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Innovation The Research Concept

A Review on Economic Forecasting (1973-2007)

Abstract

Researchers have used several econometric as well as time series models for forecasting economic variables. Comparisons have also been made with respect to forecast errors, to identify a suitable forecasting technique. In the Indian context forecasts basically have been used in the process of planning and input output model along with regression technique have been used to arrive at the forecasts. Attempts are on to find out the most suitable model.

Keywords: Forecasting, Economic Forecasting, Forecast Errors, Trends, Quantitative Models, Input Output Model, Multicollinearity, Time Series, Policy Making.

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Introduction

Forecasting economic variable is essential for policy making, as it requires accurate and timely information. Policy takes time to make partly for institutional reasons and also for, a time gap is required for policy decisions to take effect. For all these reasons policy makers have to take decisions not on the basis of actual data but of a forecast of current and future events. In brief, it can be inferred that, as policy formulations and implementation take time and it takes further time to take effect upon the economy, policy settings have to be made in response to expected value rather than actual circumstances. All these confirm the significance of economic forecasting in policy making. So, an attempt is made to present the views of some researchers on economic forecasting.

Aim of the Study

Studies are made by various policy researchers to forecast economic variable. Gradually the process is spreading in the knowledge world in various spheres. The erstwhile attempts in this regard need a base to move forward. While the policy makers will take decisions on the forecast of current and future events, knowledge on the attempts in this regard can address to the adopted methods and the methods to be trialed.17 years before the globalization and 17 years after the globalization is the period to mirror the selected literature.

Review of Literature

Gupta G.S., (1973)[1] had emphasized that forecasting plays an important role in decision-making in the sense that, the use of best available technique could minimise the forecast inaccuracy. However, he could not specifically identify 'the forecasting technique' that could be described as the 'best'. He stressed that the choice of a method was often dictated by data-availability or urgency of forecasts. The author made an attempt to classify various forecasting techniques in ascending order of sophistication. They were: a) Historical analogy method b) Trend method c) End use method d) Survey method e) Regression method f) Leading indicators method g) Simultaneous equation method. He stressed that each forecasting technique has its own advantages & limitations. The simultaneous equation method was more popular in advanced countries and it had its limitation in less developed countries. The limitation in less developed countries was identified as, unavailability of data. He also explained the importance of forecast accuracy in decision-making and discussed the evaluation of forecast accuracy for which he recommended four methods. They were:

a) Coefficient of determination test b) Root mean-square error test c) Percentage mean-absolute error test d) Percentage absolute error test. His conclusion was based on the fact that Expert judgment plays a very important role in obtaining forecasts of any variable using any forecasting technique.

However, Barker in the mid 80s (1985)[2] examined and compared the forecasts from five organisations made in United Kingdom during 1979-

80. They were Cambridge Econometrics (CE), the London Business School (LBS), the National Institute of Economic and Social Research (NI), the Cambridge Economic Policy Group (CEPG) and the Liverpool Research Group in Macroeconomics (LPOOL). He compared the forecasts of all groups in 1979 and also examined the accuracy of the forecasts for macroeconomic variables like GDP, unemployment and consumer price-inflation. He observed that various organisations failed to predict the timing and depth of recession correctly. He stressed the importance of availability of accurate and timely data for forecast accuracy and observed that the organisations groups, which used annual data, have performed less accurately than those organisations, which used quarterly data. However, this conclusion would be appropriate when a researcher uses either annual or quarterly data. It may be mentioned here that his conclusion cannot be extended to forecast macroeconomic variables, which are expressed as annual data.

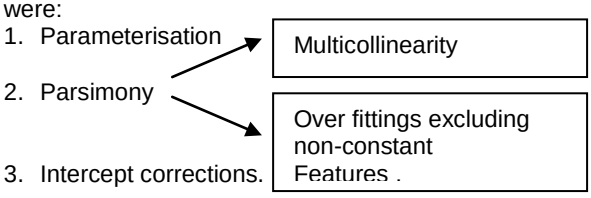
Holden & Peel, (1986)[3] had attempted to forecast growth and inflation over years for United Kingdom. They examined the forecasts of different forecasting organisations like London Business School (LBS) and National Institute of Economic & Social Research (NIESR). They had evaluated the performance of various forecasting techniques used by these organizations to forecast growth and inflation on the basis of forecast accuracy and concluded that forecasts produced by econometric methods were more accurate than forecasts of naïve models. This was consistent with the evidence on forecast accuracy for the U.K and also with U.S.A.

