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INTRADAY VOLATILITY EFFECT OF THE ETF REDEMPTION PROCESS ON THE UNDERLYING BASKET OF STOCKS

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INTRADAY VOLATILITY EFFECT OF THE ETF REDEMPTION
PROCESS ON THE UNDERLYING BASKET OF STOCKS

-
A Thesis
Presented to
the Graduate School of
Clemson University

-
In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
Economics

-
by
Daniel Alan Medlen
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-
Accepted by:
Dr. O. Isengildina-Massa, Committee Chair
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ABSTRACT

Since their introduction in the mid 1990's, ETFs have grown rapidly in number and diversified into various markets. In addition they have evolved to become increasingly more complex. While there has been some research in the area of these instruments, most of it has focused on their performance and little in regards to the possible effects they may have on the broader market. The redemption mechanism that is built into most ETFs is a unique aspect of these securities that may have unintended effects on markets due to large volume of securities changing hands. This study shows that as the spread between the price of an ETF and its net asset value increases there are measurable differences in the volatility of the stocks that make up its underlying basket.

DEDICATION

I dedicate this paper to my amazing wife. Her love and encouragement made this work possible.

ACKNOWLEDGMENTS

I extend my sincerest gratitude to Dr. Olga Isengildina-Massa for her guidance and support of this study. It was from her class instruction and assistance that led to my interest in this topic. Thanks to Dr. Maloney and Dr. Baier for advice on this paper. I am also extremely thankful to the entire John E. Walker Department of Economics' faculty for the unbelievable experience I have had at Clemson University during my undergraduate and graduate studies.

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Chapter 1

INTRODUCTION

On May 6th, 2010 US markets experienced the most tumultuous 20 minutes of trading ever. Dubbed the “Flash Crash,” the Dow Jones market index fell over 1,000 point in about 10 minutes in the second half of the trading day, only to recover a large portion of those losses immediately. With a number of theories surrounding the trading of this day, no definitive answer has yet been found to explain this event. However the action that took place in the ETF market during those 20 minutes attracted the attention of regulators and triggered investigations into the ETF market. On October 19th, 2011, Eileen Rominger, Director of the SEC’s Division of Investment Management testified before a US Senate subcommittee where she stated that the SEC “is continuing to examine the dynamics of ETF trading, the arbitrage mechanisms designed to keep the prices of ETFs close the value of their underlying assets, and linkages (both intended and unintended) between ETFs and the market as a whole.” (2011). This paper is an attempt to look at one of the “unintended consequences” of the ETFs on the broad market, specifically the impacts of the redemption process on intra-day volatility.

1.1 Exchange Traded Funds

Exchange traded funds (ETFs) are a fairly new breed of investment securities that have flourished since their introduction in the early 1990s. Most are very similar to closed-end mutual funds, tracking a particular index in an effort to match its returns. Over the last two decades ETFs have evolved and some are designed primarily to be instruments used for short-term trading rather than long-term investment. In addition to entering the realm of commodities and fixed-income, sponsor companies have also launched funds that are leveraged up two and three times over in order to magnify returns, react inversely to the movement of its respective index, or a combination of these attributes. While there are numerous instruments available to traders, the most popular ETFs remain the traditional index funds that are most similar to old-fashion mutual funds.

These traditional ETFs hold a basket of stocks in order to replicate the performance of their respective indices. They differ from mutual funds primarily in two ways. Their prices fluctuate for the same reasons that individual stock prices within their baskets rise or fall. But, as they are tradable securities themselves, their own share price fluctuates throughout a trading session. This fact can create a disconnect between the price of an ETF share and its underlying value (the sum of the values of included stocks). For this reason, ETFs differ from mutual funds and other securities in one other particular way. In order to insure that the price of an ETF and the Net Asset Value (NAV) of the fund it represents stay aligned, a special redemption mechanism was designed to help ensure that these two values do not deviate too far from one another.

