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CONSUMER BEHAVIOR MODELS IN THE MOBILE COMMUNICATIONS MARKET

D.M. Rahel

PhD in Economics, Associate Professor of the Department of Economics of the Belarusian State University of Informatics and Radioelectronics

ragel@bsuir.by

D.M. Rahel

In 2000 he graduated from the Faculty of Economics of the Belarusian State University of Informatics and Radioelectronics with a degree in Economic Informatics. In 2016 he graduated from the postgraduate course of the Academy of Management under the President of the Republic of Belarus. In 2018 he defended his PhD thesis. Research interests: data mining in marketing, process modeling, data analysis, statistical forecasting, macroeconomics.

Annotation. This article examines approaches to forecasting consumer behavior in the technology market, taking into account the key factors that describe subscriber behavior. We consider a data set with a basic set of market characteristics and apply several models to generate forecasts for the future. Based on these basic indicators, the model with the best scores is selected, demonstrating optimal performance in terms of solving the stated problems.

Keywords: Data analysis, marketing data, big data, massive data, forecasting, marketing analytics, action analysis, market activity, matrices, mobile communications market, subscribers, scalar values, predictive analytics, market forecast.

Introduction. The original dataset contained subscriber information, which we used to describe and build models of their behavior, including information on tariff changes. In this case, the behavior of a limited group of subscribers was examined across five tariff plans.

Data. In this case, the analysis was conducted using a subscriber behavior dataset containing fields for subscriber identification numbers, traffic volumes, and information about blockings resulting from subscriber payment defaults. The subscriber payment history field is designated as Series1 and represents a dynamic series with timestamps (Figure 1).

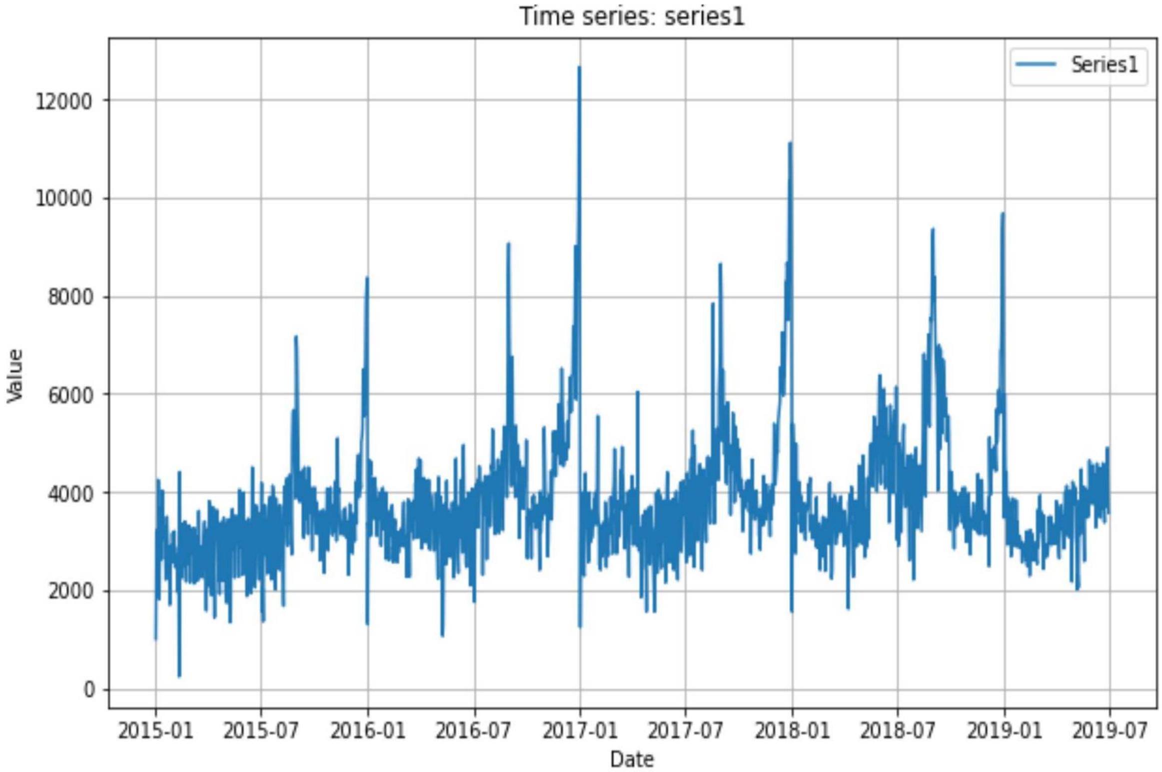

Figure 1. Existing data series for subscriber analysis

Method. To evaluate behavioral models and solve the problem of forecasting payment volumes, various models capable of most accurately predicting subscriber group behavior, taking into account as many formal behavioral characteristics as possible, were considered.

