creation and Redemption Activity.

The first two columns show the percentage of trading days when ETF shares were either created or redeemed by authorized participants transacting directly with the ETF. The next columns show the number of shares (in thousands) in each transaction, and the dollar value corresponding to it, conditional on a creation/redemption transaction taking place. The last columns show the size of the transaction relative to the total ETF shares outstanding and to the average daily trading volume that month. The median is computed first within a fund and then as another median across funds; the mean is similarly computed first within a fund and then across all funds. The time period is from 1/2009 to 12/2010.

Category	% of days		Shares ('000)		Value ($M)		% of all shares		% of volume	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
U.S. Equity - Diversified	24	11	355	100	22.0	3.4	18	3	1,253	228
U.S. Equity - Sectors	24	14	283	100	9.3	2.7	18	5	713	216
U.S. Bonds - Government	27	9	188	100	14.3	5.4	20	9	809	357
U.S. Bonds - General	18	14	218	100	13.1	6.2	24	5	1,986	442
U.S. Bonds - Munis	7	4	156	100	6.1	5.0	27	8	2,339	845
International Equity	16	10	366	100	12.8	4.6	18	5	992	269
International Bonds	13	12	177	100	10.7	10.4	13	4	546	321
Allocation	12	11	1527	50	28.9	1.5	110	19	21,826	1,600
Commodities	22	18	662	200	20.6	7.4	14	4	404	113
Miscellaneous	24	11	190	75	8.8	4.6	22	9	991	108
All	21	11	338	100	13.8	4.0	21	5	1,565	237

Fund size quintile	% of days		Shares ('000)		Value ($M)		% of all shares		% of volume	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Large	42	37	820	200	40.7	12.1	3	1	89	30
4	21	16	252	100	9.5	5.3	8	3	282	121
3	13	7	384	100	11.1	3.5	28	5	3,738	294
2	12	5	125	78	3.8	2.4	28	11	1,065	454
Small	18	3	87	50	2.6	1.8	42	31	2,770	1,134
All	21	11	338	100	13.8	4.0	21	5	1,565	237

Trading volume quintile	% of days		Shares ('000)		Value ($M)		% of all shares		% of volume	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Large	42	37	778	200	37.9	11.6	5	2	82	21
4	18	15	212	100	8.4	4.9	10	3	256	118
3	10	7	154	100	5.5	3.1	17	6	651	303
2	13	4	327	100	8.2	2.1	42	12	4,079	547
Small	22	4	101	50	2.8	1.8	48	33	4,156	1,674
All	21	11	338	100	13.8	4.0	21	5	1,565	237

Table VI. Creations and Redemptions as a Function of Lagged ETF Premium.

The dependent variable is daily ETF shares created or redeemed, expressed as a fraction of the average daily trading volume of the ETF. The independent variables represent the premium (in percent) of the ETF price (measured as the closing bid-ask midpoint) over the NAV; a premium over multiple days is expressed as the sum of daily premiums (e.g., sum of five daily premiums from t-15 to t-11). The *t*-statistics (in parenthesis) are based on double-clustered standard errors across funds and time. The time period is from 1/2009 to 12/2010.

	(1)	(2)	(3)	(4)	(5)
Premium: t-1	4.2875***	2.7975***	1.7020***	1.5378***	1.5458***
	(8.34)	(5.65)	(4.58)	(4.92)	(5.25)
Premium: t-2		3.0984***	1.9308***	1.7533***	1.7815***
		(6.13)	(5.40)	(6.04)	(6.51)
Premium: t-5 to t-3			1.2273***	0.9968***	1.0157***
			(4.05)	(5.03)	(5.62)
Premium: t-10 to t-6				0.3109*	0.3312***
				(1.94)	(2.81)
Premium: t-15 to t-11					-0.0183
					(-0.18)
N	398,058	397,581	396,211	393,947	391,446

note: *** p<0.01, ** p<0.05, * p<0.1

Table VII. ETF Premium as a Function of Lagged Creations and Redemptions.

