

Deutsche Bank  
Equities  
AAPL Trade Idea  
November 2014  
Equities Structuring Group  
(212) 250-6054  
Institutional Use Only – Not for Retail Distribution

Apple stock price performance  
AAPL's daily stock return  
has exhibited statistically  
significant correlation to  
the day of the week since  
2011

Monday's outperformance  
is greater and more  
statistically significant  
than Friday's  
underperformance

Average stock price performance by day of week  
2008 to 2010

0.1%

0.3%

0.5%

0.7%

(0.3%)

(0.1%)

(0.3%)

(0.1%)

0.1%

0.3%

0.5%

0.7%

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Apple

S&P 500

0.25%

0.20%

0.16%

0.11%

0.06%

(0.00%)

(0.06%)

(0.04%)

Monday

0.58%

Apple

S&P 500

0.30%

0.19%

0.07%

(0.05%)

Monday

(0.02%)

(0.01%)

(0.13%) (0.16%)

Tuesday Wednesday Thursday

Friday

Friday

Source: Bloomberg (for stock prices, dividend history, and index prices), as of November 3, 2014

Monday

2

0.10%

Tuesday Wednesday Thursday

2011 to Present

0.00

0.10

0.20

0.30

0.40

0.50

0.60

0.70

0.80

(0.17%)

Friday

– Friday's p-values also declined, but to a lesser extent and have increased again in 2013 and 2014

Weekly options in

AAPL list

(June 2010)

0.02%

Statistical significance over time

– To test for statistical significance, we ran yearly regressions of AAPL's daily stock returns versus whether the day was a Friday or Monday

– We calculated the p-value for the day variable

– The p-value is a measure of the probability that the return is not correlated with the variable

– For example, a p-value of 0.01 means there's only a 1% chance that the return is not correlated with the variable

– A lower p-value means more statistical significance

– Monday's p-values declined since 2008 and the variable showed very strong statistical significance since 2011

p-values

0.310

0.354

0.144

0.003

0.028

0.000

0.091

0.003

0.001

0.514

0.291

0.477

0.641

0.710

Apple stock price performance (continued)  
Value of Monday's outperformance vs S&P 500  
Trading this pattern would  
have resulted in  
significant gains with  
limited downside risk  
This analysis looks at  
trading AAPL stock and  
an equivalent value of the  
S&P 500 beginning in  
2008

Going long AAPL / short  
S&P 500 only on  
Mondays produces the  
largest gain – over 2x a  
long/short strategy held  
over all days and over 3x  
a short AAPL/long S&P  
500 strategy on Fridays  
Combining the two  
strategies (Monday and  
Friday) results in even  
greater returns

100  
200  
300  
400  
500  
600  
700  
800  
900  
0

Value of Friday's underperformance vs S&P 500  
Weekly options in  
AAPL list  
(June 2010)

100  
200  
300  
400  
500  
600  
700  
800  
900  
0

Weekly options in  
AAPL list  
(June 2010)

Combined Friday / Monday performance vs S&P 500

100  
200  
300  
400  
500  
600  
700  
800  
900  
0

Long AAPL and short S&P 500  
Weekly options in  
AAPL list  
(June 2010)

100  
200  
300  
400  
500  
600  
700  
800  
900  
0

Weekly options in  
AAPL list  
(June 2010)

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This analysis looks at trading equal amounts of AAPL and S&P 500 from January 2, 2008 till November 3, 2014. The returns of each strategy are compounded (ie, returns are reinvested back into the strategy) and both stock and index returns are calculated on a total return basis (ie, assuming dividends are reinvested).

Assumes no friction costs.

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Overview of Weekly options  
Weekly options in AAPL  
stock began to be listed in  
June 2010

This coincides roughly  
with the development of  
the Friday / Monday  
trading pattern

History

Listing

- The CBOE launched Weekly options in October 2005. These were originally only on the S&P500

- The CBOE expanded the product in June 2010 to include more underlyings

- Since June 2010, Weekly options are listed before the open on Thursdays

- Currently, the AAPL Weeklys are part of the “expanded” program and have 6 expirations. A

new expiration is added every week

- When the CBOE introduced Weeklys, it stated that they would provide an “efficient way to

trade options specifically around certain news or events – such as economic data or earnings

announcements”

Purpose

- Trading options instead of stock is a convenient way to lever positions around events

- Unlike the broader market, trading in AAPL options is much more skewed towards calls than

puts

Trading

- We have found little evidence of institutional trading in these options

- This means the majority of trading is done by:

强High frequency traders

强Retail investors

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Analysis of CBOE AAPL option trading data(a)

Summary activity of directional market participants (i.e., retail investors)

The CBOE has data on each option trade and designates the buyer and seller of options as either "customer" or "firm". We attribute "customer" transactions to directional retail investors, and "firm" transactions to hedged market participants

The dataset has certain limitations:

