

Azhar Iqbal, Director and Econometrician\*  
\*Economics Group, Wells Fargo Securities, LLC

## Abstract

Recent developments in machine learning techniques open doors to new ways of forecasting the near term outlook of major macroeconomic variables. One such example is utilizing the FOMC's minutes to forecast GDP, inflation, interest rates and recessions. The FOMC regularly provides forecasts for GDP, inflation and the unemployment rate along with a long term fed funds rate outlook. However, past studies have confirmed that the FOMC tends to over-forecast GDP/Inflation and interest rates, and under-forecast the unemployment rate. Our proposed framework utilizes the FOMC's minutes as predictors and produce accurate forecasts of such variables.

Our initial results suggest that the FOMC's minutes along with other predictors beat (provide better forecasts than) all other competing approaches. Basically, the FOMC's minutes contain important information which improve forecasts of macro variables as well as recessions.

## Introduction

This paper develops a new framework which utilizes the FOMC's minutes to forecast inflation, unemployment, GDP, fed funds rate and recessions. The recent advancements in machine learning tools (text mining and natural languages processing analysis for example) help to extract useful information from the FOMC's minutes. In addition, that information can be utilized as predictors in a model to forecast key economic and financial variables. The reason to utilize the FOMC's minutes as predictors in a forecasting framework is that the minutes discuss risks to the FOMC's forecasts as well as other key developments in the economy such as financial and housing outlooks. Therefore, the minutes contain more useful information about the current and near term economic outlook than the FOMC's forecasts for GDP, inflation and unemployment. One major reason to rely on the minutes instead of the FOMC's forecasts is that past studies have suggested that the FOMC tends to over-forecast GDP/Inflation and interest rates, and under-forecast the unemployment rate.

We utilize traditional model based forecasts of the target variables as a benchmark and one-year ahead forecast as the forecast horizon. We employ several different competing approaches in the analysis. The methods are (1) the FOMC's forecast, (2) a model with the FOMC's minutes-based predictors, (3) the FOMC's minutes along with other predictors, and (4) pure statistical models. The data for the 1985-2011 period is utilized. The major benefit of using that sample period is that there are three recessions with different depths/durations in the sample period. Basically, the longer history of the dataset helps us to analyze the predictive power of the framework during different business cycles.

## The Econometric Setup

In the first step, we quantify the FOMC's minutes using the natural language processing analysis (NLP) into neutral, risks and positive momentum. That is, we generated a categorical variable with values of zero, minus one (-1) and plus one (1). Further, if the FOMC's minutes suggest a balance risk to the outlook then the categorical variable equal zero, -1 for a negative outlook and 1 for the positive momentum. Therefore, we capture the economic outlook of the each FOMC meeting in the categorical variable. Then that variable is utilized as a predictor for the GDP/inflation and unemployment rate forecast (also for the fed funds rate and recessions prediction). Once we have a quantitative measure to represent the FOMC's minutes then we build a VAR model to generate forecasts for the target variables. Moreover, we utilize a Probit model to forecast recessions.

The second step includes LEI, the S&P500 Index and the yield spread as additional predictors (in addition to the categorical variable) in the models to forecast the target variables/recession.

We set one year ahead as the forecast horizon and utilize average forecast error as well as average directional accuracy as criteria to determined the forecast accuracy of a method. Three additional competing approaches are the FOMC forecasts, AR(1) and ARIMA (1,1) models.

