New Research in Forecasting

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All institutions in Georgia are changing. Decision-makers in Government agencies and private organizations need the best available data and analyses to meet the challenges of changing times. Evidence-based forecasting can help officials to predict the likely outcomes of their decisions. This paper reports on work being done by The Georgia Forecast™ and The University of Georgia Forecasting Center to identify and apply modern methods to Georgia's most pressing issues. These methods include statistical techniques, such as time series and regression, and judgmental adjustments, such as Delphi, surveys of consumers and producers, and scenario scripting. One recent application studied in this research project, forecasting tourism in Georgia, is an example of how modern methods may improve decision-making by those who make public policy, allocate resources, and make business decisions.

Statistical forecasting techniques assume that the near future will look substantially like the recent past. We can, therefore, use data from recent history to make predictions about the near future. The longer the horizon, the weaker the assumption. Two general classes of statistical forecasts are (1) Causal and (2) Non-Causal. The most common causal model is regression: the variable to be determined (Y) is related to one or more predictor variables (X_i). For example, the quantity demanded of a good (Q_d) may be estimated from the price of that good (P) and other factors, such as income, relative prices of substitute and complementary goods, weather, etc. Time series models are non-causal. We may not know why a variable of interest rises or falls, but we can detect patterns from the recent past, such as trend, seasonality, and cycles.

Judgmental methods assume some degree of knowledge that may not be reflected in the statistics. These may include, among others, a Delphi panel of experts, survey of consumers and producers, game theory, and scenario scripting.

Because of the high degree of uncertainty in the Georgian economic, political, and social environment, the use of one model is unlikely to yield reliable forecasts. Therefore, The Georgia Forecast™ and The University of Georgia Forecasting Center use a combination of methods and continually evaluate the performance of their forecasts. This paper uses the case of forecasting tourism to demonstrate these techniques.

ახალი კვლევა პროგნოზირების სფეროში

ედუარდ რაუპი
ბათუმის საერთაშორისო უნივერსიტეტი
ნატო აფხაზავა
საქართველოს უნივერსიტეტი

ყველა ორგანო გარკვეულ ცვლილებას განიცდის საქართველოში. საჯარო და კერძო სექტორის პასუხისმგებელ პირებს სჭირდებათ საუკეთესოდ დამუშავებული და გაანალიზებული ინფორმაცია, რომ დროის გამოწვევას შესაბამისად უპასუხონ. ფაქტებზე დაფუძნებული პროგნოზი საშუალებას მისცემს პასუხისმგებელ პირებს, მათ მიერ მიღებული გადაწყვეტილებების სავარაუდო შედეგებზე წინასწარ იქონიონ წარმოდგენა. ნაშრომი ეხება The Georgia Forecast™ და საქართველოს უნივერსიტეტის პროგნოზირების ცენტრის მიერ განხორციელებულ სამუშაოს, საქართველოში, ამჟამად აქტუალურ საკითხებზე, მეთოდების განსაზღვრისა და გამოყენების მიმართულებით. მეთოდებში იგულისხმება სტატისტიკური მექანიზმები და პროფესიული პროგნოზის რეგულირება. კვლევით პროექტში, შესწავლის ერთ-ერთი უახლესი მიმართულება არის ტურიზმის პროგნოზირება და ანალიზი საქართველოში. აღნიშნული სფერო საუკეთესო მაგალითია, იმისა თუ როგორ შეიძლება თანამედროვე მეთოდების გამოყენებამ გაზარდოს მიღებული გადაწყვეტილებების სისწორის ალბათობა. სტატისტიკური პროგნოზირების მიხედვით უახლოესი მომავალი ფაქტიურად იგივე სურათს გვაძლევს, რა სურათიც გვქონდა უახლოეს წარსულში. ძველ ინფორმაციაზე დაყრდნობით შესაძლებელია გარკვეული სამომავლო გათვლების გაკეთება. არსებობს სტატისტიკური პროგნოზირების 2 ზოგადი კლასი: 1) მიზეზობრივი და 2) არა მიზეზობრივი. ყველაზე გავრცელებული მიზეზობრივი მოდელია რეგრესი, ხოლო არა მიზეზობრივი — დროის ღერძის მოდელი. პროფესიული პროგნოზირების მეთოდები სტატისტიკის ცოდნის გარდა სხვა სახის ცოდნასაც მოითხოვს. საქართველოს ეკონომიკაში, პოლიტიკასა და საზოგადოებაში არსებული გაურკვევლობების გამო, მხოლოდ ერთი მოდელის გამოყენება არასაკმარისია ობიექტური პროგნოზირებისთვის. თუმცა The Georgia Forecast™ და საქართველოს უნივერსიტეტის პროგნოზირების ცენტრი რამდენიმე მეთოდს იყენებს და სისტემატურად აფასებს მის მიერ წარმოებულ საქმიანობას. ზემოხსენებული მექანიზმები ნაშრომში განხილულია ტურიზმის სფეროს პროგნოზირების მაგალითზე.