The dependent variable in Panel A is the daily change in premium (in percent) of the ETF price (measured as the closing bid-ask midpoint) over the NAV, and in Panel B it is the level of the premium. The independent variables are the ETF shares created or redeemed in the previous three days, expressed as a fraction of the average daily trading volume of the ETF, as well as the cumulative ETF shares created or redeemed in the previous six months, expressed as a fraction of a fund's shares outstanding. The *t*-statistics (in parenthesis) are based on double-clustered standard errors across funds and time. The time period is from 1/2009 to 12/2010.

Panel A: Change in premium from t-1 to t				
	(1)	(2)	(3)	(3)
Creations: t	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(-4.15)	(-4.15)	(-4.12)	(-4.12)
Creations: t-1		-0.0000	-0.0000	-0.0000
		(-0.60)	(-0.57)	(-0.50)
Creations: t-2			-0.0001**	-0.0001**
			(-2.57)	(-2.54)
Creations: t-3				-0.0000
				(-0.66)
N	397,977	397,315	396,666	396,039

Panel B: Level of premium at time t				
	(1)	(2)	(3)	(3)
Creations: t-1	0.0008***	0.0006***	0.0006***	0.0006***
	(8.96)	(8.11)	(8.22)	(8.13)
Creations: t-2	0.0007***	0.0005***	0.0005***	0.0006***
	(8.27)	(7.41)	(7.58)	(7.54)
Creations: t-3	0.0006***	0.0005***	0.0005***	0.0005***
	(8.05)	(7.22)	(7.32)	(7.36)
Creations: prior 1 mo		0.0022***	0.0013***	0.0013***
		(7.66)	(4.85)	(4.95)
Creations: prior 3 mos			0.0005***	0.0004***
			(5.15)	(2.79)
Creations: prior 6 mos				0.0001**
				(2.08)
N	396,264	393,549	384,426	369,865

note: *** p<0.01, ** p<0.05, * p<0.1

Table VIII. Determinants of bid-ask spreads.

The dependent variable is the time-weighted median intraday bid-ask spread of each ETF in Q4/2010. The independent variables are the log market capitalization and log average daily volume (both in dollars). Also included are dummy variables for leverage (which varies from -3 to +3) and 69 underlying asset class categories as defined by Morningstar. The *t*-statistics are in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\log_{10}$(Market cap)		-0.2934***		-0.0755***			-0.3097***		-0.1043***
		(-23.10)		(-3.32)			(-30.04)		(-5.17)
$\log_{10}$(Daily volume)			-0.2692***	-0.2153***				-0.2769***	-0.1989***
			(-26.70)	(-11.28)				(-33.37)	(-11.60)
Leverage dummies	Yes	No	No	No	No	Yes	No	No	No
Asset class dummies	No	No	No	No	Yes	Yes	Yes	Yes	Yes
N	957	957	957	957	957	957	957	957	957
R^2	3.0%	35.8%	42.7%	43.4%	28.8%	29.5%	64.7%	68.4%	69.3%

note: *** p<0.01, ** p<0.05, * p<0.1

Table IX. Bid-ask spreads by ETF category.

For all ETFs traded in the U.S., this table shows the number of ETFs and their median closing bid-ask spread, both equal-weighted (EW) and value-weighted (VW; by market cap) across ETFs within each category. The time period is 1/2009 to 12/2010. The spreads are expressed in basis points.

