



ELSEVIER

International Journal of Forecasting 19 (2003) 95–110

international journal
of forecasting

www.elsevier.com/locate/ijforecast

Forecasts of market shares from VAR and BVAR models: a comparison of their accuracy

Francisco Fernando Ribeiro Ramos

Faculty of Economics, University of Porto, 4200 Porto, Portugal

Abstract

This paper develops a Bayesian vector autoregressive model (BVAR) for the leader of the Portuguese car market to forecast the market share. The model includes five marketing decision variables. The Bayesian prior is selected on the basis of the accuracy of the out-of-sample forecasts. We find that BVAR models generally produce more accurate forecasts. The out-of-sample accuracy of the BVAR forecasts is also compared with that of forecasts from an unrestricted VAR model and of benchmark forecasts produced from three univariate models. Additionally, competitive dynamics are revealed through variance decompositions and impulse response analyses.

© 2002 International Institute of Forecasters. Published by Elsevier Science B.V. All rights reserved.

Keywords: Automobile market; BVAR models; Forecast accuracy; Impulse response analysis; Marketing decision variables; Variance decomposition; VAR models

1. Introduction

Multiple time series models have been proposed, for some time, as alternatives to structural econometric models in economic forecasting applications. One such class of multiple time series models, which has received much attention recently, is the class of Vector Autoregressive (VAR) models. VAR models constitute a special case of the more general class of Vector Autoregressive Moving Average (VARMA) models. Although VAR models have been used primarily for macroeconomic models, they offer an interesting alternative to either structural econometric, univariate (e.g., Box–Jenkins/ARIMA or exponential smoothing) models, or multivariate (e.g., VARMA) models for problems in which simultaneous forecasts are required for a collection of

related microeconomic variables, such as industry and firm sales forecasting.

The use of VAR models for economic forecasting was proposed by Sims (1980), motivated partly by questions related to the validity of the way in which economic theory is used to provide a priori justification for the inclusion of a restricted subset of variables in the ‘structural’ specification of each dependent variable.¹ Sims (1980) questions the use of the so-called ‘exclusionary and identification restrictions’. Such time series models have the appealing property that, in order to forecast the endogenous variables in the system, the modeller is not required to provide forecasts of exogenous

¹In the Marketing field these arguments are ‘mutatis mutandis’ also valid. The lack of a generally accepted theory about aggregate market response and marketing mix competition means that there is little a priori reason to support or reject any of a number of plausible model specifications.

E-mail address: framos@fep.up.pt (F.F. Ribeiro Ramos).

explanatory variables; the explanatory variables in an econometric model are usually no less difficult to forecast than the dependent variables. In addition, the time series models are less costly to construct and to estimate. This does not imply, however, that VAR models necessarily offer a parsimonious representation for a multivariate process. While it is true that any stationary and invertible VARMA process has an equivalent representation as a VAR process of an eventual infinite order (see, for example, Fuller, 1976), generally the VAR representation will not be as parsimonious as the corresponding VARMA representation, which includes lags on the error terms as well as on the variables themselves. Despite this lack of parsimony, and the additional uncertainty imposed by the use of a finite-order VAR model as an approximation to the infinite-order VAR representation, VAR models are of interest for practical forecasting applications because of the relative simplicity of their model identification and parameter estimation procedures, and superior performance, compared with those associated with structural and VARMA models.² Brodie and De Kluyver (1987) have reported empirical results in which simple 'naïve' market share models (linear extrapolations of past market share values) have produced forecasts as accurate as those derived from structural econometric market share models. Furthermore, the same paper shows that using lagged market share often gives better results than an econometric model, which incorporates marketing mix variables. Indeed, Danaher and Brodie (1992) provided a criterion which determines whether it is advantageous to use marketing mix information for forecasting market shares.

The number of parameters to be estimated may be very large in VAR models, particularly in relation to the amount of data that is typically available for business forecasting applications. This lack of par-

simony may present serious problems³ when the model is used in a forecasting application. Thus, the use of VAR models often involves the choice of some method for imposing restrictions on the model parameters: the restrictions help to reduce the number of parameters and (or) improve their estimation. One such method, proposed by Litterman (1980), utilises the imposition of stochastic constraints, representing prior information, on the coefficients of the vector autoregression. The resulting models are known as Bayesian Vector Autoregressive (BVAR) models.

In the Marketing literature, applications of multiple time series models (Transfer Functions, Intervention and VARMA models) include Aaker, Carman and Jacobson (1982), Adams and Moriarty (1981), Ashley, Granger and Schmalensee (1980), Bass and Pilon (1980), Bhattacharyya (1982), Dekimpe and Hanssens (1995), Franses (1991), Geurts and Whitlark (1992), Grubb (1992), Hanssens (1980a,b), Heyse and Wei (1985), Heuts and Bronckers (1988), Jacobson and Nicosia (1981), Krishnamurthi, Narayan and Raj (1986), Kumar, Leone, and Gaskins (1995), Leone (1983, 1987), Lui (1987), Moriarty and Salamon (1980), Moriarty (1985), Sturgess and Wheale (1985), Takada and Bass (1988), Umashankar and Ledolter (1983).

In this paper, we develop a BVAR for the leader of the Portuguese car market for the period 1988:1 throughout 1993:6 using monthly data. The rationale for the choice of a multiple time series technique is two-fold. Structural models of market share, as surveyed in Cooper and Nakanishi (1988), tend to be based on a number of generalisations about the effectiveness and relative importance of advertising, price, and other elements of the mix, with little emphasis being placed on the correct determination of exogenous assumptions and on the appropriate dynamic model specification. Secondly, and pre-

²Very few VARMA analyses of higher-dimensional time series (e.g., models with more than four series) are reported in the literature. The wider class of vector ARMA models were not considered because there was little evidence of moving average components and because both the identification and estimation of such models are relatively complicated. For a recent summary of the specification of VARMA models, see Tiao and Tsay (1989).

³Apart from the multicollinearity between the different lagged variables leading to imprecise coefficient estimates, the large number of parameters leads to a good within-sample fit but poor forecasting accuracy because, according to Litterman (1986a, p. 2), "parameters fit not only the systematic relationships ... but also the random variation".

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات