Multivariate Inflation Forecasting: A Case of Vector Auto Regressive (VAR) Model

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Abstract- ***Forecasting of a time series can be done using various models. All the models, on the basis of number of variables used can be divided into two sets: univariate and multivariate forecasting tools. VAR is a multivariate method to forecast the time series. There are several strengths and weaknesses of this model. It is a restrictive model and can be used under a few typical conditions. It only uses pre-determined variables and no contemporary terms are part of the model specification. It uses more than two variables in the systems of equation format and helps in understanding impact on one variable due to the change or shock in another variable by using impulse response function and variable decomposition tools. In toto, it is a good tool to do the multivariate forecasting of the time series. It is difficult to predict which is a better model given so many models in the market, which includes statistical as well as machine learning tools. However, VAR has a unique place in the multivariate forecasting world.***

Indexed Terms- VAR, Forecasting, Time-series, Multi-variate, Inflation

I. INTRODUCTION

Inflation is always a matter of grave concern to any economy. Two things always go simultaneously when it comes to inflation management: there are ways and means by which it is claimed that inflation can be managed; and 2) despite all the efforts there are also a possibility that genie of inflation may not be put back inside the bottle. Moreover, there is no exposition of this situation. They appear to be dialectical ideas but firmly grounded on the reality, which cannot be denied.

In such situations, the ex-ante values of inflation may be of great help. As fondly described in the risk parlance, risk is manageable till it is known. The real problem of the risk is when it is not known. This analogy aptly fits with inflation management as well. Both, risk and inflation accord with each other in this aspect. Inflation, if known, can be managed well. Hence, forecasting of inflation may be quite helpful in its management.

Time-series forecasting has a unique feature. It can very well be modelled using itself. It is true despite the fact that there are several determinants of the inflation [2]-[10]-[8]-[34]-[1]-[3]. At times, it may be a matter of convenience than the strategy for the inflation forecasting that the time series itself is used to forecast the inflation. Most of the popular methods of forecasting are of the same nature, univariate. However, there are occasions when there might be a valid reason or pressing need to look beyond univariate models to forecast a time series.

II. LITERATURE REVIEW

Regression analysis is one of the methods which can easily be incorporated to model a bi-variate or multi-variate version of inflation forecasting. Factually, one of the most popular univariate forecasting models, ARIMA is also a kind of regression analysis. Hence, merely using the regression analysis for forecasting does not make the method multi-variate. A forecasting method using more than one variable to forecast make the method a multivariate method of forecasting.

VAR (Vector Autoregressive Model) is one such model which, by design, uses more than one variable to model the time series which can be used for the forecasting purpose. It is to be noted that a time series cannot be modelled correctly unless it is stationary. However, VAR is one such model where additional conditions are imposed. VAR can only be modelled if all the series to be used in it are non-stationary in levels and stationery in first-difference. Under this typical condition, a VAR model can be estimated. VAR model is modelling with lag term of the all the variables used in the model. Since, all the variable are

lag terms so there is no problem of endogeneity as pre-determined variables are again by design exogenous variables.

Volatility in the market is an important aspect to understand the disturbances in the economy. High volatility is always perceived as a problem [13]-[16]-[17]-[24]-[28]-[25]-[4]. Volatility is not only in the stock market but in the commodities markets as well matter a lot regarding inflation [29]-[23]-[19]-[22]-[5]. Furthermore, volatility in the interest rate market also play a role [21]. Even volatility in the international market also may impact the domestic inflation [20].

Banks also play vital role in inflation management [9]-[7]. They control the money supply through various channels. The money supply also gets affected by the digitalization and inclusive growth of the nation [26]-[18]-[27]-[6]. This also include micro-finance institutions and MSME sector [30]-[31]-[32]-[33]-[11]-[12]-[13]-[15]-[14].

III. DATA

Data for both CPI and WPI are used for inflation forecasting using variables which can be considered as the determinant of the inflation. Gold prices, crude oil price, G-sec bond yield and exchange rates are used for multivariate inflation forecasting purpose. The monthly data is collected from Feb 2011 to Jan 2022 (all prices are in USD; Exchange rate is Rs/$; bond yield is in percentages).

IV. ISSUES TO BE ADDRESSED

The following estimations can be done using VAR modelling (preferably through STATA or EViews).

a) Forecast WPI and CPI for coming three months i.e. Feb, March and April 2022 using only Exchange rates.
b) Forecast WPI and CPI for coming three months i.e. Feb, March and April 2022 using Exchange rates and Gold Prices.
c) Forecast WPI and CPI for coming three months i.e. Feb, March and April 2022 using Exchange rates, Gold Price and Crude Oil rates.
d) Forecast WPI and CPI for coming three months i.e. Feb, March and April 2022 using Exchange rates, Gold Price, Crude Oil and bond yield.
e) In the last case (case (d)), calculate impulse response function and variance decomposition and discuss their implications in the forecasting of inflation.

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