TWO SIGMA

Street View

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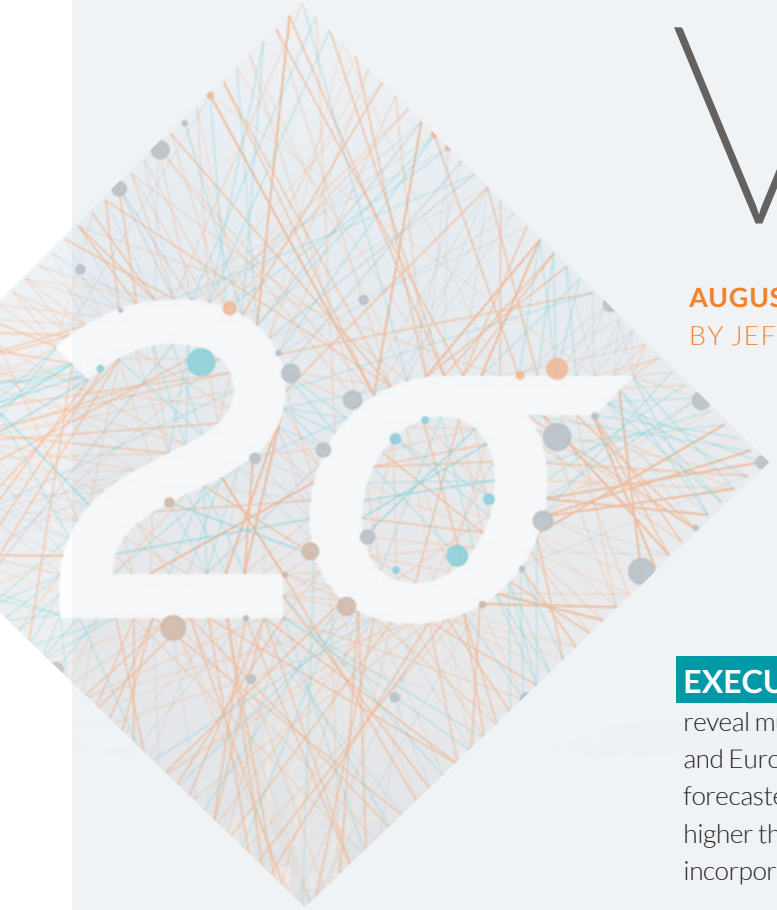

EXECUTIVE SUMMARY Polls of economic forecasters can reveal much more than point estimates. Data from the Federal Reserve and European Central Bank show that the level of disagreement across forecasters today is within the historical norm, but uncertainty appears higher than ever, particularly in Europe. Asset allocators might want to incorporate that uncertainty when hedging their economic risk.

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ECONOMIC FORECASTERS' UNCERTAINTY VS. DISAGREEMENT

Even though economists do not have a reputation for their sense of humor, they generate a lot of jokes. One joke describes three economists playing darts in a bar. The first misses the board entirely, throwing a dart one foot to the left and leaving a small hole in the wall. The second economist misses the board as well, breaking a mirror one foot to the right. The annoyed bartender glares when the third economist cheers loudly and earnestly, "We averaged a bullseye!"[1]

Some asset allocators might take as a moral of this story that they ought to ignore entirely polls of economists on topics like GDP growth. Recent data releases for Q2 2016 GDP growth, which fell short of expectations in the US (1.2 percent actual versus Bloomberg estimate of 2.5 percent expected)[2] and other major markets, might further that belief. However, rather than ignoring polling data because of dubious point forecasts, allocators might delve deeper into other characteristics of the data. For example, does the data imply a high degree of dispersion or disagreement across forecasters? Do individual forecasters have a high degree of confidence or certainty in their own views?