1.2 The ETF Redemption Mechanism

In the event that the share price of an ETF and its NAV deviate away from one another an arbitrage opportunity arises. ETFs have a unique redemption process where, for most ETFs, an in-kind exchange of underlying securities or ETF shares can be performed. Because ETFs can be sold short the trades necessary for making this exchange can be completed simultaneously. The following example shows how this process works. In the case that the share price of an ETF exceeds the NAV of the fund a trader could purchase the securities that make up the index the ETF tracks. At the same time the trader would also sell short the ETF share. This action would lower the ETF price and raise the NAV, pushing the two prices back into alignment. At the close of business the trader would then redeem the basket of securities with the ETF sponsor and they would issue a new ETF share. In the case there would be the “creation” of an additional ETF share. This process can work in the reverse, however, as the ETF sponsor would “destroy” an ETF share in order to return to the trader a basket of securities used to represent the index tracked by the ETF. For the ETF sponsor, who takes a small fee for redeeming shares, this is a zero-sum game. There are two important facts about this process. First, only those deemed an “Authorized Participant” (AP) could redeem shares with the ETF sponsor. APs are usually large market making firms. Second, these transactions typically involve a minimum of number of units to be redeemed at one time, for most ETFs this number is 50,000 units. With the possibility that ETF funds are being rebalanced throughout the day and that these redemptions are done in such large numbers, is likely that ETFs can have some impact on the market as a whole.

1.3 Literature

Previous studies on ETFs tend to focus on their efficiencies in tracking their respective index and the performance of these funds, Deville (2008). However, there have been a few studies that look at some of the effects that ETFs may have on their respective trading markets and components stocks. One of the interesting questions surrounding ETFs is their effect on liquidity. With regards to the specific ETF studied here, Hegde and McDermott (2004) found that the introduction of the DIA improved liquidity in the 30 component stocks of the DJIA. Madura and Ngo (2008) expand on the previous work, finding that the introduction of an ETF had positive valuation effects on the largest (market valuation) stocks in each ETF. With regards to volatility, Lin and Chiang (2005) study the very first ETF introduced on the Taiwan Stock Exchange and find that volatility of the component stocks increased after the introduction of the Tiawan Top 50 Tracker Fund.

Engle and Sarkar (2006) provide some of the foundation for this paper when they focused on measuring the existence of premiums and discounts that exist in ETFs both daily and intra-daily. These premiums between an ETF and underlying assets represent opportunities for arbitrage. Measuring volatility around these deviations in prices is employed in this study to determine the redemption processes effect on the broad market.

Chapter 2

DATA

This study will examine State Street Global Advisor's Dow Jones Industrial Average ETF (DIA). Belonging to a group of ETFs commonly referred to as SPDRs (spiders), the DIA ETF began trading in early 1998. This security is selected due to four characteristics. First, liquidity, over 7,000,000 shares traded daily on average. Second, its basket of underlying stocks, the 30 Dow Jones components are also very liquid. This liquidity is essential in order to provide good measures of volatility since this paper is concerned with high-frequency intra-day trading. Third, DIA is a traditional ETF in the sense that it tracks an index based on the share prices of a basket of securities and redemptions are in-kind. Lastly, there is recorded redemption activity. Though the data does not indicate exactly when a firm may have executed a trade to take advantage of an arbitrage opportunity, there is evidence that this practice takes place. This is indicated by the net change in shares outstanding. At the end of each trading day when APs make redemptions with the ETF sponsor the net increases or decreases the total number of shares on the market is reported. The net creation of shares increases the number of shares on the market. A net decrease in shares outstanding signifies the destruction of shares. (Appendix A)

The prices of the ETF and the 30 component stocks were collected from Bloomberg Services for the period October 19th 2011 through April 20th 2012 and contains 126 trading days¹. The returns for each component are the differences between the log values of the share price in one-minute intervals. The calculation of the premium is the percentage difference between the ETF price and the IPOV (indicative optimized portfolio value). The IPOV is an estimate of the NAV of an ETF that is calculated and posted every 15 seconds. Keeping with various other studies of intraday volatility the first and last 10 minutes of the trading day are excluded. This is done primarily to deal with missing or stale quotes that exist at the beginning and end of a trading session, the opening “pricing” of information in premarket hours, and the, sometimes large, end of the day trades due to the rebalancing of various funds.

¹ In addition to market holidays, November 22, 2011 was excluded due to a halt in trading in one of the DOW component stocks.

