



LESSONS LEARNED

Reflections from 25 Years as a Forecasting Consultant

Antonio García-Ferrer

PREVIEW

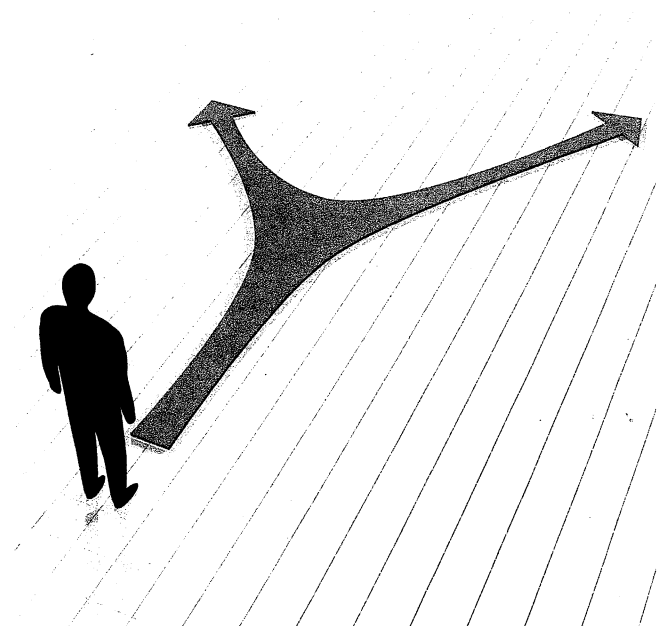
Antonio presents a contrasting pair of studies performed during his consulting career, illustrating the conditions that distinguish a successful project outcome from a failure. He offers provocative advice for implementation and management of forecasting projects.

INTRODUCTION

My work as an independent forecasting consultant began in 1980. I use the word *independent* here to emphasize that my consulting activity was done my way; that is, choices and judgments made were my own. Although I had not anticipated it, my consulting experiences made meaningful contributions to my research, a large portion of which has dealt with issues that I discovered through my consulting activities. Access to fresh data, either raw or conveniently disguised, from the companies I worked with proved to be a blessing in testing theories and implementing “controlled” experiments. I feel that I have had the best of both worlds, and I have enjoyed both worlds enormously.

WHY I BECAME A FORECASTER

In college I was trained as an economist and given some background in quantitative analysis and modeling. At a time when punch cards were still in use – at the beginning of the computer revolution – I



was lucky enough to be a research assistant on the first econometric model built for the Spanish economy (HISPA I). In that era, considerable emphasis was placed on theories (as opposed to empirical evidence) in guiding the evaluation of econometric models.

*Those who can, do;
those who can't, forecast.*

Consequently, a large number of econometricians viewed the forecasting problem as one of secondary importance. Their primary interest was to concentrate on understanding the economy. We were secure in the belief that good forecasts would follow automatically from good descriptions of the economy. Indeed, we often heard the saying, “Those who can, do; those who can’t, forecast.”



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When I began working as a forecasting consultant, my attitude changed. I felt like a physician's assistant who could only confirm a patient's fever, but not identify the causes and likely progress of the malady. I searched for an alternative approach. In this respect, I was intrigued by the well-known bone of contention between Milton Friedman and David Hendry regarding the monetary history of the United States. A major issue was that of simplicity vs. complexity in model building and forecasting (Friedman & Schwartz, 1991). This dispute dramatically illustrated how misleading the forecasts of complex econometric models can be, even for those models that satisfied all standard statistical tests. Some years later I published a paper that corroborated this finding (García-Ferrer & Novales, 1997).

In 1979 I met Gwilym Jenkins (of Box and Jenkins) while I was attending a time-series (ARIMA) course he was teaching throughout Europe. Later I met George Box and Georg Tiao in their courses on multiple time series (MTS). Although the technical level of the MTS approach was more demanding than the univariate ARIMA, the basic message remained unchanged. Model building and forecasting are intimately connected: the test of a model should include its forecasting ability.

In this regard, two related issues attracted my attention: first, the need to become more serious about data – describing them effectively, finding new and unusual facts, and developing explanations for them – and second, the need to treat *a priori*, internal or external information in a systematic way.