To more accurately select a model, the data series under consideration was decomposed, revealing its key characteristic components – an upward trend, seasonality, and noise (Figure 2).

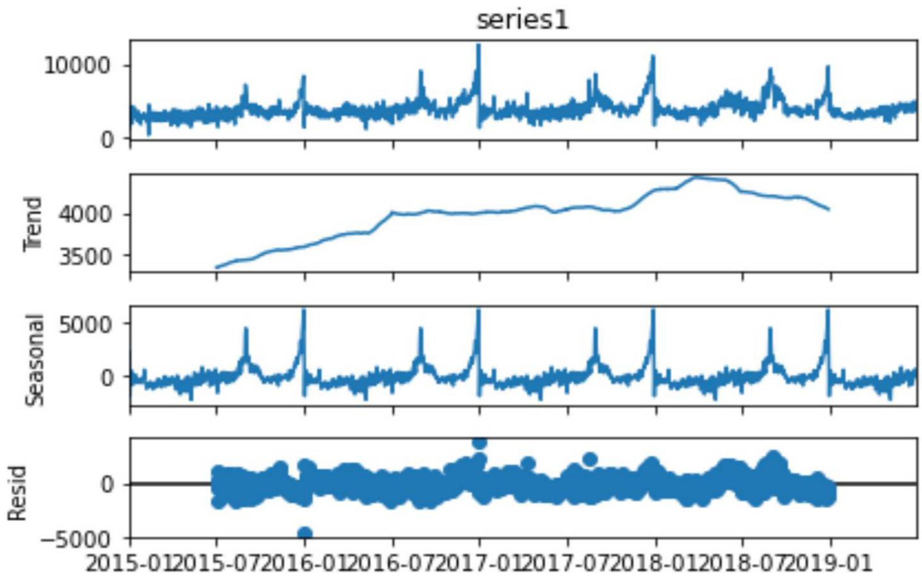

Figure 2. Result of time series decomposition

To assess the stationarity of the existing series, we also assessed stationarity and seasonal patterns in our data series using the autocorrelation function (Figure 3).

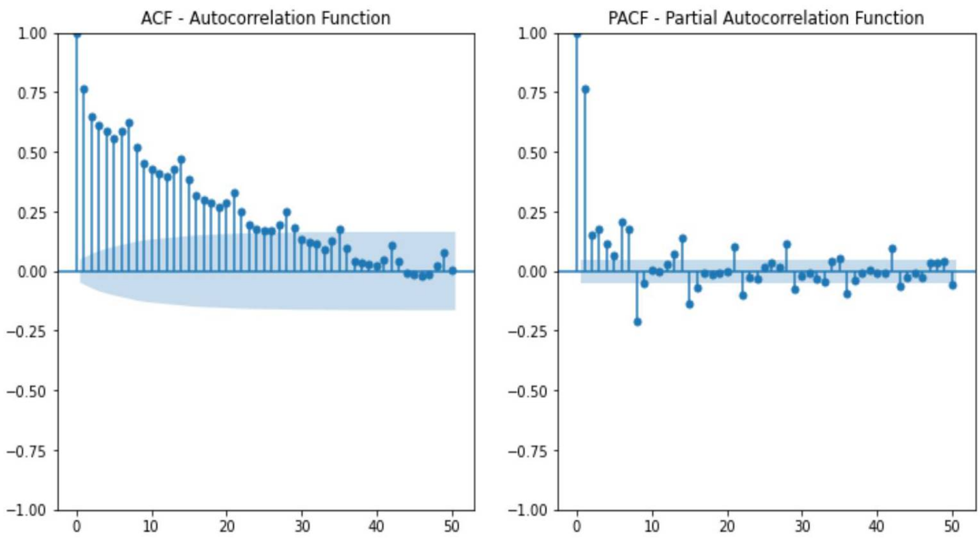

Figure 3. Results of the autocorrelation calculation for our data series

Results. Ultimately, it can be noted that mobile subscriber behavior depends on the service package provided within their tariff. However, tariff changes are generally characterized by positive billing dynamics, indicating that mobile communication costs are not a determining factor for the majority of subscribers. Furthermore, it is important to note the presence of seasonality in mobile communication costs; despite the upward trend in costs, the cycle of communication costs is also quite pronounced, as became evident from the breakdown of the main factors in the data series under consideration.

