

Forecast of the Small Wind Turbines Sales with Replacement Purchases and with or without Account of Price Changes

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Abstract : The purpose of the paper is to estimate the US small wind turbines market potential and forecast the small wind turbines sales in the US. The forecasting method is based on the application of the Bass model and the generalized Bass model of innovations diffusion under replacement purchases. In the work an exponential distribution is used for modeling of replacement purchases. Only one parameter of such distribution is determined by average lifetime of small wind turbines. The identification of the model parameters is based on nonlinear regression analysis on the basis of the annual sales statistics which has been published by the American Wind Energy Association (AWEA) since 2001 up to 2012. The estimation of the US average market potential of small wind turbines (for adoption purchases) without account of price changes is 57080 (confidence interval from 49294 to 64866 at $P = 0.95$) under average lifetime of wind turbines 15 years, and 62402 (confidence interval from 54154 to 70648 at $P = 0.95$) under average lifetime of wind turbines 20 years. In the first case the explained variance is 90,7%, while in the second - 91,8%. The effect of the wind turbines price changes on their sales was estimated using generalized Bass model. This required a price forecast. To do this, the polynomial regression function, which is based on the Berkeley Lab statistics, was used. The estimation of the US average market potential of small wind turbines (for adoption purchases) in that case is 42542 (confidence interval from 32863 to 52221 at $P = 0.95$) under average lifetime of wind turbines 15 years, and 47426 (confidence interval from 36092 to 58760 at $P = 0.95$) under average lifetime of wind turbines 20 years. In the first case the explained variance is 95,3%, while in the second -95,3%.

Keywords : bass model, generalized bass model, replacement purchases, sales forecasting of innovations, statistics of sales of small wind turbines in the United States

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