The importance of incorporating *a priori* information sparked my interest in the Bayesian approach to forecasting. I was inspired by the work of Arnold Zellner, whom I met during my sojourn at the University of Chicago's Graduate School of Business in 1984-85. Zellner postulated that good forecasting performance is a necessary condition for granting credence to any given model. This was a pragmatic observation for an aspiring forecasting consultant: forecasts – rather than models – are the basic objects of analysis.

KEY POINTS

- An effective forecasting consultant knows that economic data are frequently subject to large, intermittent, and unanticipated shocks. When you begin a consulting job, be sure that your methodology is capable of dealing with such eventualities.
- My forecasting activity has been inextricably linked to the building of statistical/econometric models. My experience is that these models are the only tools that allow the forecaster to assess the uncertainty associated with a forecasting model. Unless you have hundreds or thousands of series, I do not advise using *automatic* software devices. Detailed analysis of individual series always pays off.
- While client size, volume, and ownership structure are not significant factors in determining how a company responds to consulting recommendations, high educational level and diversity among decision makers have been crucial to a favorable consulting relationship. Gaining acceptance of your forecasts is easier with well-educated managers who understand the purpose for which the forecast is intended.
- Other factors that help ensure consulting success include total freedom for the consultant to design the study and close interaction with the main departments involved in decision making.
- Remember that accepting second-rate consulting fees is a bad policy. You will easily be considered a second-rate consultant.

Other substantial influences on my work came from noneconomists in the control engineering area such as Peter C. Young, whose unobserved component models changed my views on the interpretation of key economic concepts such as trend, cycle, and seasonality. Although these fundamental time-series concepts are easy to understand, they are rather difficult to define objectively since, by definition, these components are unobservable. Given the almost infinite number of

The closer you are to a problem, the more likely you are to develop a good solution.

alternative combinations available, it is not surprising that much of the empirical debate on this matter has created a Tower of Babel, where any outcome becomes dependent on the particular decomposition method used. So when forecasting is itself the goal, then a *subjective* view (based on forecasting accuracy) has proved to be a fruitful way to narrow the alternatives.

MY RECORD AS A FORECASTING CONSULTANT

Anybody expecting to be an effective forecasting consultant must know that economic data are frequently subject to large, intermittent, and unanticipated shocks. Some of these have their origins in new legislation, economic policy, or political turmoil. As disruptions work their way from the macroeconomy to the company level, they may become magnified by the organization's internal problems. When you start a consulting job, you need to be sure that your chosen methodology is capable of dealing with such

eventualities. The closer you are to a problem, the more likely you are to develop a good solution.

Companies

In Table 1, I present a summary of my lifetime of consulting activities. The list of institutions and businesses includes three university research departments, four private companies, and five public/private companies trading in utility markets. I have had to analyze agricultural and dairy products, transportation networks, population and pension plans, electricity demand and telephone calls, road accidents and more.

Data Characteristics

The most important ingredient of my consulting activity has been a good database. In general, micro (firm) data are a blessing:

1. They are "fresh" and offer reliable information, if properly accounted for. In contrast, macroeconomic data are overused and abused, as is hilariously reported in Karni and Shapiro (1980).
2. They are promptly updated, allowing timely checking of forecast accuracy.

Table 1. Main Forecasting Consulting Activities

DATES	COMPANY	ACTIVITY
1970-1971	International Wool Secretariat / Barcelona, Spain	Wool market in Spain
1973-1974	Spanish Planning & Development Agency / Madrid, Spain	Road transportation network
1975-1978	Giannini Foundation / U.C. Berkeley, USA	Simulation models for agricultural products in the San Joaquin Valley
1985-1997	BMW Spain / Madrid)	Marketing and car sales forecasts
1988-1991	FEDEA / Madrid	Population forecasts and effects on pension plans
1990-1992	National Electrical Network / Red Eléctrica, Madrid	Electricity demand and load curves forecasts
1991-1992	Spanish Telephone / CTN, Madrid	Calls and revenues forecasts
1991-1992	Canal de Isabel II / CYII, Madrid	Water demand forecasts for the Madrid region
1991-1992	Madrid Transportation Network / CT, Madrid	Estimation & forecasting of price elasticities in public transport
1993-2005	ERISTE monthly economic report / UAM, UC, Madrid	Founder & editor of the macroeconomic monthly bulletin forecasts
1996-2000	MILFORD Food / Madrid	Dairy product forecasts
2003-2005	Spanish Traffic Agency / DGT, Madrid	Road accident forecasts
2005-2006	Leaseplan / Madrid	Retail value of cars under leasing contracts