Chapter 3

METHODOLOGY

As mentioned above it is not possible to identify exactly when an arbitrage trade is executed, but the potential opportunities are observable. To estimate the effect that the redemption mechanism has on the volatility of a particular stock the spread between the price of the ETF and its NAV at the beginning of each one-minute interval will act as the independent variable in this study. This spread is calculated as:

$$Spread_t = \log(P_{DIA,t}) - \log(P_{IPOV,t}) \quad (1)$$

where $P_{DIA,t}$ is the price of the ETF at time t and $P_{IPOV,t}$ is the IPOV value as time t . This spread is the percentage above or under that the DIA is trading relative to its NAV, thus an ETF can be traded at a premium or discount to its NAV. Negative spreads represent the instances when the ETF is trading at a discount.

The return series for the 30 individual stocks are calculated in a similar manner over one-minute intervals as a measure of volatility of these stocks:

$$R_{s,t} = \log(P_{s,t}) - \log(P_{s,t-1}) \quad (2)$$

where $R_{s,t}$ is the return and $P_{s,t}$ is the price of stock S at time t . Following Engle and Sarkar (2006), this study uses the GARCH (1,1) model to model volatility while dealing with heteroskedasticity and volatility clustering. Much work has been done in the field of estimating volatility using this method, the bulk of which will not be discussed here in

great detail (See Engle, 1982 & Bollerslev, 1986 for discussion of these issues). The standard GARCH model is:

$$R_{s,t} = a + B_t \text{Spread}_{t-1} + \varepsilon_t \quad (3)$$

$$h^2_t = c + \alpha \varepsilon^2_{t-1} + \beta h^2_{t-1} \quad (4)$$

where a is a constant, B_t measures the percentage change in $R_{s,t}$ due to a one percent change in the spread. h^2_t is the variance, the measure of volatility. α is the spread from the prior period, β is the variance from the prior period, and c is a constant. Because the redemption process either involves buying or selling the component stocks, the general model is expanded to account for asymmetries caused by the spread being either positive or negative. The simple asymmetric GARCH model (Engle, 1990) introduces an additional term to equation (4):

$$h^2_t = c + \alpha \varepsilon^2_{t-1} + \beta h^2_{t-1} + \gamma \varepsilon_{t-1} \quad (5)$$

the additional coefficient, γ comes from the prior periods spread, but unlike α the spread is not squared.

This method is used on each of the 30 DJIA component stocks to determine if the size of the spread, which represents the arbitrage opportunity, has an effect on the volatility of the stock price. The use of a method that accounts for asymmetries between positive and negative innovations will control for differences between the reaction of a stock's volatility if there is a premium or a discount between the ETF and its NAV. While spreads can be both positive and negative this is of no consequence in regards to the redemption process as the arbitrage process mechanisms allows for a two way in-kind exchange.

Chapter 4

EMPIRICAL RESULTS

Table 4.1 shows the results of the GARCH modeling of volatility of each DOW Jones Component stock. The spread coefficient represents the percent change in returns due to the changes in the spread between the DIA's price and its NAV. As expected, all coefficients are positive indicating that as the spread increases so does the volatility in the underlying stocks. In all but three of the component stocks this value is significant at the 5% level. In order for an arbitrage trader to profit from the redemption trade, the spread between the ETF price and its NAV must be large enough to cover the costs of executing the trades involved. These cost included, but not limited to, the transactions cost execute the trade and the small redemption fee charged by the ETF sponsor. In order for such redemptions to take place, a large number of shares of the basket stocks must be bought and sold in order to complete the arbitrage process. As expected, larger spreads are immediately followed by increased volatility, if only for a short time. This increase in volatility is presumed to be the effect of arbitrage traders making large and fast trades to take advantage of the mispricing of the ETF. Lagging the premium just one additional minute makes the effect of the spread insignificant on all 30 DOW components. Though volatility may only be increased immediately following a spread that is large enough to create a profitable arbitrage opportunity, it is possible that such opportunities happen

multiple times during trading hours. Evidence of this is found in the daily net changes in ETF shares. The average daily redemption is nearly 900,000 shares for the DIA ETF. The average effect on the volatility of the basket of stocks is 4.00%. Thus, though these values are significant, overall the effect is small. The spread rarely is larger than a few basis points. The average spread is just 0.0002 basis points and the max spread is .0034 basis points. Given that the ETF price and its NAV does not deviate greatly and the large number of redemptions continually occur a conclusion can be made that the redemption process is occurring on a regular basis. If the conclusion is correct it explains the findings of other studies that show volatility increases due to ETF trading, however this study directly links the redemption mechanism to increased volatility.

