TWO SIGMA

Street View

JANUARY 2016

BY JEFFREY N. SARET AND ALEX DEMENTIEV

EXECUTIVE SUMMARY The US Federal Reserve expects to hike interest rates four times (by 25bps each) during 2016 while the market projects only two hikes. Something has to give. Either the Fed's beginning-of-year intentions will prove more hawkish than its actions, or the market will need to adjust its expectations. Many previous episodes of market adjustments to Fed policy, including the so-called "taper tantrum" during the summer of 2013, proved destabilizing. Another tantrum could strike after the January 28th or (more realistically) March 18th FOMC meetings if the Fed forces the market to reevaluate its expectations.

www.twosigma.com

NEW YORK HOUSTON
LONDON HONG KONG

Inside:

THE MARKET FIGHTS THE FED —AND MIGHT WIN

FOR MANY, DECEMBER REPRESENTS A CONVENIENT TIME TO MAKE NEW YEAR'S PROGNOSTICATIONS AND RESOLUTIONS. For the Federal Open Market Committee (FOMC) of the US Federal Reserve, December presents an opportunity to proffer both. FOMC members submit their forecasts on how the US economy will evolve, and what policy actions the FOMC will enact, during the following year. The Fed then publishes these forecasts in its so-called "dot plot," a scatter plot of its estimates for the end-of-year readings of US economic variables (e.g., real GDP and inflation) as well as the Fed's primary policy variable—the fed funds rate.[1]

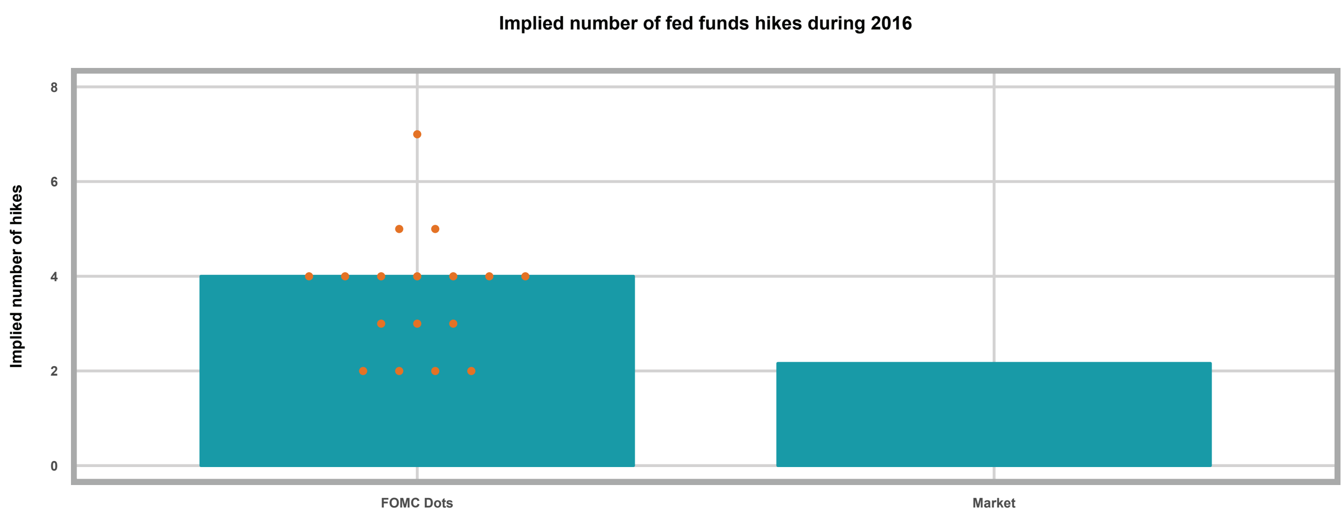
Since the Fed publishes its dot plot four times annually, perhaps a more accurate statement would describe December (and January) as a convenient time to evaluate the FOMC's prognostications and resolutions. One dimension worth evaluating is the alignment of the Fed's expectations of the future with the market's. Along that dimension, the market seems to treat the FOMC's dots more like a toddler's random paint splattering than a precise, pointillist masterpiece by Seurat. According to the FOMC's most recently released dot plot (December 16, 2015), the FOMC plans between two and seven rate hikes during 2016 with a median forecast of four.[2] The fed funds futures market expects only two hikes (see figure 1).

Something has to give. Either the Fed's beginning-of-year intentions will prove more hawkish than its actions, or the market will need to adjust its expectations, or both. If the market must correct its expectations quickly, as it did during the summer of 2013 following comments from then-FOMC chairman Ben Bernanke about the end of quantitative easing, a market "tantrum" may ensue.

1 For a more complete explanation, see the Federal Reserve's projects from December 16, 2015: http://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20151216.pdf

2 Assumes 25 basis point hikes.

FIGURE 1



Notes: Chart reports the implied number of rate hikes during 2016 based on forecasts reported by the Federal Reserve for the December 2016 fed fund rates level. Assumes Fed hikes rates in 25 basis point increments. Left side depicts the median (blue bar) and 16 dots (orange) from the FOMC's December 16, 2015 dot plot. Right side based on data from Bloomberg for the fed funds futures market on December 16, 2015.

THE FOMC'S CONFIDENCE IN ITS 2016 RATE HIKE EXPECTATIONS APPEARS TO BE RISING

Not only does the FOMC expect to hike rates twice as often during 2016 as the market believes, the FOMC has arguably become more resolute in its plans. One measure of this certainty compares the difference between the highest and lowest forecasts in the dot plots (Figure 2). When the FOMC expressed its end-of-year 2016 forecast for the fed funds rate in December 2014, more than 350 basis points separated the highest and lowest dots. Back then, the median forecast called for the fed funds rate to reach 2.5 percent. A year later, in December 2015, the spread between the highest and lowest dots compressed to only 125 basis points, while the median declined to 1.4 percent. In statistical parlance, the coefficient of variation[3] decreased from 39 percent to 27 percent between December 2014 and December 2015.

Many market participants might question the insightfulness of the dot plot. Its history has not demonstrated much prophetic skill on the FOMC's part. For example, the December 2014 dot plot indicated that the committee anticipated four rate hikes during 2015. As late as June 2015, the FOMC still expected two hikes that year. In reality, the FOMC hiked only once, during the final month of the year.

Perhaps, as in 2015, during the course of 2016 the Fed will once again behave more dovish than it signaled it would prior to the calendar turning from December to January. Many New Year's resolution-makers who aspire to spend more time in the gym would be able to relate.

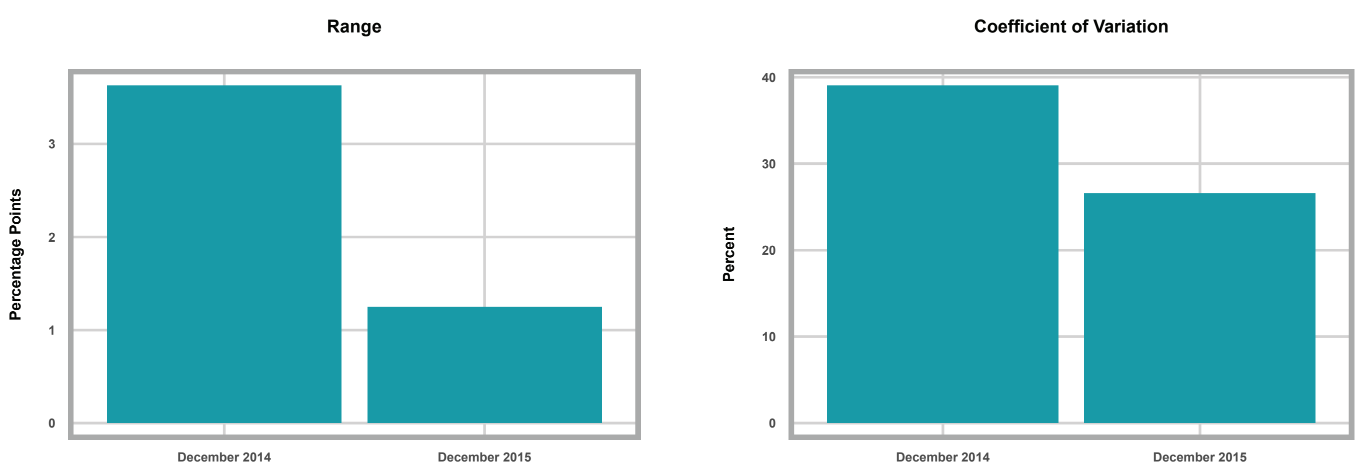
IF THE MARKET LOSES ITS FIGHT WITH THE FOMC, A "TANTRUM" COULD ENSUE

If the Fed manages to hit its target of four rate hikes, the market may not like the surprise. One such incident led to a market "tantrum." During the spring of 2013, then-FOMC chairman Ben Bernanke suggested that the Fed might taper its asset purchases (i.e., end QE3) earlier than the market had been anticipating. During that spring and summer of 2013, the yield on the US 10-Year Treasury bond increased by 140 basis points. Global equity and currency markets also quaked.

For the Fed to raise rates four times during 2016, and to do so with a relatively smooth trajectory, it might feel compelled to hike again as early as its March meeting. Since the market's implied probability of a rate hike in March currently hovers around 40 percent, an FOMC decision to raise rates would qualify as a surprise. If the FOMC does not hike rates in March, market observers may look to the dots. Then, they might go to the gym.

3 The ratio of the standard deviation of the forecasts to mean expressed as a percent.

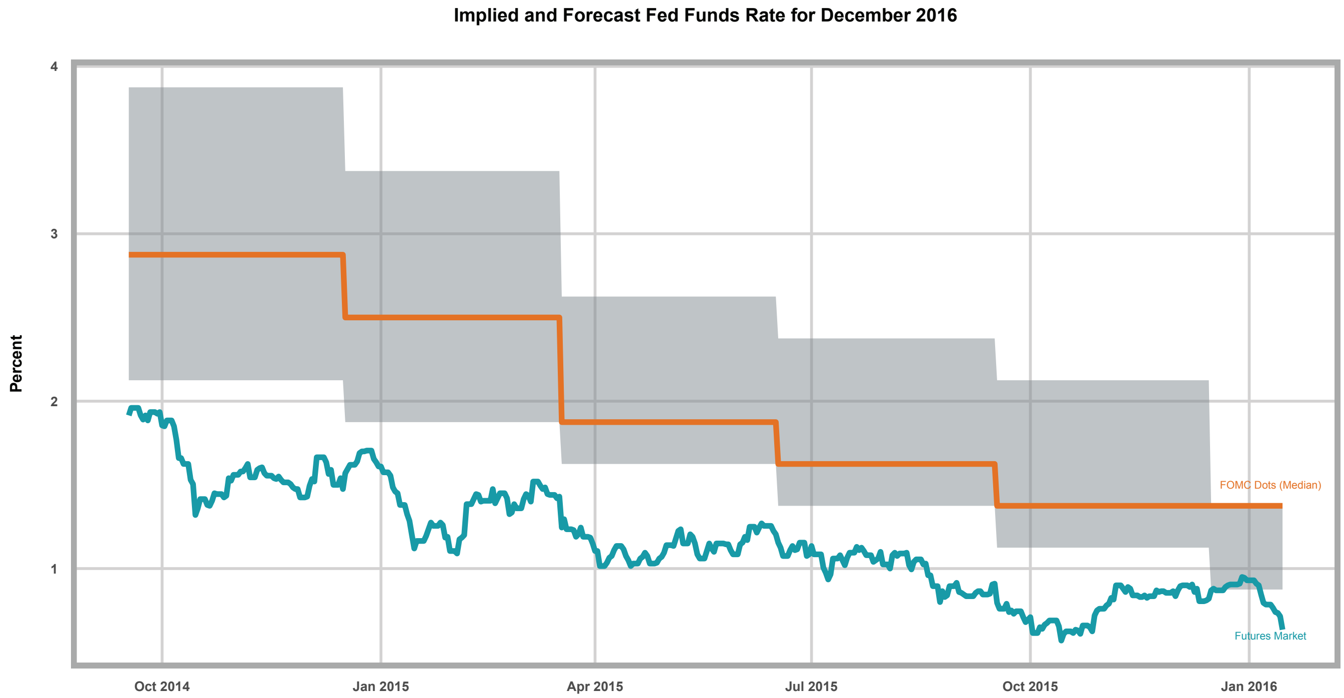
FIGURE 2



Notes: Left side plots the range of the FOMC's forecast for the December 2016 fed funds rate. Values from the December 2014 and December 2015 FOMC meetings. Right side reports the coefficient of variation of the forecast from the same meetings.

APPENDIX

FIGURE 3



Notes: Blue line plots the implied December 2016 rate from the Fed funds futures market. Orange line plots the median forecast from the FOMC dots. Grey bars show what the Fed calls the "central tendency" of the FOMC dots (i.e., range of the dots after excluding the highest and lowest three forecasts). Data from the Federal Reserve and Bloomberg.

INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma is a technology company that applies a rigorous, scientific method-based approach to investment management. We draw upon a diverse set of fields to inspire our technology, including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

"A Robot Life Preserver Goes to Work in the Greek Refugee Crisis" by Matt Simon, *WIRED,* January 12, 2016 (http://www.wired.com/2016/01/a-robot-life-preserver-goes-to-work-in-the-greek-refugee-crisis/)

As 2,000 refugees reach the Greek island of Lesvos each day, the Coast Guard struggles to rescue boats that have capsized, run out of fuel, or broken down. The Coast Guard brought in a team from Texas A&M University's Center for Robot-Assisted Search and Rescue to pilot a program using Emily, its Emergency Integrated Lifesaving Lanyard robot. The robot—a self-propelled life preserver (paired with an observation quadcopter)—can retrieve up to five people at a time from the water, bringing them to shore safely.

"In Pursuit of an Affordable Tablet for the Blind" by Signe Brewster, *MIT Technology Review,* January 11, 2016 (http://www.technologyreview.com/news/545301/in-pursuit-of-an-affordable-tablet-for-the-blind/)

Researchers at the University of Michigan are developing an advanced and relatively inexpensive tablet-sized Braille display using microfluidics, rather than traditional motors, to make the writing system more user-friendly and accessible to the visually impaired. Tiny bubbles of air or liquid pop up on the screen to create block characters, allowing much more text to be displayed than is possible with motor-driven devices, at a much lower cost. Text-to-speech technology has curbed Braille's popularity in recent years, but certain kinds of written information—often mathematical and scientific—translates poorly into audio. The researchers hope that the new tablets will help make such information more broadly available.

IMPORTANT DISCLAIMER AND DISCLOSURE INFORMATION