In the same year McNees, (1986) [4] had made an attempt to compare the forecasts from conventional econometric models like BVAR and VAR models. He had observed that in VAR models, a large number of variables were included in each equation & hence suffered from multicollinearity, with the coefficients being imprecisely determined. However, in BVAR model, initially each variable had to follow a random walk with the objective of determining the impact of other variables. So estimated BVAR models had fewer parameters than VAR models. He advocated that both the models generate unconditional forecasts, as they do not require any explicit assumptions about future-course of the economy. The variables considered by him were Nominal GNP, Money-stock, Real non-residual fixed investment and Unemployment and it was found that BVAR forecasts for the variables were better than that of VAR models. But he rightly stressed that; both these models should be used as complementary tools providing different kinds of information to forecasters.

Gill & Kumar, (1992)[5] had observed several quantitative methods were available for forecasting such as ARIMA model and VAR models, which had brought time series model and econometric models close together. They also observed that if the data series were non-stationary, then the use of VAR model might result in unstable econometric relationships, hence use of Bayesian VAR model was more precise. Their study aimed at forecasting macroeconomic data like – Real GDP, Consumer PI, 90 days banks accepted bill rates (BAB). The forecasts were generated by the use of ARIMA, Multivariate VAR and Bayesian VAR models. A comparison of forecasts of Univariate model and Multivariate time series model brought out the fact that both VAR and BVAR models had performed better than Univariate ARIMA for 50% and 100% of the time. For short-term forecasts, they stressed the use of BVAR model, as the forecasts of BVAR model were more accurate. They emphasized that the forecasting performance of the VAR model could be improved by imposing Bayesian priors on its parameters. The conclusion emerged from the overall forecasting results showed that the univariate ARIMA model could not perform better than the multivariate VAR & BVAR time series models, which allowed multivariate interaction among variables.

In the 90s Funke, (1992)[6] had attempted to use time series forecasting technique to forecast unemployment rate in Germany. Main issues dealt by the researcher were: (a) examination of alternative methods of short-term time-series forecasts, (b) exploration of the forecasting performance of univariate model taking the possibility of structural change and (c) application of various forecasting methods to forecast monthly German Unemployment rate. He had made an attempt to use multiple impacts of different types, to improve the forecast accuracy of univariate Box-Jenkins model in the presence of non-homogeneous data. It was observed that the multiple impacts ARIMA model outperformed the univariate ARIMA model, in both a fitting and a predictive sense.

However Clements & Hendry in the mid nineties (1995)[7] stressed that there are many ways of making economic forecasts. They suggested on the four criteria for any model based forecasting method. Thosewere: a) Regularities on which models were based, (b) Whether regularities were informative about the future, (c) Encapsulation of the regularities in the selected forecasting model and (d) Exclusion of non-regularities. They enumerated a number of distinct forecasting methods including Guessing, Extrapolation, Leading indicators, Surveys, Time-series models – ARIMA, Vector autoregressive and Econometric model (which rely on the model containing the invariants of the economic-structure). But they emphasised the role of leading indicators to forecast macroeconomic variables. They also discussed about reduction of forecasting errors for increasing forecast accuracy. They advocated three possibilities for reduction of forecasting error, which were:



Their empirical findings suggested that econometric analysis could help to improve macroeconomic forecasting procedures. They advocated

intercept corrections for increasing forecast accuracy against structural breaks.

Upadhyay, (1992)[8] had observed that usually random variables in time-series data were assumed to be stationary & follow stochastic process, but almost all time series data were non-stationary i.e., they were characterised by some type of trend, hence it was difficult to build an ARMA model. He examined the time-series data for non-stationarity, and developed models for forecasting six economic time-series. He had used the following two methods of forecasting:

1. An appropriate trend was fitted by OLS technique and residuals were estimated. Then an appropriate ARMA was developed on the residuals. Both the trend part and residual part were forecasted separately and superimposed on each other to give final forecast.
2. A model was developed using Box – Jenkins (ARIMA) method.