3. Company data are almost ideal for revealing unusual facts.
4. They are suitable for *pseudo-controlled* experiments in certain type of products. These experiments allow us to make causal inferences in complex situations where experimental control is not possible. Basically, the idea is to compare two groups that share all characteristics but the one that we are trying to test.
5. Much company-level data is monthly, which allows for analysis of trend, seasonality and (possibly) cyclical behavior. Obtaining these components may be critical if someone is interested in comparing the company's present situation with the one corresponding to the general business cycle.

Methodologies

My forecasting activity has been inextricably linked to the building of statistical/econometric models. My experience is that these models are the only tools that allow the forecaster to assess the *uncertainty* associated with a forecasting model. I endorse most of Chris Chatfield's recommendations in his earlier *Foresight* article (Chatfield, 2007), but with the qualification that I have made more use of unobserved component (UC) and ARIMA models than of exponential smoothing.

My experience with state-space unobserved component models has been quite rewarding, although I agree with Chatfield that we need more widely available software. A recent article on the advantages of new UC algorithms, including fast computational speed, avoidance of some numerical problems, and automatic model identification, is provided by Bujosa et al. (2007).

A basic issue concerns the choice between univariate and multivariate models. *Univariate* forecasting models (UM) are based solely on the past values of the time series to be forecast, while *multivariate* models (MM) exploit cross-variable correlations. Although univariate models (exponential smoothing, ARIMA, UC) may seem simplistic, they are often worth trying, especially as a starting point and benchmark for the development of the more complicated multivariate models.

Because they exploit more information, MMs have the potential to produce forecast improvements relative to UMs. In practice, however, this is not always the case. There are many practical situations where deadlines must be met, and enlarging the information sets is either impossible or prohibitively costly. So, in deciding between UM and MM, you must weigh if the gains of MM (potential forecast improvements) overcome the costs in terms of time, effort, and money. My experience is that you will encounter diminishing returns to forecast accuracy by making your model more complex.

Regardless of which particular forecasting method you use, do not undervalue the power of graphics. Graphics are an extremely useful tool, not only at the beginning of your analysis but in the final stages as well. Most managers do not bother to understand the technicalities of your procedure, but there is no doubt they identify and recognize the figures and the information that a good graphic conveys.

Management Structure

I have experienced various combinations of client size, volume, and ownership structure, and have not found these variables to be significant in how the company responded to consulting recommendations. However, a *high educational level* within the management team has been crucial. The education level shapes the firm's attitude toward decentralization and diversity. A decentralized company permits diffusion of decision making through the system, but this is a meaningless virtue if all the people in power are alike. We also need diversity, which facilitates decision making based upon analysis rather than influence, authority, and group allegiance. Diverse decision makers know precisely what they are looking for, and you provide the technical expertise that they may lack.

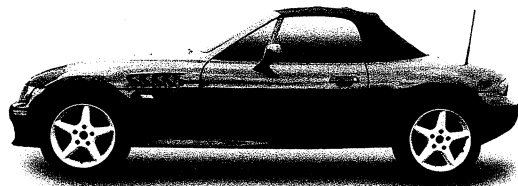
On the contrary, when the educational level in the management team is low and the company lacks an established *enterprise culture*, decisions tend to be concentrated in the CEO's office; this introduces

personal considerations and makes it more difficult to assess your contribution as a consultant.

TWO CONTRASTING CASES

BMW Spain (1985-1997)

BMW Spain was established in the mid-1980s to replace the direct-import process. It enjoyed considerable autonomy in the decision-making process, reporting



only to BMW AG in Munich, as did most of BMW's European branches. At the start, Spain lacked a consolidated dealer network, and customer complaints about service were considerable. During 1980-1985, BMW sales in Spain stagnated at around 3,000 cars per year. The company now wished to create a nationwide dealer network. Note that the BMW fleet consisted of three basic car models (the Series 3, 5, and 7) as well as several motorbikes.