Category	Market cap ($M)	N	Bid-ask spread	
			EW	VW
U.S. Equity - Diversified	355,421	216	15	4
Large Blend	163,291	52	16	2
Large Growth	49,031	28	14	4
Large Value	44,374	35	12	6
Mid-Cap Blend	32,646	21	16	4
Mid-Cap Growth	8,718	19	16	8
Mid-Cap Value	6,649	16	17	8
Small Blend	32,563	19	12	4
Small Growth	8,313	11	14	7
Small Value	9,837	15	16	8
U.S. Equity - Sectors	134,140	273	30	9
Communications	1,845	9	33	14
Consumer Discretionary	5,129	16	29	7
Consumer Staples	4,740	14	28	7
Energy	20,476	38	26	8
Financial	17,236	35	30	9
Health	10,570	25	26	8
Industrials	8,115	26	28	10
Miscellaneous Sector	10,643	7	16	9
Natural Res	13,357	35	36	12
Precious Metals	5,717	6	30	6
Real Estate	15,016	15	25	7
Technology	15,204	30	36	9
Utilities	6,092	17	27	8
U.S. Bonds - Government	42,059	34	13	3
Short Government	12,315	8	10	1
Intermediate Government	2,011	7	10	7
Long Government	6,877	13	17	4
Inflation-Protected Bond	20,857	6	10	4
U.S. Bonds - General	73,674	43	29	5
Ultrashort Bond	1,013	1	2	2
Short-Term Bond	14,062	10	15	3
Intermediate-Term Bond	29,010	16	44	5
Long-Term Bond	14,369	8	25	6
Multisector Bond	686	4	32	21
High Yield Bond	14,003	3	11	6
Convertibles	530	1	33	33

Table IX (continued).

Category	Market cap ($M)	N	Bid-ask spread	
			EW	VW
U.S. Bonds - Munis	6,603	27	22	12
Muni Short	2,450	9	15	9
Muni National Interm	210	7	23	20
Muni National Long	3,404	4	16	11
Muni California Long	320	3	31	30
Muni New York Long	133	3	42	47
High Yield Muni	86	1	19	19
International Equity	250,595	204	34	7
World Stock	3,989	14	47	19
Foreign Large Blend	51,071	17	38	4
Foreign Large Growth	1,352	2	26	11
Foreign Large Value	8,161	13	36	13
Foreign Small/Mid Growth	1,732	5	30	21
Foreign Small/Mid Value	2,078	5	50	25
Latin America Stock	19,305	17	29	7
Europe Stock	11,677	30	37	11
Diversified Pacific/Asia	1,804	3	18	13
Japan Stock	5,243	9	41	13
China Region	15,568	21	26	7
Pacific/Asia ex-Japan Stk	21,042	23	22	9
Diversified Emerging Mkts	105,153	34	38	5
Global Real Estate	2,419	11	41	26
International Bonds	6,440	11	22	17
World Bond	2,723	7	28	23
Emerging Markets Bond	3,717	4	12	12
Allocation	1,008	25	40	30
Conservative Allocation	67	3	43	38
Moderate Allocation	255	2	18	15
Aggressive Allocation	55	1	20	20
Target Date	181	11	52	69
World Allocation	450	8	30	22
Commodities	95,165	31	14	4
Agriculture	2,754	2	16	5
Broad Basket	7,684	5	21	11
Energy	5,876	10	15	10
Industrial Metals	513	1	21	21
Miscellaneous	0	0	0	0
Precious Metals	78,339	13	9	3
Miscellaneous	25,696	131	114	9
Currency	5,073	22	22	7
Long-Short	205	3	44	21
Bear Market	18,812	90	18	5
(Dead Funds)	1,606	16	270	46
All	990,803	995	41	6

Table IX (continued).

Fund size quintile	Market cap ($M)	N	Bid-ask spread	
			EW	VW
Large	898,943	198	8	4
4	64,690	199	17	16
3	18,749	200	24	24
2	5,966	200	30	27
Small	1,504	198	46	47
All	989,852	995	25	6

Trading volume quintile	Market cap ($M)	N	Bid-ask spread	
			EW	VW
Large	876,650	206	7	4
4	82,519	209	16	15
3	23,072	209	23	24
2	6,897	207	33	28
Small	1,665	164	127	81
All	990,803	995	41	6