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Makridakis and Hibon (1979) note that, "The ultimate test of any forecast is whether or not it is capable of predicting future events accurately." Statistical forecasting techniques assume that the near future will look substantially like the recent past. We can, therefore, use data from recent history to make predictions about the near future. The longer the horizon, however, the weaker the assumption. Two general classes of statistical forecasts are (1) causal and (2) non-causal. The most common causal model is regression: the variable to be determined (Y) is related to one or more predictor variables (X_i). For example, the quantity demanded of a good (Q_d) may be estimated from the price of that good (P) and other factors, such as income, relative prices of substitute and complementary goods, weather, etc. Time series models are non-causal; we may not know why a variable of interest rises or falls, but we can detect patterns from the recent past, such as trend, seasonality, and cycles.

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Problem

The study on which this paper is based investigated the problem of forecasting under conditions of a high degree of uncertainty (Raupp & Apkhazava, 2009). Specifically, that study aimed to forecast tourism in post-Soviet Georgia, acknowledging the uncertainty caused by a volatile global economy, belligerent domestic opposition, and threat of recurring armed invasion from the Russian Federation.

Background

Forecasting under the best of conditions is characterized by uncertainty. Traditional forecasting methods make a critical assumption, i.e., that conditions in the near future will look very much like conditions in the recent past. All other things being equal, the assumption may be useful for the task of forecasting in the relatively near future, perhaps up to a few years. However, it is seldom the case that all things in the future will look like all things in the past. It is necessary, therefore, to use non-traditional methods to forecast such highly uncertain variables as tourism in post-Soviet Georgia.

Methods

Recognizing the weakness of traditional methods alone in forecasting under conditions of a high degree of uncertainty, Raupp and Apkhazava (2009) used a mix of statistical and judgmental methods. Each of these is described below.

Statistical Methods

Causal models relate the variable to be forecasted to one or more predictor variables. Perhaps the best known is what economists call "the law of demand" and "the law of supply." As the price of a good rises the quantity demanded of that good falls; and as the price of a good rises, the quantity supplied of that good also rises. Each of these is a simple regression model. We know, however, that other factors determine the quantities of a good demanded or supplied, e.g., as income rises the quantity demanded also rises, and as a drought produces lower yields, the quantity supplied falls. These are examples of a multiple regression model, and each asserts a causal relationship.

Non-causal models make no claims that changes in the variable to be forecasted are known to be caused by changes in any other variable. The most common non-causal model is *time series*. In this case, we do not know from the data why the variable changes, but we discern several elements in the series: trend, seasonality, cycles, and unexplained factors. One of the most accurate computer programs available on the market today to deal with time series is ForecastPro (Stellwagen & Goodrich, 2008), which is used extensively by The Georgia Forecast™ and The University of Georgia Forecasting Center.

Judgmental Methods

In seeking the most accurate forecast, it is sometimes helpful to adjust the statistical forecast using one or more judgmental methods. Perhaps the forecaster knows something about the past or the future that may not be reflected in the data.

Analogies include examples of past situations that may be similar in key respects to the situation today. The tourism study used the Bali bombings, Assisi earthquakes, and Kauai hurricane Iniki to gain insights into what happens to tourism after a disaster. The study concluded that tourism falls sharply in the short term but may recover given investments in infrastructure and marketing.