He grouped the data in two groups a) TS group, which contained data series moving on a deterministic path with stationary fluctuation b) DS group, contained data, showing stochastic trend with cyclical component .He observed that all economic time-series belonging to TS class had done better with first method and the second method had given better forecasts for the time series belonging to DS class. He concluded that as the data series belonging to TS class moved on a deterministic path with stationary fluctuation, so the series could be forecasted over for very long periods with bounded uncertainty. On the other hand as the other data series belonging to DS class had stochastic trend with cyclical component, the uncertainty in the distant future was unbounded.

In the late 90s Sethi, (1998)[9] had based his research on short-term forecasts. He had made an attempt to prepare sufficiently precise short-term forecasts of different components of India's domestic savings. He tried to determine the trend stationarity in time series data with different forms i.e. Simple linear, Quadratic, Cubic, Exponential cubic, Modified exponential, Gompertz and Logistic. It was observed that savings in general had traced non-linear growth paths. Empirical tests suggested 'Exponential cubic' to be the function of best fit for main-aggregates of India's savings. Box-Jenkins method with four stages of identification, estimation, diagnostic checking and forecasting were executed. The forecasted structural composition revealed that the largest chunk of domestic savings would continue accruing from household sector and the least from public sector. As per the forecasts, the relative share of the household sector would consistently decline and that of the private sector would continue to gain momentum towards the generation of domestic savings. On the basis of forecasts of savings of different sectors of India, he emphasized that the policy implication should be to curtail the size of public sector to enhance the overall efficiency of the economy.

In the same year, Sims & Zha, (1998)[10] had observed that, if dynamic-multivariate models were to be used to guide decision-making, probability assessment of forecasts or policy projections should be provided. They made a study on this and attempted to develop methods to introduce prior information in reduced form and structural VAR models without introducing substantial new computational burdens. They had identified a form for a prior on the coefficients of a multiple equation linear model, which was appealing and computationally tractable. They concluded that, Bayesian methods could be extended to larger models and to models with over identifying restrictions, which according to them would increase the transparency & reproducibility of these methods and be more useful for forecasting and policy-analysis.

Clements and Krolzig,[11] (1998) evaluated the forecast performance of two leading non-linear models that had been proposed for US-GNP i.e. the Self-Exciting Threshold Autoregressive model (SETAR) and Markov-Switching Autoregressive model (MS-AR). They observed that construction of multi-period forecasts was difficult in comparison to linear models. They had referred to the earlier study made by Clements & Smith which compared a number of alternative methods of obtaining multi-period forecasts, including normal forecast error. On the basis of their comparative analysis, they suggested that, SETAR model forecasts of US-GNP were superior to forecasts from linear AR models, particularly when forecasts are made during a recession. Their findings based on empirical studies suggested that the MS-AR and SETAR models had done better than linear models in capturing features of business cycles.

Diebold, (1998)[12] attempted to study the past and present era of macroeconomic forecasting and elaborated his ideas regarding what would most probably be the future of forecasting. He had observed that structural economic forecasting was based on postulated systems of decision rules and enjoyed a golden age in the 50s and 60s, following advances in Keynesian theory in 1930s. The two then declined together in the 70s & 80s.The evolution of non-structural forecasting had outweighed the importance of structural forecasting and continued towards vast increase in use and popularity at a rapid rate. While comparing the role of both structural and non-structural macroeconomic forecasting with logical reasoning, he explored that the future of structural and non-structural forecasting was intertwined. He stressed that, the on-going development of non-structural forecasting, together with recent developments in dynamic stochastic general equilibrium theory and associated structural estimation methods bode well for the future of macroeconomic forecasting. He concluded that, the hallmark of macroeconomic forecasting over the next 20 years would be a marriage of the best of the non-structural and structural approaches, facilitated by advances in numerical and simulation techniques and that would help the researchers to solve, estimate and simulate the forecast with rich models.

In the late nineties Samanta, (1999)[13] had observed that over the years, non-linear model building had become an integral part of any forecasting exercise dealing with time-series data.