By disentangling disagreement from uncertainty in polls of forecasters, asset allocators can draw a much clearer picture of what the data says and potentially hedge their exposures accordingly. For example, if half of polled experts believe with high conviction that one outcome appears likely, and the other half believe equally firmly that the opposite outcome appears likely, an asset allocator might want to hedge against two discrete scenarios. Alternatively, if all forecasters share a common expected outcome, but each feels highly uncertain of that outcome, an asset allocator might want to hedge against a broader range of scenarios.

For GDP and inflation forecasts, data from the US Federal Reserve and the European Central Bank (ECB) reveal two interesting findings.[3] First, both US and European forecasters currently disagree among themselves about as much as usual on growth and inflation. However, the level of uncertainty for each forecaster appears higher today than at any other time during the past 15 years, particularly in Europe. Asset allocators might want to account for that uncertainty when hedging their economic risk.

COMPARING UNCERTAINTY TO DISAGREEMENT IN FORECASTS

When the Federal Reserve and the ECB survey professional forecasters for their economic outlooks, the respondents do not simply input point estimates for the mean. Instead, each forecaster enters a probability that an economic outcome (e.g., GDP growth) will fall within a pre-specified band (e.g., 1.0–1.9 percent). The Fed and ECB generate these surveys quarterly.

One can infer more than just the means from the surveys of professional forecasters by studying both the disagreement and the uncertainty of the forecasts. Consistent with academic research, disagreement equals the inter-quartile range (75th minus 25th percentile) of point forecasts, whereas uncertainty equals the average of the individual variances from each forecaster's probability distribution of outcomes.[4] Figure 1 depicts these two measures.

Figure 1 plots the level of disagreement and uncertainty in the Fed and ECB surveys of professional forecasters. For both growth and inflation, the data (mostly) start in 1999.

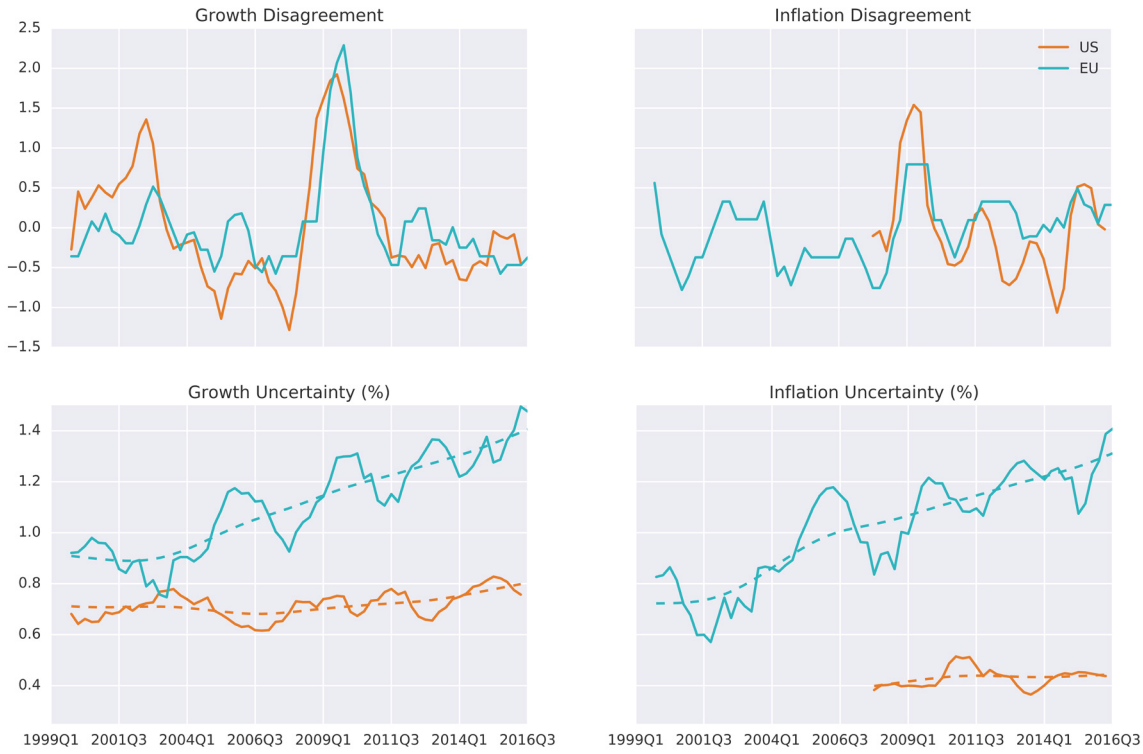
1 Similar jokes apply equally well to statisticians, though statisticians seem to generate jokes only 20 percent as often as economists (based on a Google search). Perhaps that stems from differences in socializing behavior at bars.