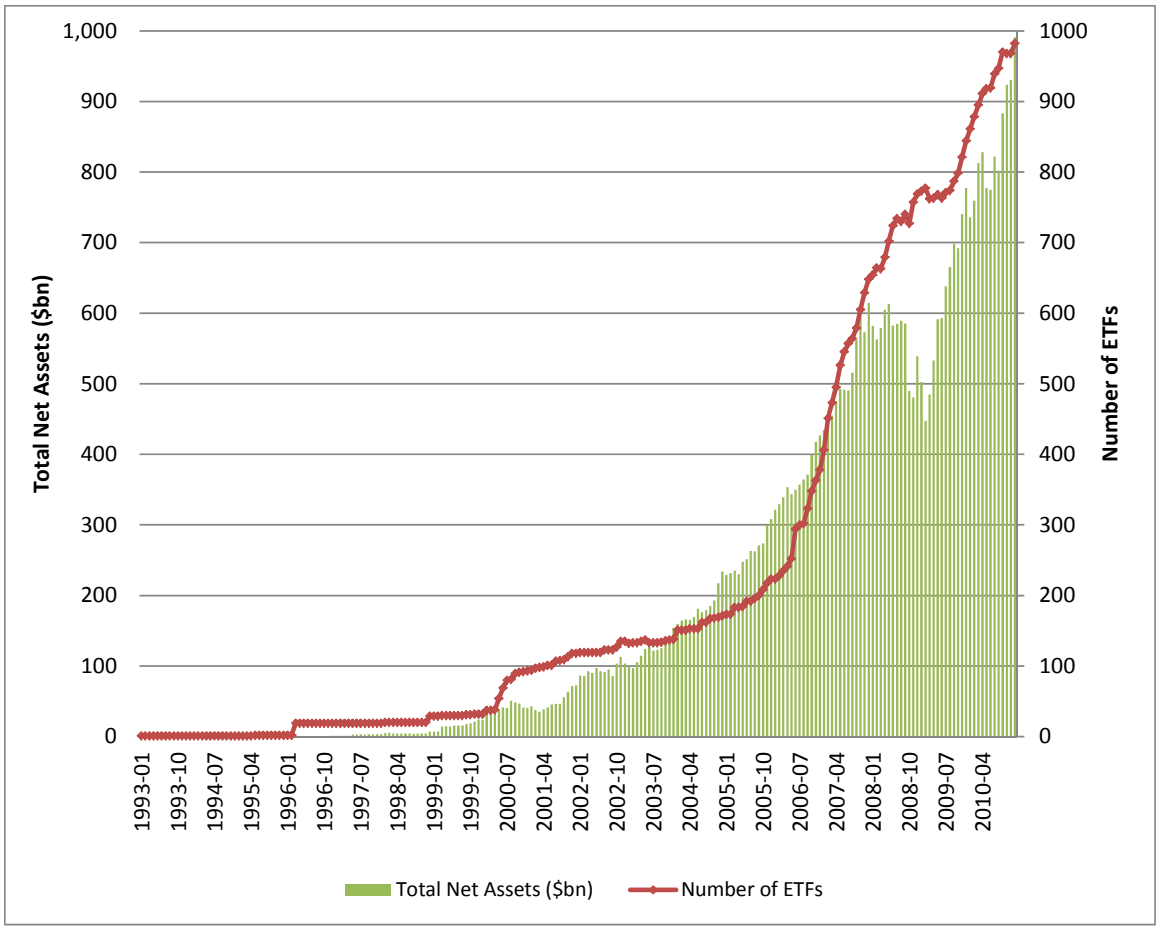

Figure 1. The size of the ETF sector in the U.S.

For all ETFs traded in the U.S., this figure shows the number of ETFs and their total market capitalization from the inception of the first ETF in 1/1993 to 12/2010. ETNs are excluded from the sample, but all ETFs including commodity and currency ETFs are included.