## Contact

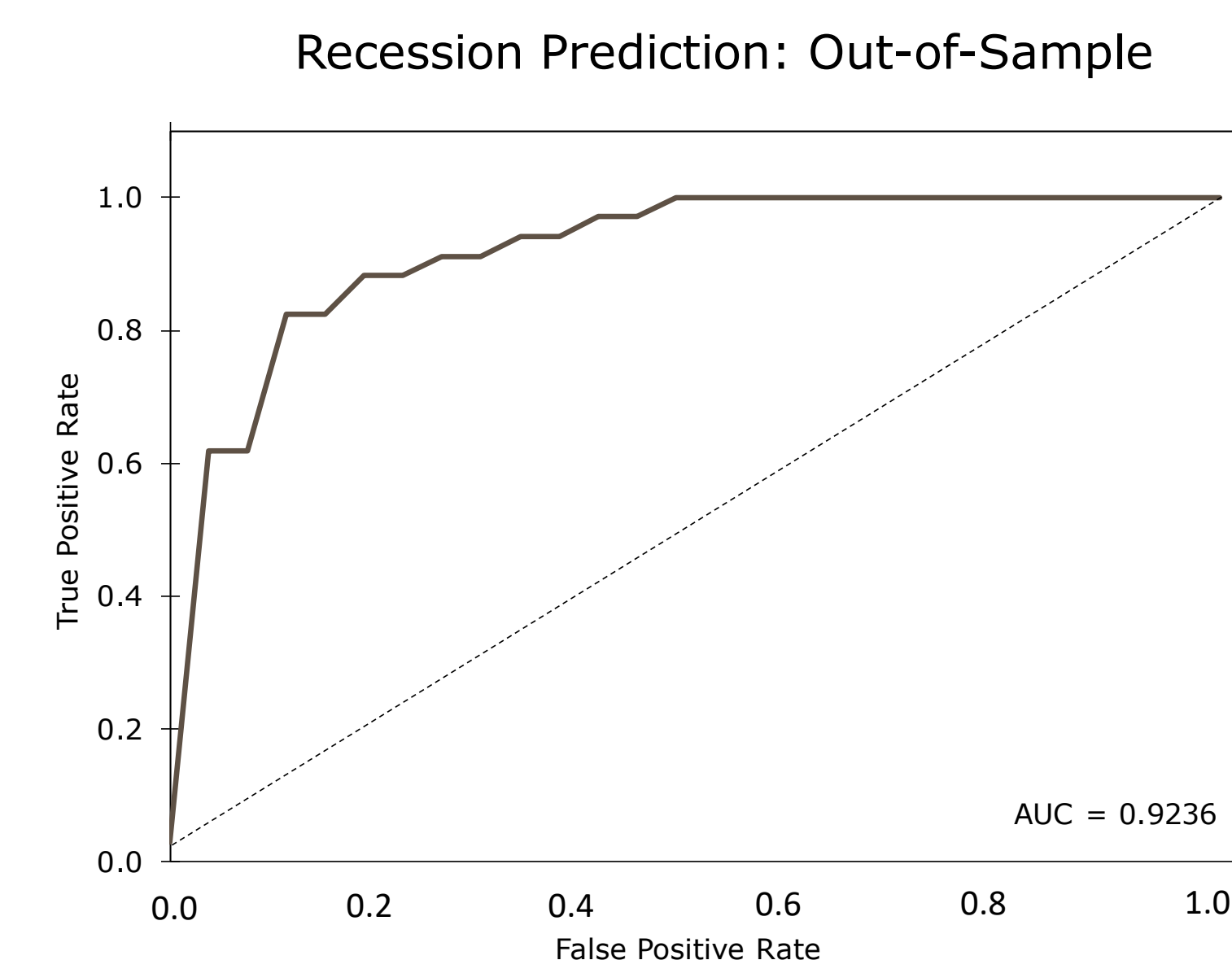
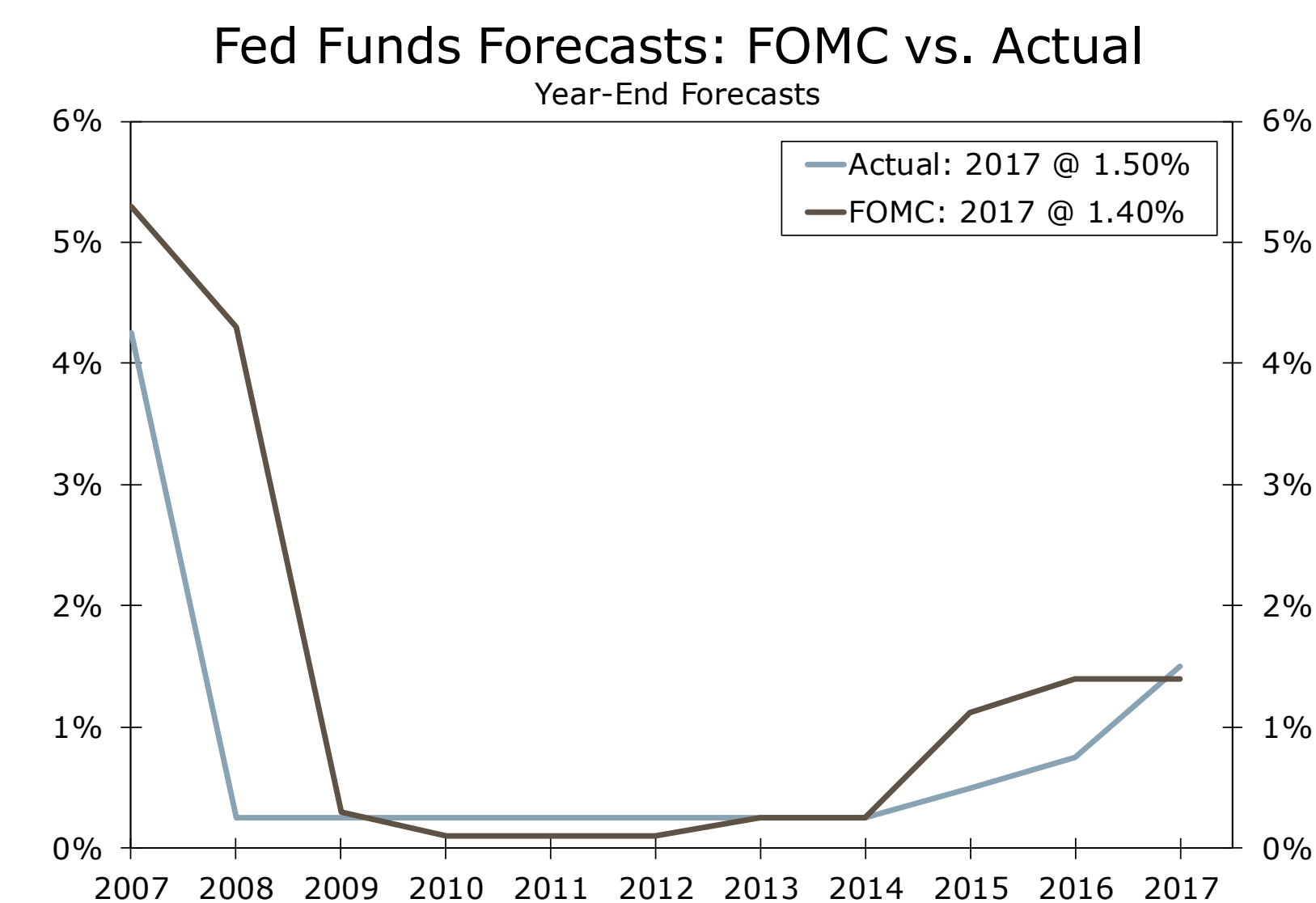
Azhar Iqbal  
Wells Fargo Securities, LLC  
Email: [azhar.iqbal@wellsfargo.com](mailto:azhar.iqbal@wellsfargo.com)  
Website: <https://www.wellsfargo.com/com/insights/economics/>  
Phone: 704-410-3270