2 http://www.bloomberg.com/news/articles/2016-07-29/u-s-economy-grew-a-less-than-forecast-1-2-in-second-quarter

3 A search of academic and practitioner published research suggests that a long time series of publicly available data for other regions that incorporates both disagreement and uncertainty for GDP and inflation does not appear to exist.

4 Academic research, including Kajal and Sheng (2010), Rich and Tracy (2010), and Borea, Smith, and Walls (2015), applies similar approaches.

FIGURE 1 UNCERTAINTY AND DISAGREEMENT IN REAL GROWTH AND INFLATION IN EUROPE AND IN THE US



Source: ECB, Philadelphia Federal Reserve, and authors' computation.

The figure highlights two main points. First, disagreement in growth and inflation vary over time (e.g., peaks during periods of financial stress such as 2001 and 2009), but the most recent surveys (Q3 2016) show that the current level does not differ significantly from the long-term mean. Forecasters seem as split today as usual.

Second, and more interestingly, the level of uncertainty today appears higher than usual, particularly in Europe. European forecasters appear 20 percent less confident in both their growth and inflation predictions than in March 2009 (trough of global equity markets) and 15 percent less confident than in March 2012 (Greek sovereign default).

POTENTIAL IMPLICATIONS

Asset allocators feeling befuddled while trying to hedge the macroeconomic risks in their portfolios should not feel alone. Professional forecasters also appear to suffer from a degree of uncertainty today that exceeds recent memory, including during the global financial crisis. The policy uncertainty from Brexit and the ongoing refugee crises likely contribute to the economic uncertainty. Asset allocators might also feel some relief that forecasters at least agree amongst themselves, both within and across the US and Europe. Then again, it might feel like a good time to go back to throwing darts.

References

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INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma views itself as a technology company that applies a rigorous, scientific method-based approach to investment management. Our technology is inspired by a diverse set of fields 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.

"How Can Big Data and Analytics Help Athletes Win Olympic Gold in Rio 2016?" Bernard Marr, *Forbes*, August 9, 2016 (http://www.forbes.com/sites/bernardmarr/2016/08/09/how-big-data-and-analytics-help-athletes-win-olympic-gold-in-rio-2016/#1c160ab14205)

> Great Britain, and likely other countries, uses data analytics to improve its expected outcomes in the Olympics. One application appears to use a form of a machine learning algo known as "nearest-neighbor" to identify a rower's talent based on the athlete's similarity to a historical star. Another application tries to identify the habits that successful rowers employ to improve their skills. "The idea is that by collecting every bit of data about every athlete who enters the training program, new entrants can be matched against profiles of former entrants, to identify the approach most likely to turn each individual into a champion."

"The bandwidth bottleneck that is throttling the Internet" Jeff Hecht, *Nature*, August 10, 2016 (http://www.nature.com/news/the-bandwidth-bottleneck-that-is-throttling-the-internet-1.20392)

> "With global Internet traffic growing by an estimated 22% per year, the demand for bandwidth is fast outstripping providers' best efforts to supply it," according to a recent article in Nature. The problem stems from the fact that the internet still relies heavily on a "global patchwork built on top of a century-old telephone system," where local links bottleneck global data flows. Massive investments to lay more modern fiber optic wires, along with the continuous development of software updates, will likely prove necessary to alleviate the problem.

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