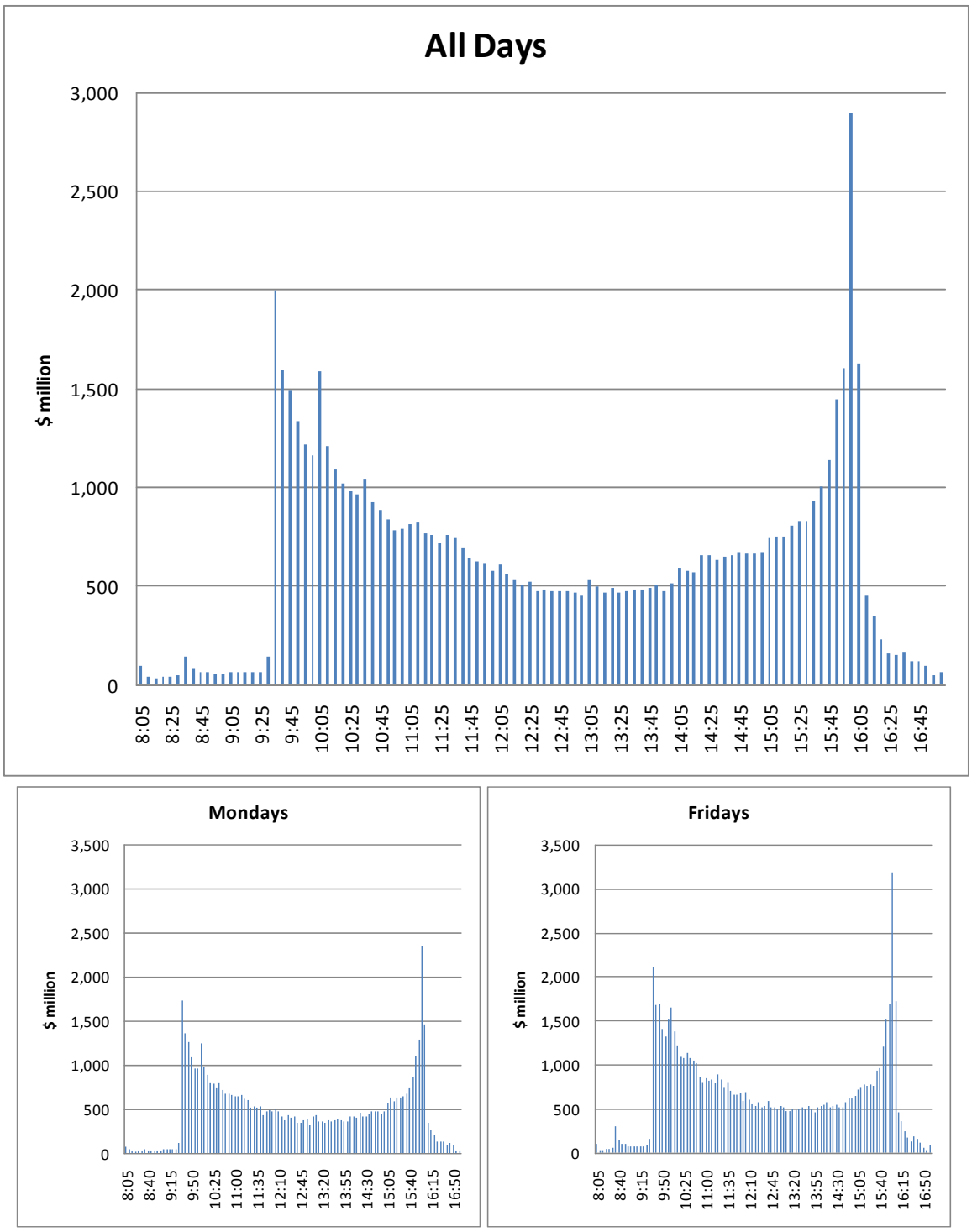

Figure 2. Daily ETF trading volume in 2010.

