Method Description

General Information

Type of Entry (*Academic, Practitioner, Researcher, Student*)	**Researcher**
First Name	**Azhar**
Last Name	**Iqbal**
Country	**United States**
Type of Affiliation (*University, Company-Organization, Individual*)	**Company-Organization**
Affiliation	**Wells Fargo Securities**

Team Members (*if applicable*):

1st Member	
First Name	John
Last Name	Silvia
Country	United States
Affiliation	Wells Fargo Securities
2nd Member	
First Name	Shannon
Last Name	Seery
Country	United States
Affiliation	Wells Fargo Securities

Information about the method utilized

Name of Method	**Bayesian Vector Autoregression**
Type of Method (*Statistical, Machine Learning, Combination, Other*)	**Statistical**
Short Description (up to 200 words)	**Our estimation method is Bayesian Vector Autoregression (BVAR). We utilize original as well as a modification of the original series to build a BVAR model for each of the 100,000 variables. That is, we utilize log-difference form of each variable to create another variable. Therefore, we have a two-variable (original and log-difference form) BVAR.**

Extended Description:

Forecasting Method: The Bayesian Vector Autoregression Model

We utilize the Bayesian Vector Autoregression (BVAR) approach to generate forecasts for the 100,000 variables provided. The BVAR model is an extension of the Sims (1980) Vector Autoregression (VAR). Litterman (1980, 1986) presented the BVAR approach. The BVAR approach is more flexible than the VAR approach, as it allows the inclusion of more information about the relationship and therefore is more informationally efficient than the traditional VAR. For more detail about BVAR approach see Silvia and Iqbal (2012) and Silvia et al. (2014).

We employ a two-variable BVAR model for forecasting. That is, we have an original (target variable), Y_{1t} for example, and we generate the log-difference of the original variable (let's label it LDY_{1t}). Therefore the BVAR model for Y_{1t} consists of two variables, which are Y_{1t} (original and target variable) and LDY_{1t} (log-difference of the Y_{1t}). As log-difference is equivalent to growth rates, the LDY_{1t} variable may represent momentum of the series. Thereby, our model incorporates the level as well as momentum of each series.

We utilize SAS software for the estimation and forecasting. The Proc VARMAX (within SAS) generates forecasts of each variable, and estimates prediction intervals (95% interval) for the forecasts. Therefore, the forecasts and prediction intervals are based on the BVAR model using SAS' Proc VARMAX. For any questions, please contact azhar.iqbal@wellsfargo.com.

References

Litterman, R. 1980. “Techniques for Forecasting with Vector Autoregressions”. *University of Minnesota,* Ph. D. Thesis.

—1986. “Forecasting with Bayesian vector Autoregressions - 5 years of experience”, *Journal of Business and Economic Statistics*, 1986, 4, 25.38.

Silvia, John and Azhar Iqbal. (2012). A Comparison of Consensus and BVAR Macroeconomic Forecasts. *Business Economics*, Vol. 47, No. 4.

Silvia, John E., Azhar Iqbal, Sam Bullard, Sarah Watt and Kaylyn Swankoski. (2014). *Economic and Business Forecasting: Analyzing and Interpreting Econometric Results*. Wiley, 2014.

Sims, C. A. 1980. “Macroeconomics and Reality”. *Econometrica, V*ol. 48, no 1, 1-48.