Based on the analysis, we selected two standard models that best matched the nature of the series under consideration: the Prophet model and the ETS model. These models are more business-focused and therefore take into account seasonality and other potential events that correspond to the characteristics of mobile subscriber consumer behavior (Figure 4).

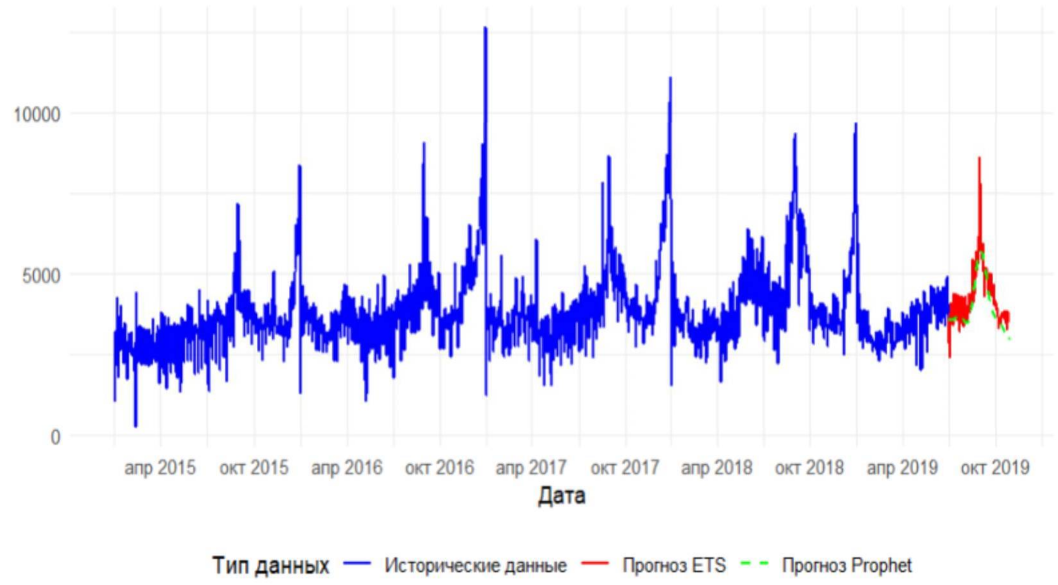

Figure 4. Results of forecasting consumer behavior based on the ETS and Prophet models

The initial data fluctuates significantly (mean value of 3855, with a deviation of 1237). Significant properties of this series include seasonality and nonstationarity, as determined by the Dickey-Fuller test. Five models were tested on a 329-day test set for forecasting. The Prophet model demonstrated the lowest RMSE (1191.5), but the ETS model with STLF seasonal adjustment was selected for the final forecast, as it appears more stable and interpretable in terms of predicting the behavior of the studied subscriber group. On the test data, ETS demonstrated acceptable performance, as evidenced by the baseline estimates:

MAE – 933 units,

MAPE – 22.4%.

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МОДЕЛИ ПОВЕДЕНИЯ ПОТРЕБИТЕЛЕЙ НА РЫНКЕ МОБИЛЬНОЙ СВЯЗИ

Д.М. Рагель

к.э.н., доцент кафедры экономики Белорусского государственного университета информатики и радиоэлектроники

Аннотация. В статье рассматриваются подходы к прогнозированию потребительского поведения на технологическом рынке, с учетом основных факторов, которые описывают поведение абонентов. Рассматривается набор данных с базовым набором характеристик для рынка и применяются несколько моделей для прогнозирования на будущий период времени. На основании базовых показателей выбирается модель с лучшими оценками, которая является оптимальной по результатам с точки зрения решения поставленных задач.

Ключевые слова: Анализ данных, маркетинговые данные, большие данные, массив данных, прогнозирование, маркетинговая аналитика, анализ действий, рыночная активность, матрицы, скалярные значения, рынок мобильной связи, абоненты, прогнозная аналитика, рыночный прогноз.