The total trading volume (in $ million) is computed across all ETFs for each 5-minute interval during the day. The figure shows the average across all trading days in 2010.

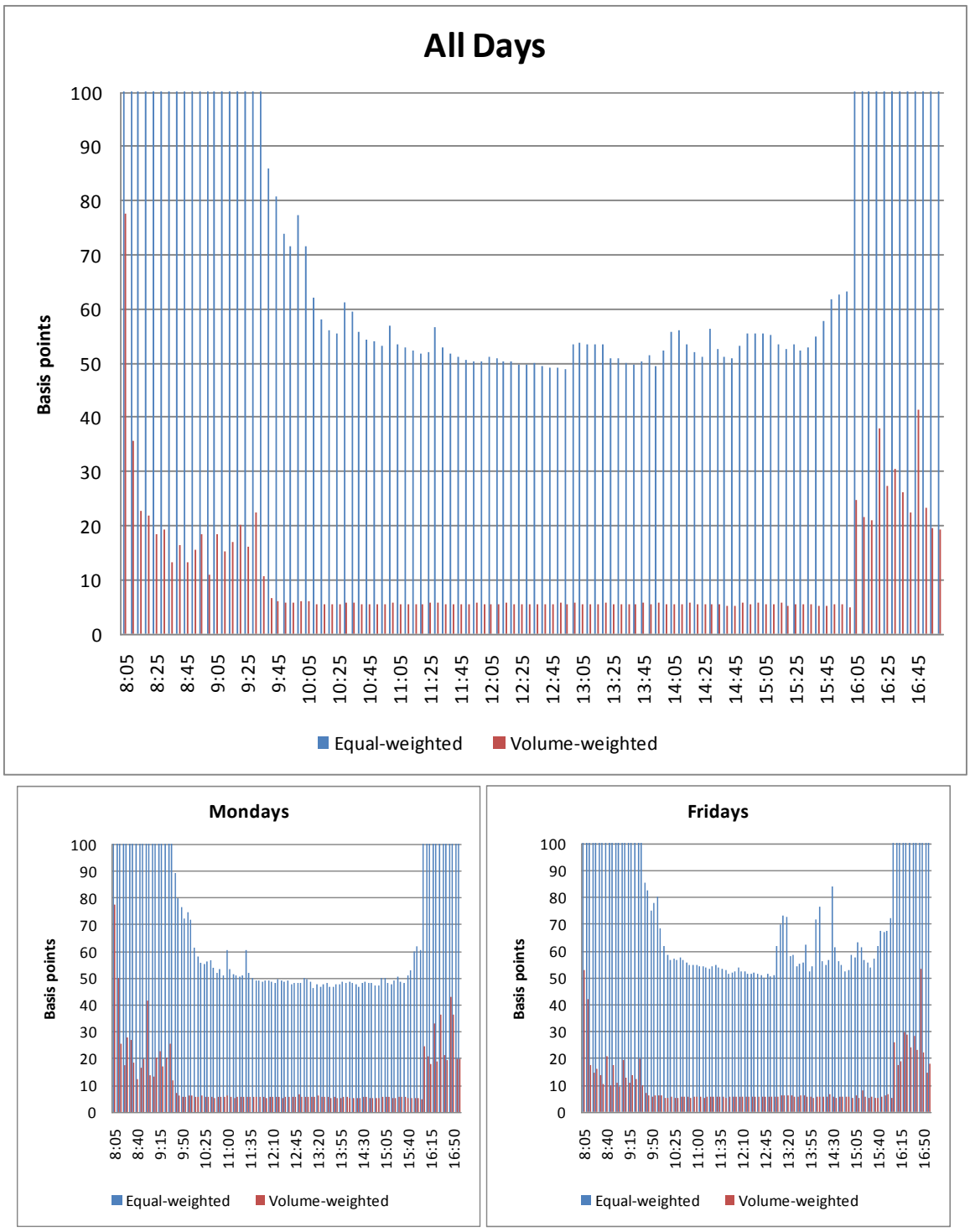

Figure 3. Average ETF bid-ask spread in 2010.

The average bid-ask spread (in basis points) is computed across all ETFs for each 5-minute interval during the day. The figure shows both the equal-weighted and volume-weighted averages across all trading days in 2010, where volume-weighting is based on dollar trading volume.

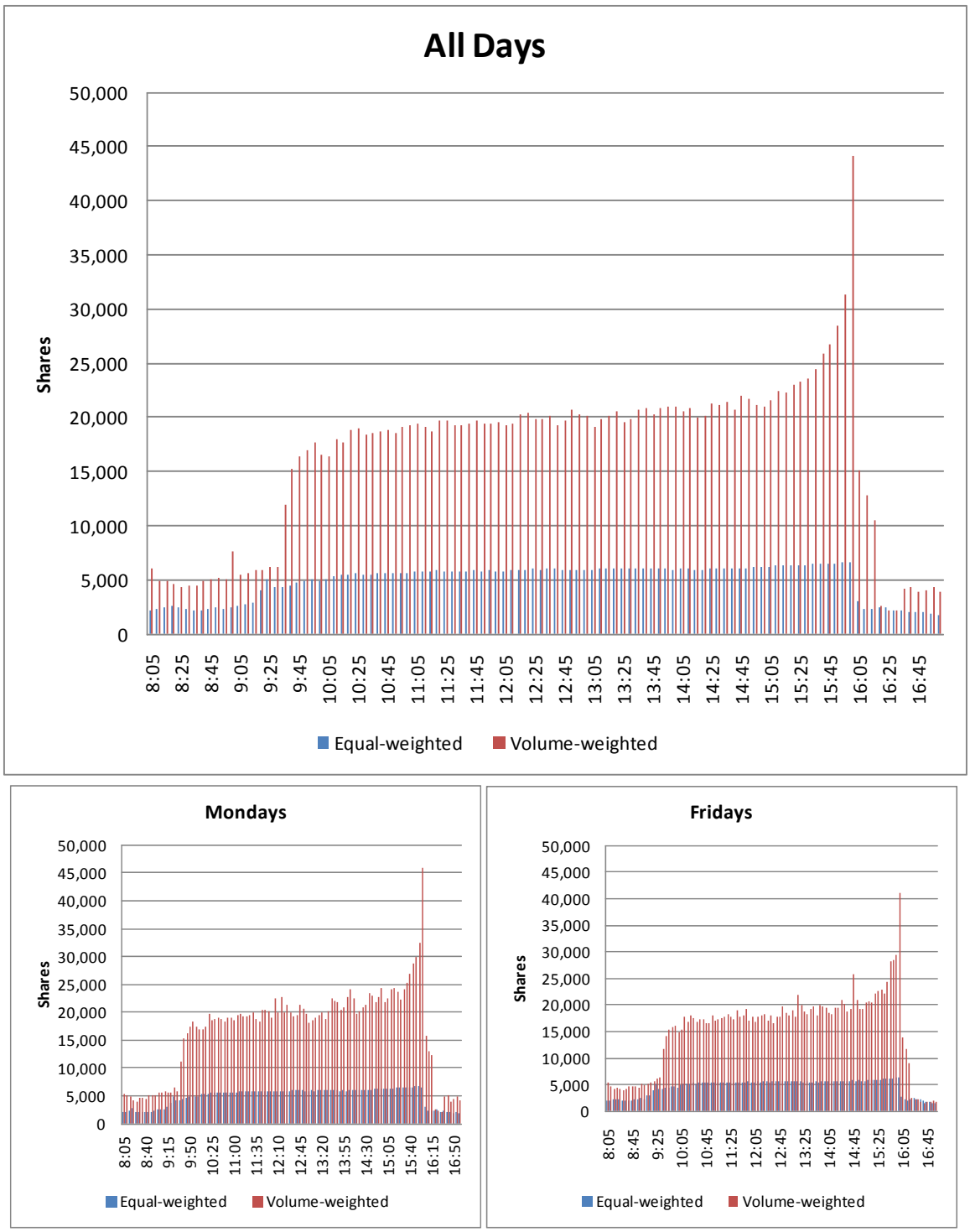

Figure 4. Average ETF bid and ask size in 2010.