## Results

Our analysis suggests that the FOMC's minutes contain more useful information, statistically, then the FOMC forecasts as the model with the minutes (categorical variable) produces more accurate forecasts (lower average forecast error along with higher directional accuracy). Furthermore, the forecast accuracy improved when we added additional predictors in the model. The Probit model with categorical variable along with additional predictors was able to forecast, successfully, all three recessions in an out-of-sample simulation analysis. The FOMC forecasts do perform better than the traditional statistical methods such as the AR and ARIMA models.

Summing up, non-traditional predictors such as the FOMC's minutes as a predictor, can improve forecast accuracy of the near term economic outlook. The FOMC forecasts, on the other hand, are more informative then those forecasts which are based on traditional statistical models.

## Magic of the Machine Learning



### Forecast Evaluation

| Method                         | Forecast Error* | Directional Accuracy** |
|--------------------------------|-----------------|------------------------|
| FOMC                           | 1.56            | 63%                    |
| Minues-Based                   | 0.92            | 71%                    |
| <b>Minutes Plus Predictors</b> | <b>0.647</b>    | <b>78%</b>             |
| AR(1)                          | 2.89            | 48%                    |
| ARIMA (1,1)                    | 2.97            | 43%                    |

\*Average Root Mean Squared Forecast Error  
\*\*Average Directional Accuracy

## Conclusions

Our study proposed a new framework which utilizes the FOMC's minutes as a predictor to forecast near term economic outlook. The framework produces more accurate forecasts then the traditional methods as well as then the FOMC forecasts. Essentially, we are suggesting to incorporate non-traditional information (predictors), which can be extracted using the recently developed machine learning tools, in a statistical model to generate forecasts of major macroeconomics and financial variables. In our analysis, such forecasting practice outperform the traditional methods. In other words, analysts need to look beyond the currently available quantitative predictors to improve a model's accuracy.

## References

Iqbal, Azhar and Abigail Kinnaman. (2018). Is the FOMC or the Private Sector More Optimistic?. *Wells Fargo Securities, LLC, Economics Group Special Commentary*, August 28, 2018.  
Iqbal, Azhar and John Silvia. (2018). Can Machine Learning Improve Recession Prediction? *Wells Fargo Securities, LLC, Economics Group Special Commentary*, April 17, 2018.  
Nechio, Fernanda and Daniel Wilson. (2016). How important is information from FOMC Minutes? *FRBSF Economics Letter*, 2016-37, December 19, 2016.