Here was the mission and the consultants' approach to solutions.

1. *Set targets for individual dealer annual sales.* We accomplished this by building econometric models of *hedonic prices* (see Griliches, 1968 and Rosen, 1974). This procedure helps to determine potential sales targets as a function of certain characteristics of the population and geographical region. Dealers that systematically stayed above their potential targets were rewarded.

2. *Produce forecasts of monthly and annual car sales for different market segments: total car sales, import car sales, domestic car sales, and BMW sales.* For these we developed time-series (i.e., UM) models. Disaggregating by different segments and car models produced considerable forecasting improvement over the aggregated figures (García-Ferrer et al., 1997).

Since disaggregate information may not be available for all variables in MM models, this is another reason why UM models may be preferred to MMs.

3. *Evaluate alternative marketing strategies and measure the effects of advertising campaigns.* We first decided where to advertise (radio, TV, newspapers, magazines, etc.) using survey research among BMW customers. Later, we evaluated each advertising campaign using our monthly UM with intervention analysis.

4. *Write a forecast monthly report for discussion at the BMW Spain board meeting.* At this meeting:

- Forecasts were discussed and revised.
- Initial targets were also revised.
- Advertising was tested and its effectiveness challenged.
- The success of the dealers' targets was assessed.

Two features of my job proved to be key:

- total freedom in designing my activity and proposing new lines of research
- close interaction with the main departments involved in decision making: marketing, sales, finance, and dealers

The BMW experience was the kind of relationship that every forecasting consultant dreams of. Because of the project's long duration, the consulting team was certain that its forecasts were beating the internal "benchmark" as the result of superior skill, not due to sheer luck. To be able to make such an assertion, one needs many years – if not decades – of data. When I completed my assignment for BMW in 1997, BMW's share of the total Spanish car market had increased from 0.5% to 2.6%, and total sales had grown at a 36.5% annual average growth rate. A key figure in this achievement was BMW Spain's first president, the late Oscar Ozaeta; I was fortunate to share and learn from his considerable knowledge of the car market.

Milford (1996-2000)

Milford is a manufacturer of dairy products, a family-



owned company that was established in the early 1960s and experienced a quick and successful transition from first- to second-generation management. In 2000, the firm employed 450 workers and its total annual sales were around U.S. \$280 millions. A large percentage of sales was concentrated on fresh and dry cheese for the domestic market. This market is characterized by small annual growth variation ($\approx \pm 1\text{-}2\%$) with low customer discrimination among different brands. During 1995-1998, Milford cheese sales in Spain stagnated, and the company looked for external advice to completely revamp its production and marketing activities.

The main objectives of my involvement were:

1. Creating an executive board (EB) to discuss principal activities and budgeting. All members of the EB (with the exception of the company's CEO) were recruited outside the firm to assure independence in the decision-making process.
2. Performing quality-control experiments on the cheese production chain.
3. Collecting segmented sales data to create a database for budgeting and forecasting purposes.
4. Planning and developing new lines of production that would allow greater growth in sales and income. A natural by-product was the creation of a marketing department.
5. Establishing a well-defined logistics plan that allowed efficient delivery of goods while saving on transportation costs.

This ambitious strategy encountered internal difficulties as a consequence of two important factors:

a low educational level in the management team and the lack of an established enterprise culture within the company. All decisions were entirely dependent on the CEO's personal considerations, and most strategic moves were either deferred or eliminated. Nevertheless, I enjoyed considerable freedom in collecting information and was able to build a sound, monthly database.

In 1999, I produced my first set of forecasts, for year 2000. These are shown in the sixth row of Table 2, together with the historical growth rates. My forecasts showed a renewal of growth in sales volume, after two years of declines, and an acceleration of growth in sales revenue.

Then the marketing department (MD) made its "independent" 2000 forecasts, which are shown in the last row of Table 2. It presented these to the Executive Board in a public press conference.

Table 2. Forecasts vs. Marketing Department Targets

YEARS	TOTAL SALES/KGS.	TOTAL SALES/\$
1995	-5.4	-3.2
1996	-1.9	1.1
1997	1.5	-0.04
1998	-0.6	3.0
1999	-0.6	3.0
2000 (F)	1.8	4.3
MD forecasts	36.5	43.5

Figures are annual growth rates.