The volatility most sensitive to the spread between the DIA price and its NAV is that of BAC (Bank of America) with a coefficient of 12.14%. This means that as the DIA price deviates from its NAV by 1%, BAC returns increase by 12.14%. The volatility of KO (Coca-Cola) is effected the least by the spread and has a coefficient of .69%, indicating a very inelastic response. The average closing price of KO is \$68.97, putting it above the median average share price, but with an average daily volume of 7.8 millions shares, it trades below the median volume. BAC experiences the largest average daily volume over the sample period and also has the lowest average closing price. However, on average, across all significant results there appears to be little correlation between the share price or volume, and the effect the redemption process has on volatility. The correlation between the volatility measure and average closing price is

-0.39 and 0.69 for average daily volume. However when introduced into the model they were both found to be insignificant.

Table 4.1: GARCH Results

<i>Security</i>	<i>Spread(t-1)</i>	<i>Std. Err.</i>	<i>Spread(t-2)</i>	<i>Std. Err.</i>
Alcoa (AA)	0.0946*	0.011	0	0.0117
American Express (AXP)	0.0407*	0.0067	-0.001	0.0074
Boeing (BA)	0.0451*	0.006	0.0053	0.0063
Bank of America (BAC)	0.1214*	0.0144	0.0172	0.0153
Catapiller (CAT)	0.0386*	0.0078	-0.0063	0.0081
Cisco Systems (CSCO)	0.046*	0.007	-0.0033	0.0072
Chevron (CVX)	0.0116	0.0062	0	0.0063
Dupont (DD)	0.0363*	0.0062	0.0053	0.0064
Disney (DIS)	0.04*	0.007	-0.0071	0.0074
General Electric (GE)	0.0655*	0.007	-0.0055	0.0075
Home Depot (HD)	0.0376*	0.0062	0.0054	0.0064
Hewlett Packard (HPQ)	0.0574*	0.0082	0.0073	0.0086
IBM (IBM)	0.0432*	0.0055	0.001	0.0058
Intel (INTC)	0.0499*	0.007	-0.0046	0.0069
Johnson & Johnson (JNJ)	0.0129*	0.0038	-0.0017	0.0041
JPM	0.0068	0.0092	-0.0072	0.0094
Kraft Foods (KFT)	0.0233*	0.0045	-0.0024	0.0048
Coca-Cola (KO)	0.0069*	0.0035	-0.0088	0.0037
McDonalds (MCD)	0.0128*	0.004	-0.005	0.0042
3M (MMM)	0.0347*	0.0055	-0.0001	0.0056
Merck (MRK)	0.031*	0.0053	-0.0043	0.0053
Microsoft (MSFT)	0.0356*	0.0065	0.002	0.0067
Pfizer (PFE)	0.0486*	0.0064	0.0071	0.0069
Proctor & Gamble (PG)	0.0209*	0.0039	0.0041	0.0042
AT&T (T)	0.0208*	0.0045	-0.0056	0.0047
Travelers Co. (TRV)	0.0275*	0.0053	-0.0062	0.0055
United Technologies (UTX)	0.0442*	0.0061	-0.0041	0.0061
Verizon (VZ)	0.0241*	0.0043	0.0016	0.0044
Wal-Mart (WMT)	0.0222*	0.0042	-0.0017	0.0044
Exxon Mobil (XOM)	0.0062	0.0055	0.0004	0.0058

* significant at the 95% level

The volatility of three out of thirty stocks in the DIA basket is not significantly affected by the size of the spread. Two of these stocks are the only energy related stocks

in the basket, Exxon Mobil (XOM) and Chevron (CVX). The only other stock that does not have a significant coefficient is JP Morgan Chase (JPM). While the particulars of an industry may explain why XOM and CVX do not respond the same to the ETF spread and redemptions it does not do the same for JPM. There are various other financial institutions in the index, Bank of America (BAC), American Express (AXP), and Travelers Companies (TRV).

The daily volume and share price in table 4.2 offer little insight as to why JPM does not respond the same as other DOW components or other financial companies in the sample. Relative to BAC, JPM does have a much higher average closing price, but not the highest of all financial stocks. It appears that market forces beyond the ETF arbitrage have a much larger effect on JPM. This may attribute to the large standard error in the GARCH model for this stock. The effect of the redemption process may also be shaded by other arbitrage activity. Since the DOW Jones Index is composed of some of the largest, most heavily traded stocks in the US they are also components in a number of other ETFs. Each stock belongs to a number of sector ETFs. They are also present in large cap indices and divided between growth and dividend baskets as well. The effect of other ETF redemptions may possibly dampen the measurable effect that is shown above. Though it is certain that there are other influences on the volatility of a stock beyond the redemption mechanism of an ETF, these findings support that there is a significant correlation between the magnitude of the spread between asset price and net asset value in regards to the DIA ETF. The findings also support the work of Engle and Sarkar that the existence of arbitrage opportunities is short lived.

Table 4.2: Share Price and Volume

<i>Security</i>	<i>Average Closing Price</i>	<i>Average Daily Volume</i>	<i>Spread(t-1)</i>	<i>Std. Err.</i>
Alcoa (AA)	\$9.95	28,373,116	0.0946*	0.011
American Express (AXP)	\$51.41	6,586,835	0.0407*	0.0067
Boeing (BA)	\$72.00	4,910,406	0.0451*	0.006
Bank of America (BAC)	\$7.22	277,207,333	0.1214*	0.0144
Catapiller (CAT)	\$101.96	7,464,621	0.0386*	0.0078
Cisco Systems (CSCO)	\$19.24	44,439,621	0.046*	0.007
Chevron (CVX)	\$105.41	7,847,532	0.0116	0.0062
Dupont (DD)	\$49.15	6,240,024	0.0363*	0.0062
Disney (DIS)	\$39.05	10,094,376	0.04*	0.007
General Electric (GE)	\$18.11	55,171,149	0.0655*	0.007
Home Depot (HD)	\$43.72	10,086,791	0.0376*	0.0062
Hewlett Packard (HPQ)	\$26.30	19,095,998	0.0574*	0.0082
IBM (IBM)	\$191.99	4,699,680	0.0432*	0.0055
Intel (INTC)	\$25.87	47,729,887	0.0499*	0.007
Johnson & Johnson (JNJ)	\$64.62	10,598,864	0.0129*	0.0038
JPM	\$37.17	36,591,573	0.0068	0.0092
Kraft Foods (KFT)	\$37.20	8,081,221	0.0233*	0.0045
Coca-Cola (KO)	\$68.97	7,833,174	0.0069*	0.0035
Mcdonalds (MCD)	\$97.28	5,720,862	0.0128*	0.004
3M (MMM)	\$84.17	3,553,373	0.0347*	0.0055
Merck (MRK)	\$37.05	15,281,972	0.031*	0.0053
Microsoft (MSFT)	\$28.80	51,510,142	0.0356*	0.0065
Pfizer (PFE)	\$21.04	40,939,894	0.0486*	0.0064
Proctor & Gamble (PG)	\$65.34	10,939,894	0.0209*	0.0039
AT&T (T)	\$29.95	26,112,435	0.0208*	0.0045
Travlers Co. (TRV)	\$58.14	3,625,972	0.0275*	0.0053
United Technologies (UTX)	\$78.80	4,410,963	0.0442*	0.0061
Verizon (VZ)	\$38.11	14,266,935	0.0241*	0.0043
Wal-Mart (WMT)	\$59.51	9,345,244	0.0222*	0.0042
Exxon Mobil (XOM)	\$83.29	17,649,751	0.0062	0.0055

* significant at the 95% level

Chapter 5

Summary and Conclusions

The results of this study find that the arbitrage mechanism, as measured by the magnitude of the spread between an ETF's price and NAV, does have a significant effect on the volatility of the individual stocks held by the ETF. For this particular ETF, volatility of the underlying stocks increase by an average of 4% for each percent increase in the spread. The disappearance of this effect as trading moves further away from the mispricing of the ETF supports earlier work that shows arbitrage opportunities in the ETF market are small and there is only a small window of opportunity to exploit them.

