

Exponential Smoothing with additional Seasonal Factor to Forecast Peak Season Demand

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Abstract

Seasonal time series depicts a variety of demand patterns due to the trend and seasonality effects. Short lifecycles and peak demand are the complex characteristics of most seasonal products. This study presents a multiplicative exponential smoothing technique and introduces an additional seasonal parameter in the quest for better peak season forecast. Considering an actual time series of a seasonal product, the study analyzes four possible combinations of additive and multiplicative forms to feature the trend and strong seasonality of the data. The model uses the appropriate combination of additive and multiplicative forms and introduces an additional smoothing parameter to represent the time series pattern. The technique is relatively easy and computationally stable. The test result indicates the model performance is robust and encouraging for researchers and practitioners to exercise customized model in predicting strong seasonal demand.

Keywords

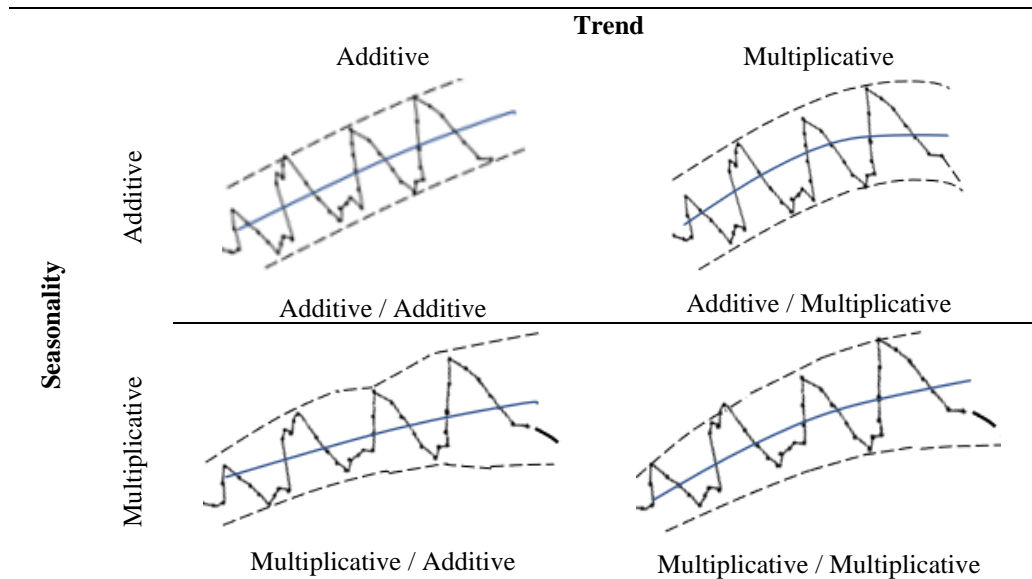
Classical Exponential Smoothing, Additive, Multiplicative, Peak Demand, Seasonal Products

Biographies

Mohammad Rahman is an Associate Professor of Manufacturing and Construction Management Department at the Central Connecticut State University, USA. His research and teaching focused on supply chain strategy, decision making under uncertainty, and lean six sigma processes for quality. His research articles appeared in academic journals. He published book chapters and presented topics in national and international conferences and forums. His funded research projects are sponsored by American Association of University Professors (AAUP), US Department of Transportation (USDOT) and Mississippi Department of Education (MDE). He served as a member in executive board and committees in research centers and international conference forum at various responsibilities. He regularly reviews paper for major journals and conferences.

Appendix

Figure 2. Trend and seasonality in exponential smoothing technique



Selected Time Series

Dataset used in forecasting models is collected from the US census bureau, Department of Commerce, which is the partial demand of women's winter apparel in the US.

Table 1: Demand record of a seasonal product (woolen apparel, 1998 to 2005)

Month	1998	1999	2000	2001	2002	2003	2004	2005
Jan	801,200	771,039	844,005	1,232,589	1,499,544	1,382,481	1,630,893	1,803,997
Feb	506,609	790,062	572,093	1,257,118	849,768	1,325,336	1,512,496	1,546,309
Mar	850,961	852,246	971,594	1,293,980	1,127,911	1,292,599	1,485,483	2,094,937
Apr	1,151,522	888,911	1,100,097	1,205,326	1,168,875	1,380,987	1,559,342	1,901,859
May	1,326,139	1,343,017	1,111,883	1,243,011	1,172,453	1,514,573	1,384,160	1,906,783
Jun	1,784,196	1,193,230	1,603,974	1,270,732	1,449,888	1,682,368	1,725,807	2,315,753
Jul	1,692,825	1,349,451	2,070,043	2,059,496	2,185,608	2,018,939	2,366,774	2,834,571
Aug	2,697,061	2,018,771	3,108,957	3,207,157	3,017,227	2,994,918	3,097,687	3,328,028
Sep	2,362,882	2,166,497	2,744,466	3,356,925	3,920,854	4,337,951	4,823,764	4,102,475
Oct	1,894,332	1,906,160	2,535,864	3,475,341	3,359,162	5,651,788	5,536,149	5,110,310
Nov	1,069,811	1,440,326	1,664,043	2,162,664	2,413,125	2,195,432	3,364,407	3,460,540
Dec	1,007,821	1,007,062	1,349,740	981,247	1,560,131	2,022,672	2,289,976	2,280,498

Sources: U.S. Department of Commerce, Office of Textiles and Apparel.
<http://otexa.ita.doc.gov/scripts/tqmon.exe/catdata>; [Date: 12/11/2018].