Delphi uses a panel of experts to collect data in areas where clear statistical evidence is not available (Armstrong, 1999). Experts provide their judgments anonymously, receive feedback on what other experts are saying, and have a chance in a second or third round to adjust their estimates.

Surveys are useful to collect data on opinions in the surveyed population. They have been used by The Georgia Forecast™ (Raupp, 2009) since 2007 to calculate a Consumer Confidence Index and a Producer Confidence Index. Surveys are conducted in Gori, Tbilisi, Batumi, and Kutaisi.

Game theory is a powerful tool in decision-making when there are only two or a few actors, e.g., in oligopolies. This method was not used in the tourism study, but it is used by The Georgia Forecast™ in other studies.

Combining Methods

Given results of statistical forecasts and various judgmental methods, the forecaster may decide to combine the forecasts. Combining forecasts is a subject of considerable discussion and research among forecasting professionals (e.g., see Armstrong, 1989). When forecasters adjust statistical fore-

casts by using judgmental factors, the must explain in detail what was done and why, and they must document the process. A set of rules should be established in advance.

The tourism study uses a "6-8-10" rule with respect to its monthly nation-wide confidence survey. There are two classes of subjects (consumers and producers) in each of four cities, resulting in a 2-by-4 matrix of 8 cells. If 6 of the 8 cells are in agreement (either above or below 1.0), then adjust the statistical forecast by 10 percent; if, however, the trend in those 6 cells is opposite of the ratio, make no adjustment, as the results are ambiguous.

Scenario scripting is the final step in creating forecasts under conditions of a high degree of uncertainty. The reality is that a single point forecast is not feasible. We simply do not know what will happen to the global economy. Nor do we know what civil disturbances may break out. And we cannot know the mind of Vladimir Putin. Therefore, if we cannot predict, then we can prepare (see Taleb, 2007).

The tourism study scripted nine scenarios, as shown below. Three basic scenarios are Best Case (B), Middle Case (status quo) (M), and Worst Case (W). Each was analyzed using three forces: Macroeconomic Forces (V_1), Domestic Forces (V_2, and Russian Forces (V_3). An expected value matrix was calculated based on expert judgment. In the Best Case scenario, Georgia could expect a substantial increase in tourism, while in the Worst Case scenario, tourism would essentially vanish.

Figure 1. Summary of scenario scripts.

	Best Case (B)	Middle Case (M)	Worst Case (W)
Macroeconomic Forces (V_1)	B_1 More tourists can afford to travel to Georgia. Improved infrastructure soon.	M_1 Some tourists can afford to travel to Georgia. Improved infrastructure later.	W_1 Few tourists can afford to travel to Georgia. Little work on infrastructure.
Domestic Forces (V_2)	B_2 Tourists are not put off by civil unrest.	M_2 Some tourists are discouraged by civil unrest.	W_2 Most tourists are discouraged by civil unrest.
Russian Forces (V_3)	B_3 Tourists are not afraid of armed conflict.	M_3 Some tourists fear Russian invasion.	W_3 Tourists do not travel to war-torn Georgia.

Results

Figure 2 shows the output of ForecastPro for expenditures in restaurants and hotels (RH).