- The CBOE is only one of several exchanges that list options (with ~20% of total volume)
- Market maker trades are excluded
- The data does not have time stamps (which would have allowed us to see whether trading is clustered during a certain part of the day and compare this to the stock's intraday behavior)

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- Since the Monday / Friday phenomenon coincides with the listing of weekly options, we focused on options with the shortest expiry
  - Consistent with a hypothesis that Monday's outperformance is due, at least in part, to retail investors initiating option positions, the vast majority of directional option trades on Mondays were opening transactions
  - In addition, the majority of the positions that were opened were bullish transactions, which would have caused a hedged market participant to buy shares
  - By Friday, the majority of option trades were closing transactions
  - Since the majority of option trades were bullish positions, closing these positions would have caused a hedged market participant to sell shares
- Opening versus closing transactions for directional market participants(b)

20%  
25%  
30%  
35%  
40%  
45%  
50%  
55%  
60%  
65%  
70%

Monday

Tuesday Wednesday Thursday

% of option trades that opened positions

% of option trades that closed positions

Bullish opens versus bearish opens for  
directional market participants(b)

10%  
20%  
30%  
40%  
50%  
0%

Monday

(a) Source: [www.marketdataexpress.com](http://www.marketdataexpress.com).

(b) From July 2010 to February 2014. Based on options with the shortest  
expiry.

Tuesday Wednesday Thursday

Bullish opens (buy calls / sell puts)

Friday

Bearish opens (sell calls / buy puts)

5

Friday

% of options traded

% of options traded

Net "delta" in AAPL listed option market  
DB analyzed every AAPL  
listed option trade that  
occurred from January  
2013 to February 2014

These trades were  
classified as bullish or  
bearish depending on  
whether they traded at the  
bid or the offer. So, for  
example, a call that traded  
on the offer side was  
deemed a bullish trade.

We ignored transactions  
that traded at mid market  
We then delta-weight this  
activity to capture a  
directional view of the  
overall options market

– Option traders will hedge their positions by trading in the underlying  
stock to maintain a "delta" neutral  
position to stock price performance (i.e., sell calls and buy stock such  
that they are indifferent to changes  
in the stock price)

– Looking at the net deltas of actual option activity shows that Fridays are  
more likely to see selling activity,  
while Mondays are more likely to see buying activity

Average net delta  
(in shares)

Friday

Monday

Other

(99,292)

131,618

(373,363)

% of days negative % of days positive

63.8%

39.7%

56.0%

36.2%

60.3%

44.0%

– Even though the amount of stock is small relative to Apple's ADTV of 10 –  
15mm shares, there is a strong  
correlation between this activity and the stock return on the relevant day  
of the week(a)

Fridays – return vs net delta

(4%)

(3%)

(2%)

(1%)

0%  
1%  
2%  
3%  
4%  
5%  
(1,000)  
(500)  
0

Mondays – return vs net delta  
 $R^2 = 0.7548$

(4%)  
(3%)  
(2%)  
(1%)

0%  
1%  
2%  
3%  
4%  
5%  
500

Net delta (sold) bought  
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Source:

trade-alert.com

(a) Based on January 1, 2013 to February 14, 2014

(b) The dataset includes some outliers (e.g., earnings releases) that depress the  $R^2$ . Excluding datapoints that have more than 1mm shares of net delta or

absolute value of the return of greater than 5% results in a 0.57  $R^2$

1,000  
(1,000)  
(500)

0

500

Net delta (sold) bought  
Other days – return vs net delta(b)  
 $R^2 = 0.6285$

(4%)  
(3%)  
(2%)  
(1%)

0%  
1%  
2%  
3%  
4%  
5%

1,000

(1,000)

(500)

0

500

Net delta (sold) bought

6

$R^2 = 0.2218$

1,000

Stock Return

Stock Return

Stock Return

AAPL option volume analysis(a)  
60-day moving average volume in options (in 000s)  
Trading in AAPL options  
(calls and puts) has  
doubled from 2010 to  
June 2014

The underlying shares  
that these options  
represent are larger than  
the stock volume – delta  
adjusted, though, the  
volume would be about  
25-50% based on recent  
data

200  
400  
600  
800  
1000  
1200  
0

Apple's open interest as a  
percent of its outstanding  
stock is higher than any  
other S&P 100 company  
and its ratio of calls to  
puts is higher than the  
broader market as well as  
the average S&P 100

company

Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14

S&P500

Apple

Ratio of calls to puts

0.00x  
0.20x  
0.40x  
0.60x  
0.80x  
1.00x  
1.20x  
1.40x  
1.60x  
1.80x

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1.66x  
1.43x  
1.18x  
1.20x  
1.28x