According to him, any model essentially tries to approximate the generating process of the time-series, in its own-way. Estimation of the model also requires making some simplified but specific assumptions about the behaviour of the series. Thus, appropriateness in capturing the behaviour of a series and accuracies in forecasts by a particular model depends heavily on the validity of the assumptions. He stressed that, the forecast performance of any model could be judged by estimating forecast errors where lowest forecast error would indicate better performance. He identified two methods for comparing forecast performance of various forecasting models. First method was about calculation of probable error values for the variables in different time period, for which the forecasting exercise might be repeated for a number of times including one extra observation in each repetition. Forecasts might be generated for time points where actual data were already available. The author observed that the above method helped in comparing the forecast performance of various models but failed to quantify the extent of percentage errors in forecasts. It could only indicate the relative performance of the various models & rank them qualitatively. The second method was about the calculation of Root-Mean-Square-Percentage errors (RMSPE), which suggested that, the lower the value of RMSPE, better would be the forecast performance. He had estimated four different univariate time-series models i.e. ARMA, Bilinear modeling, RCA and SETAR. Empirical results showed that, the performance of SETAR model was found to be effective for forecasting a few time-series data. Overall performance of the models indicated that Bilinear modeling was the best for generating one month ahead forecasts, followed by SETAR & ARMA.

The SETAR model was found to be more efficient in generating multi-step forecast, which ensured the capability of SETAR models to capture the behaviour of a wide-class of time-series. Thus, it was concluded that SETAR could at least be considered as potential alternative for modeling and forecasting any time-series.

Bhattacharya, Ria & Agarwal, (1999)[14] made an attempt to forecast some macroeconomic variables of Indian economy for the year 1999-2000. They forecasted the variables like GDP's growth rate, growth rate of Indian economy, industrial growth rate, imports, deficit on trade-account, money supply and interest rates. The methodology used by them were:

1. Computable general equilibrium models (large blocks of simultaneous equations) were used to generate short-term forecasts.
2. Macro-econometric models were used for medium or long term forecasting.

The technique of regression – estimation method was used in the Macro econometric model to create four inter-related blocks of equations: the production block, the monetary block, the fiscal block & the external block. These methods were used by the authors to forecast the selected macroeconomic variables on the basis of the time-period of forecast.

However, in the same year, Bhattacharya & Kar (1999)[15] had analysed the usefulness of Macro-econometric modeling in forecasting. Such as:

1. It provided an opportunity to test alternative theories about different aspects of the economy.
2. Policy simulations based on macro econometric models could provide the net-effect of stimuli.
3. Macro-econometric exercises could be used as a useful technique for forecasting macroeconomic variables.

They described that, macro-modeling was based on the 'structural macro-modeling' methodology associated with the Cowles Commission. The methodology adopted by them can be described in the following steps.

1. Construction of a theoretical model of macro-economy on the basis of appropriate framework, with chosen degree of dis-aggregation.
2. Acquiring time series data for all variables for the period to be studied.
3. Estimation of behaviour equations for which usually OLS methods were used.
4. The whole model including technical equations, identities and behavioural equations were solved using Gauss – Seidel method to generate the values of endogenous variables.
5. The model was validated by examining the behaviour of errors in terms of statistical measures like Root-Mean-Square Error (RMSE) and Inequality statistics.
6. The validated model could be used to forecast values of variables.

They also discussed some theoretical aspects of a macro-econometric model for the Indian economy, which according to them would be useful for forecasting macroeconomic variables.

Bidarkota, (2001)[16] had experimented with the inflation rates of United States and found the rates to be shifted in its mean level and variability. He had evaluated the performance of 3 useful models for studying such shifts. They were:

1. Markov switching models,
2. State-space models with heavy tailed errors,
3. State-space models with compound error distributions.

He observed that all the three models had similar performance when evaluated in terms of 'mean-squared' or 'mean absolute forecast' errors. He stressed that the later two models were more parsimonious and easily could beat the more profligately parameterized Markov-switching models in terms of model selection criteria. He concluded that, these models might serve as a useful alternative to the Markov switching model for capturing shifts in time.