I was caught by surprise and expressed my indignation in the form of a resignation the next day. I do not think the resignation was a shock to the company. The fact that the year 2000 results turned out to be very close to my forecasts (1.6% and 4.3%, respectively) did not relieve my sense of frustration. But I did include a frustration premium in the consulting fee.

ADVICE FOR THE FORECASTING CONSULTANT

Although you might find the idea difficult to accept – after all, it runs counter to our basic intuitions about intelligence and business – many people believe that

the value of expertise is highly overrated. Recently, some authors have speculated that there is no real evidence that one becomes an expert in something as broad as “decision making,” or “policy,” or “strategy” (Surowiecki, 2004). To make things worse, even leading figures in the field have found that “expertise and accuracy are unrelated” (Armstrong, 1980).

These assertions are not borne out by my own experience. Your advice as a forecaster can be an invaluable tool in the firm’s decision making, particularly if you abandon the idea that there is a true model from which optimal forecasts can be found. Instead, think along the lines wisely stated by George Box: “All models are wrong but some are useful.” In your case, “usefulness” can always be tested against the firm’s internal forecasts (often nonexistent) and targets, or some alternatives, including “naïve” or “benchmark” models. In any case, you may always be sure that forecasting an uncertain future and deciding the best course of action is a risky business.

I will concentrate my final recommendations on four areas: data analysis, methodologies and software, internal organization of the firm, and some practical and personal advice.

Data Analysis is the more important aspect of your work.

- Remember that data can be your best ally but also your worst enemy.
- Check the quality of existing data by finding data inconsistencies or creating a new database.
- Draw a clear time-plot and look for:
 - changes in trend or seasonality
 - discontinuities and other interesting effects
 - unusual observations
 - missing observations.

If available, always use disaggregated data. This practice not only provides better forecasts but also

avoids some equivocal implications for policy (García-Ferrer et al., 2006).

Methodologies and Software

In both areas, your options are plentiful. Once you understand the problem at hand and the expected output that your employer demands, make your choices while keeping a few points in mind:

- Use those methods that are well suited for the characteristics of your data.
- When comparisons are fair, average differences between sensible methods are quite small. Over-enthusiastic claims on large differences should be treated with suspicion.
- *Combining* forecasts always reaps rewards.
- The choice of the metric to measure forecasting accuracy is crucial. To compare accuracy, the metric must be *scale-independent* (Hyndman & Koehler, 2006).
- Unless you have hundreds or thousands of series, I do not advise using *automatic* software devices. Detailed analysis of individual series always pays off.
- Given the large number of good alternatives, there is enough evidence so far to stay away from EXCEL as forecasting software.

Internal Organization of the Firm

No matter how well informed and sophisticated your report might be, your advice and predictions should be pooled with those of others to get the most out of them. Remember:

- In many countries, the majority of firms and organizations simply do not forecast. At most, they confuse forecasts with *targets*. Getting their initial forecasts will always be a hard objective to obtain.
- Unless these companies are already in a great deal of difficulty, they will not change their bad habits.

A successful forecasting program is always a progressive process, beginning simply but possibly ending in an elaborate system that includes other outside consultants.

- In these circumstances, I have witnessed how fiercely people will defend their territory when their jobs are challenged. Remember that managers are always anxious to protect their employment.
- Gaining acceptance of your forecasts is easier with well-educated managers who understand the purpose for which the forecast is intended.
- A successful forecasting program is always a progressive process, beginning simply but possibly ending in an elaborate system that includes other outside consultants. In this regard, the longer the duration of your contract, the higher the probability of a successful consulting experience.

Some Personal Advice

- Spend as much as you or your institution can in order to get a good knowledge of the field. It's always worth the price in hours and dollars.
- Be sure you have the technical expertise to understand how to carry out the method that you are proposing.
- I did not forecast for a living. That gave me a great deal of freedom, but I also had some misunderstanding about market fees. Remember that accepting second-rate market fees is a bad policy. You will easily be considered a second-rate consultant.
- Don't work for friends and relatives. Chances are that you'll end up losing your friends and alienating your relatives, while wasting your time and money.

Good luck in your endeavors!

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