Though the effect is small it does appear to be persistent since data shows redemptions of ETF shares is frequent. While three of the thirty stocks used to form the index basket did not seem to be effected by the arbitrage process, two belong uniquely to the energy sector. Factors that can move volatility in this sector, specifically oil price volatility may have an domineering effect on these two stocks.

The growth in ETF markets is not showing any signs of slowing down in the near future. As these instruments become more and more complex it is vital that all of their effects are understood. The recent press coverage and interest of regulators should provide the catalyst to expand the study of exchange traded funds beyond that of performance measures. Future studies should consider the effect of other popular ETFs

on the market, such as SPDR sector ETFs and the S&P 500. In addition the introduction of additional controls such as, but not limited to, interest rates and commodity prices may provide a greater understanding of how ETFs may effect the broad market beyond their intended purpose. Since volatility is incorporated into a number of option pricing models, the effect of ETF trading on options could significantly further the understanding of the effects ETFs have on the broad market.

APPENDICES

Appendix A

Daily DIA Activity

Date	Closing NAV	Net Δ Shares Outstanding	Volume
10/19/11	114.949841	3,650,000	15,286,300
10/20/11	115.354587	4,850,000	7,944,500
10/21/11	117.830588	50,000	13,012,000
10/24/11	118.875326	850,000	8,407,500
10/25/11	116.810612	600,000	9,405,200
10/26/11	118.429702	400,000	9,938,700
10/27/11	121.81484	300,000	12,948,500
10/28/11	122.038056	2,200,000	6,666,900
10/31/11	119.284241	-350,000	13,398,600
11/1/11	116.321396	-1,450,000	15,120,600
11/2/11	118.098982	-700,000	7,617,200
11/3/11	120.192774	-1,000,000	12,007,500
11/4/11	119.580533	3,400,000	7,021,900
11/7/11	120.42903	-4,550,000	8,694,400
11/8/11	121.582437	1,550,000	7,383,200
11/9/11	117.70043	1,700,000	12,096,200
11/10/11	118.856127	1,200,000	9,960,400
11/11/11	121.446209	0	7,260,300
11/14/11	120.700732	100,000	7,391,200
11/15/11	120.886597	3,450,000	6,467,700
11/16/11	119.082979	-650,000	7,142,200
11/17/11	117.737493	-100,000	10,984,300
11/18/11	117.704442	-2,500,000	8,307,400
11/21/11	115.22234	1,650,000	18,829,600
11/23/11	112.372848	-100,000	7,988,400
11/25/11	112.157323	-900,000	3,532,100
11/28/11	115.060894	-400,000	6,666,100
11/29/11	115.495823	0	5,325,400
11/30/11	120.382733	-50,000	11,581,500
12/1/11	120.126331	700,000	5,437,700
12/2/11	120.118627	1,200,000	5,584,400
12/5/11	120.899948	-800,000	6,285,400
12/6/11	121.420892	250,000	7,062,300
12/7/11	121.93995	1,300,000	9,026,700
12/8/11	119.95826	1,100,000	9,595,600
12/9/11	121.816971	0	8,999,200
12/12/11	120.201308	1,750,000	6,291,500