Harvey, Leybourne and Newbold, (2001)[17] made their study in the spirit of 'exploratory data-analysis'. Their main interest was focused on the forecasts made by a large panel. Their forecasts underwent regular monthly revisions & the data set was rich & voluminous. On this line, the forecasts of GDP growth, inflation and unemployment in UK, made by a panel of forecasts had been analysed. Annual outcomes were predicted and forecasts were revised

monthly, over a period of 24 months. Consensus forecasts could be calculated as a simple average of all panel members' forecasts at any point of time. They observed that, the consensus forecasts evolved towards actual outcomes with diminishing cross-sectional standard deviations. Finally, they attempted to assess the magnitude of eventual consensus forecast errors from the cross-sectional standard deviations i.e. from the degree of consensus among individual forecaster. The conclusion, which emerged from empirical investigation, was that, the forecaster's variability played a limited role in anticipating the reliability of the consensus forecasts. Thus, the methodology adopted by them was a combination of qualitative and quantitative forecasting methods.

In the same year Croushove and Stark, (2001),[18] made an attempt to describe the reasons for the construction of real time data set. They described the importance of real time data set for macro-economists, explained how data were assembled and showed the extent to which some data revisions were potentially large enough to matter for forecasting. The empirical exercise worked out by them suggested that, when evaluated over very long periods, forecast error statistics were not sensitive to the distinction between real time data and latest available data even though forecasts for isolated periods could diverge.

Mishra, (2005)[19], observed that, time series data often exhibit differential trends in different sub-periods, when examined either as a function of time or as a function of one or more determinants. In such cases, a large forecast error is generated, if attempt is made to forecast the variable using pooled data for the entire time period. Test of Structural stability of functions in different sub-periods and addressing it while forecasting becomes a necessary condition in such situations. Structural stability is often examined with Chow's test and if instability is observed in two or more periods then the latest period data is used for forecasting. However, using this method causes loss of degrees of freedom for the researcher. Hence, dummy variable as an alternative method is suggested by the author to address the differences in the sub-periods and forecast the values of the variable without any loss of degrees of freedom

In Indian context, the Planning Commission, to forecast macroeconomic variables, has used the following methods.

During Eighth Plan[20], Planning Commission had used the mathematical and quantitative model like the Leontief's input-output model, which detailed out the precise relationship between the output of an industry and inputs drawn from other industries. It became a powerful instrument in determining the economic inter-relationship between different sectors of production. Input output tables were used in the projection of long term economic growth scenario and also for working out sectoral output. The input output table used in Eighth Plan yielded an input co-efficient matrix, in which inputs used in the industry were expressed as quantities per unit of output for that industry. The input co-efficient matrix for the terminal year of the plan was projected from the co-efficient matrix of the base year. The core model brought forth the interaction between a set of final demand elements and the input-output matrix. Once the final demand components were worked out the consistent production level could also be estimated, which would enable not only the final demands to be met but also the needs of industrial consumption as inputs. The intermediate demands for each sector was obtained through the inter-relationship among different sectors using input-output co-efficient, whereas the final demand for each sector was determined separately in respect of private consumption, public consumption, gross fixed investment, change in stocks and exports.

During the Tenth five-year Plan (2002-2007)[21] an exhaustive exercise has been carried out on the forecast of labour force participation. Projections of labour force for this Plan has been estimated on the basis of age specific and sex specific study of labour force participation rates (LFPR). It has been observed by the expert group that participation in labour force varies across age groups as well as over time for specific age group. The direction of change depends on the benefits perceived by the individual from devoting time to an economically productive activity than other pursuits. A crucial factor in the choice between joining /remaining in the labour force or out of it, is the availability of social security in some form. The most recent years for which LFPRs were available by age groups were 1999-2000. Variations in LFPRs over the past years were not uniform across the age group; there was a steeper decline in LFPR in younger age group. LFPRs had been fluctuating in the case of older age groups. In this background, the LFPRs for 2001-02 and 2006-07 have been projected by using the past trend. Age group wise labour force is obtained by multiplying the LFPRs of the respective age groups with the population of those age groups. Thus, growth rate of the labour force is determined by the age structure of the population and partly by age and sex specific LFPRs.

Conclusion

Thus, it is observed that researchers have used several econometric as well as time series models for forecasting economic variables. Comparisons have also been made with respect to forecast errors, to identify a suitable forecasting technique. In the Indian context forecasts basically have been used in the process of planning and input output model along with regression technique have been used to arrive at the forecasts.

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