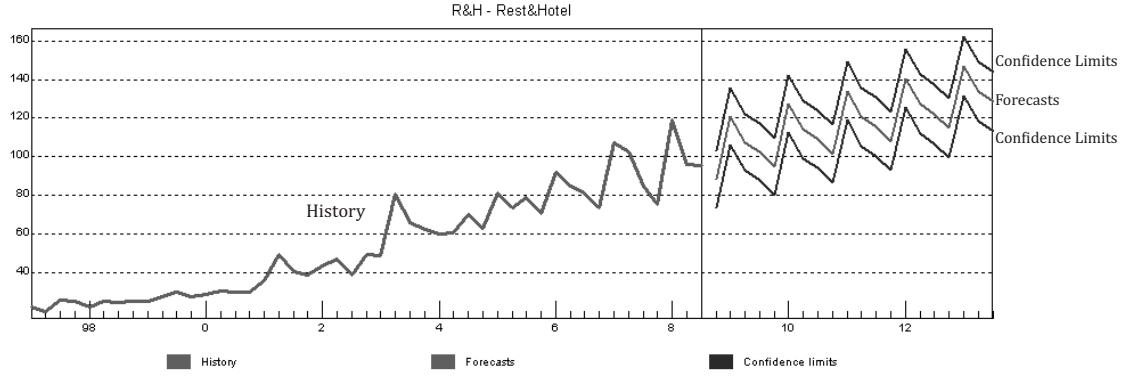
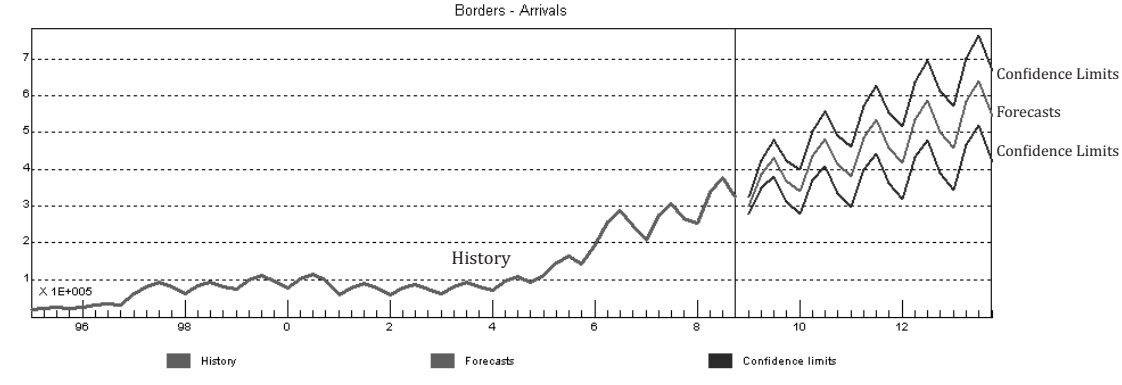


Figure 2. Restaurant and Hotel expenditures, historical and forecasted.

Another estimator for tourism is the number of non-residents at Georgia's borders. The history of this series and a 5-year forecast is shown below. The growth rate exceeds that of RH expenditures.

Figure 3. Non-resident arrivals at Georgia's borders, historical and forecasted.



Alternative scenario forecasts for tourism in Georgia are shown here for 2013.

	Best Case (B)	Middle Case (M)	Worst Case (W)
Expected Value Factor	1.20	1.00	0.07
Statistical Forecast RH (mil GEL)		524	
Adjusted Forecast RH (mil GEL)	891	524	37
Statistical Forecast B (000 persons)		2,226	
Adjusted Forecast B (000 persons)	2,671	2,226	156

Conclusion

The tourism study, as well as the current literature, strongly suggest that judgmental methods may improve the accuracy of forecasts when combined in an orderly way with statistical forecasts. Scenario scripting is an effective way to forecast under conditions of a high degree of uncertainty.

Recommendations for Further Research

Continuing research is needed in the application of forecasting methodologies in the countries of the former Soviet Union.

In light of skepticism regarding the reliability of data provided by governments of nations in transition, more research is needed in verifying the reliability of sources.

Further research is needed in forecasting under the conditions of great uncertainty that prevail in economies affected by unstable relations with near neighbors and internal opposition.

The "Tourist Trauma Trough" should be studied in greater detail in order to understand the depth and duration of periods of lost income in a variety of situations.

More research is needed in combining both methods of forecasting and results from different sources using the same method. Combining statistical and judgmental forecasts, in particular, needs more attention.

Forecasting accuracy in economies and sectors in post-Soviet states needs to be monitored and analyzed over time.

Further research in tourism demand forecasting is needed in nations in transition from authoritarian systems to open societies. Narayan (2003), however, concludes his extensive literature review with the comment that "…the tourism demand literature must be viewed with caution…" (p. 377).

There is an almost complete absence of research in the area of return-on-investment in tourism in the post-Soviet space. This is a most fertile area for further study.

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