12/13/11	119.569807	-250,000	7,761,800
12/14/11	118.303597	-1,400,000	10,062,700
12/15/11	118.755124	-650,000	5,261,400
12/16/11	118.373815	-1,350,000	7,758,400
12/19/11	117.374783	950,000	7,977,500
12/20/11	120.737956	-2,450,000	7,867,300
12/21/11	120.778906	600,000	6,679,800
12/22/11	121.40853	800,000	4,202,800
12/23/11	122.646272	-100,000	2,281,300
12/27/11	122.61929	-150,000	3,878,700
12/28/11	121.245157	-250,000	3,871,400
12/29/11	122.59703	-250,000	5,133,600
12/30/11	121.903076	550,000	4,734,000
1/3/12	123.699099	-200,000	7,175,100
1/4/12	123.940791	1,500,000	7,625,200
1/5/12	123.91305	2,750,000	8,678,900
1/6/12	123.42605	2,800,000	7,488,600
1/9/12	123.752282	1,350,000	5,881,800
1/10/12	124.447577	150,000	5,274,400
1/11/12	124.317222	350,000	4,890,300
1/12/12	124.531751	0	5,591,300
1/13/12	124.041149	600,000	6,392,100
1/17/12	124.639084	-500,000	5,348,800
1/18/12	125.678912	-100,000	6,473,000
1/19/12	126.127401	-650,000	8,095,300
1/20/12	126.921453	-950,000	6,995,400
1/23/12	126.804642	-1,050,000	5,166,800
1/24/12	126.474243	350,000	4,798,200
1/25/12	127.283486	500,000	9,642,500
1/26/12	127.060257	-850,000	5,902,300
1/27/12	126.318874	0	6,136,400
1/30/12	126.251122	950,000	5,910,600
1/31/12	126.042992	550,000	5,951,700
2/1/12	126.894502	-600,000	9,891,000
2/2/12	126.783729	-2,800,000	4,531,500
2/3/12	128.36161	0	8,654,000
2/6/12	128.190454	-1,150,000	3,852,400
2/7/12	128.519676	0	5,739,300
2/8/12	128.701725	-800,000	4,884,400
2/9/12	128.766038	-400,000	5,416,600
2/10/12	127.874453	0	6,380,600
2/13/12	128.630843	150,000	4,654,100
2/14/12	128.687608	-1,300,000	5,608,500
2/15/12	127.858344	-200,000	9,589,200
2/16/12	129.085663	-900,000	8,699,000

2/17/12	129.208356	-1,550,000	5,765,200
2/21/12	129.365493	150,000	6,589,200
2/22/12	129.095467	150,000	6,092,200
2/23/12	129.566563	500,000	12,890,500
2/24/12	129.590481	3,550,000	3,769,100
2/27/12	129.575545	-250,000	5,778,600
2/28/12	129.86325	0	4,953,700
2/29/12	129.334352	400,000	7,724,200
3/1/12	129.615267	300,000	6,684,300
3/2/12	129.586309	550,000	3,818,700
3/5/12	129.438543	0	5,286,400
3/6/12	127.428893	-700,000	14,410,100
3/7/12	128.238872	0	5,736,200
3/8/12	128.972433	200,000	4,417,000
3/9/12	129.111032	650,000	6,248,400
3/12/12	129.495347	1,000,000	5,197,000
3/13/12	131.738545	500,000	8,699,500
3/14/12	131.901716	-200,000	5,124,600
3/15/12	132.486021	0	5,716,900
3/16/12	132.02856	-550,000	5,047,200
3/19/12	132.092861	1,050,000	4,424,000
3/20/12	131.403475	-500,000	5,403,700
3/21/12	130.948528	850,000	5,031,900
3/22/12	130.165276	0	6,987,900
3/23/12	130.508413	300,000	4,373,300
3/26/12	132.112362	0	4,991,500
3/27/12	131.674017	-1,150,000	5,777,300
3/28/12	130.982083	1,350,000	5,293,700
3/29/12	131.176957	500,000	4,487,400
3/30/12	131.836141	0	4,218,500
4/2/12	132.357957	-350,000	8,683,800
4/3/12	131.753573	-2,350,000	6,098,700
4/4/12	130.508439	-1,000,000	10,402,500
4/5/12	130.431321	-1,900,000	4,179,800
4/9/12	129.128846	-500,000	5,360,200
4/10/12	126.997707	-200,000	12,912,700
4/11/12	127.889176	-2,700,000	5,603,300
4/12/12	129.695328	-1,150,000	7,164,600
4/13/12	128.327385	350,000	8,826,800
4/16/12	129.043006	1,650,000	7,503,100
4/17/12	130.978229	500,000	6,290,900
4/18/12	130.151978	350,000	5,057,100
4/19/12	129.501575	500,000	8,957,000
4/20/12	130.000637	-450,000	5,686,800
<i>Average</i>		112,302	7,183,525

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