The average size (in shares) of the best bid and ask is computed across all ETFs for each 5-minute interval during the day. The figure shows both the equal-weighted and volume-weighted averages across all trading days in 2010, where volume-weighting is based on dollar trading volume.

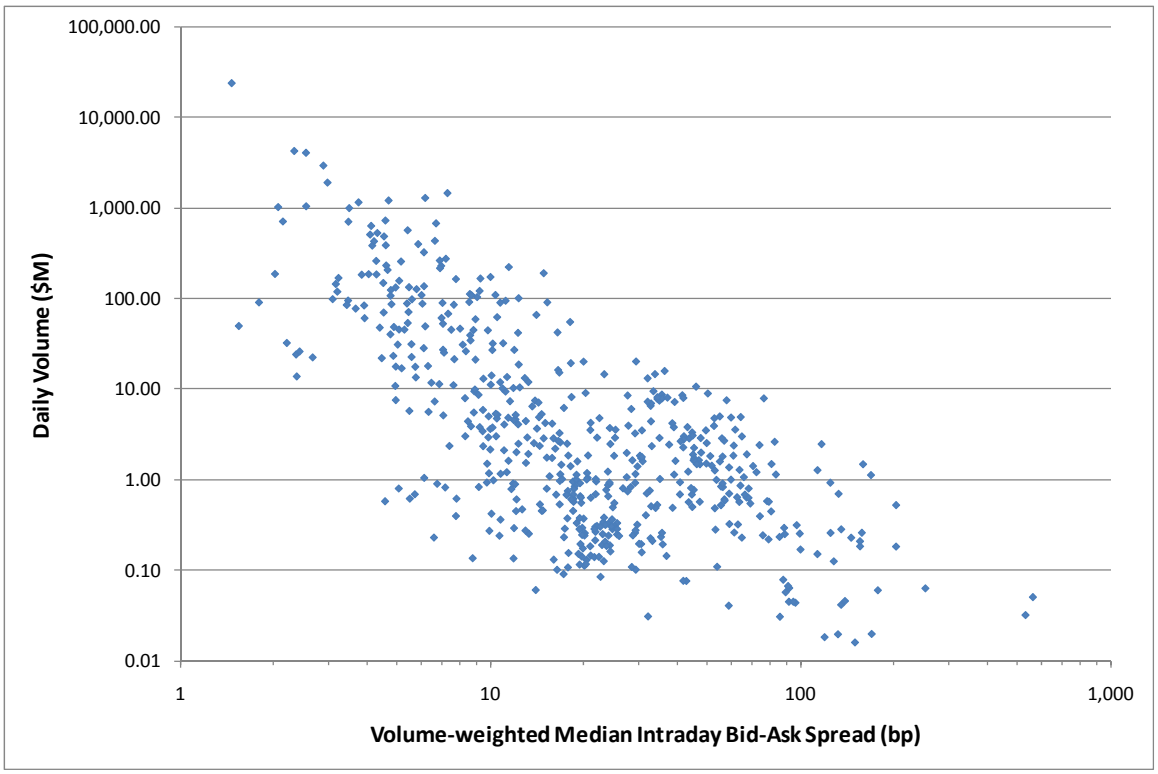

Figure 5. ETF trading volume and median intraday bid-ask spread.

The figure shows the mean daily trading volume plotted against the volume-weighted median bid-ask spread for all ETFs in 2010. The numbers are based on intraday 5-minute periods from 9:30am to 4:00pm. Both axes are in log scale.