1.34x  
1.47x  
Rank OEX Index  
1 AAPL UW Equity Apple Inc  
2 FB UW Equity  
0.69x  
0.59x  
0.61x  
0.60x 0.58x  
0.61x 0.56x  
Facebook Inc  
3 GOOG UW Equity Google Inc  
4 GM UN Equity  
5 CAT UN Equity  
6 APC UN Equity  
General Motors Co  
Caterpillar Inc  
Anadarko Petroleum Corp  
7 AMZN UW Equity Amazon.com Inc  
8 FCX UN Equity  
9 HAL UN Equity  
10 EBAY UW Equity eBay Inc  
2008 2009 2010 2011 2012 2013 2014  
YTD  
AAPL S&P500  
Source:  
Bloomberg.  
(a) As of June 6, 2014  
(b) Not averaged over any time period  
7  
Average -- top 10  
Average -- all 100  
Freeport-McMoRan Copper & Gold Inc  
Halliburton Co  
Company  
Weekly options in  
AAPL list  
(June 2010)  
60-day moving average of Apple stock and option  
volume (based on underlying shares)  
100%  
200%  
300%  
400%  
500%  
600%  
0%  
Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14  
Shares underlying options  
AAPL stock volume  
Top 10 S&P 100 companies by option open interest(b)

Option open  
Market cap  
(\$bn)  
\$479  
\$173  
\$404  
\$57  
\$61  
\$42  
\$160  
\$34  
\$46  
\$71  
interest as %  
of shares  
27.4%  
16.0%  
13.1%  
11.9%  
11.5%  
10.3%  
9.2%  
8.7%  
7.9%  
7.6%  
12.4%  
3.7%  
Ratio of calls  
to puts  
1.49x  
1.61x  
1.08x  
1.22x  
1.00x  
2.16x  
0.99x  
1.01x  
1.28x  
1.81x  
1.37x  
1.33x  
Weekly options in  
AAPL list  
(June 2010)  
10  
20  
30  
40  
50  
60  
0

AAPL stock volume (in mm)  
Shares underlying option volume  
as % of AAPL stock volume

## Summary

- Apple's stock price does exhibit an abnormal trading pattern on Monday and Friday
- Monday's outperformance is more significant, and more consistent, than Friday's underperformance
- The pattern developed around 2011 coinciding with the listing of Weekly options on AAPL stock
- AAPL option trading is more significant than the option trading for other large companies
- Weekly options increased the amount of AAPL option trading volume
- The net "delta" of the options market (limited to what we classify as directional transactions), while small relative to total liquidity, does correlate to the stock price performance
- Given all the above, along with the ratio of calls to puts, and the significant retail element to the listed option market, we suspect the abnormal trading pattern could be explained by the following activity:
  - Investors selling puts and strangles (a combination of out-of-the-money puts and calls) to generate income
  - Investors buying calls as a levered long equity investment
  - Assuming this is the case, hedged market participants will be short calls on a net basis. Such participants will need to purchase stock to hedge their stock price risk
  - This may result in hedged investors purchasing stock on Mondays as positions are initiated, while selling stock as their delta erodes on Fridays
  - The change in open interest supports this as the open interest increases the most on Mondays and decreases the most on Fridays

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Strategy Implementation

Monday outperformance vs SPY

DB proposes a strategy  
referencing the combined  
return of the Friday and  
Monday trades with gains  
or losses reinvested in the  
strategy on a daily basis  
(alternatively, a strategy  
on Monday-only could  
also be implemented)

Strategy will use SPY, the  
SPDR S&P 500 ETF, to  
replicate the S&P 500  
total return

Strategy assumes  
dividends are reinvested  
on the ex-date

Strategy incorporates a  
transaction cost of  
0.002% per execution on  
notional amount executed

100  
200  
300  
400  
500  
600  
700  
800  
0

'08 to '10 11.5%

'11 to Present 30.6%

Ann. Return Volatility Sharpe Ratio

14.2%

11.5%

0.81

2.67

Friday underperformance vs SPY

100  
200  
300  
400  
500  
600  
700  
800  
0

'08 to '10

Ann. Return Volatility Sharpe Ratio

1.2%

'11 to Present 13.4%

14.6%

8.4%

0.08

1.59

Combined Friday / Monday performance vs SPY

Ann. Return Volatility Sharpe Ratio

Annual Returns

100

200

300

400

500

600

700

800

0

'08 to '10 12.8%

'11 to Present 48.2%

19.9%

12.5%

0.64

3.86

-20%

-10%

0%

10%

20%

30%

40%

50%

60%

70%

80%

Monday

Friday

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Monday

Friday

Combined

2008 2009 2010 2011 2012 2013

2014

YTD

-7.6% 27.3% 18.0% 33.1% 47.0% 23.5% 32.8%

16.8% -9.5% -1.7% 2.5% 19.5% 27.4% -0.1%

Combined 8.0% 15.2% 15.9% 36.5% 75.7% 57.4% 32.7%

This Strategy assumes trading an equal dollar amount long and short (or short and long) of AAPL and SPY on each execution day and reinvesting the gains or

losses in the strategy. Source: Deutsche Bank, Bloomberg Finance L.P., as of

November 3, 2014  
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