Correlation-constrained and sparsity-controlled vector autoregressive model for spatio-temporal wind power forecasting - DTU Orbit (02/12/2018)

**Correlation-constrained and sparsity-controlled vector autoregressive model for spatio-temporal wind power forecasting**

The ever-increasing number of wind farms has brought both challenges and opportunities in the development of wind power forecasting techniques to take advantage of interdependencies between thousands of spatially distributed wind farms, e.g., over a region. In this paper, a Sparsity-Controlled Vector Autoregressive (SC-VAR) model is introduced to obtain sparse model structures in a spatio-temporal wind power forecasting framework by reformulating the original VAR model into a constrained Mixed Integer Non-Linear Programming (MINLP) problem. It allows controlling the sparsity of the coefficient matrices in a direct manner. However, this original SC-VAR is difficult to implement due to its complicated constraints and the lack of guidelines for setting its parameters. To reduce the complexity of this MINLP and to make it possible to incorporate prior expert knowledge to benefit model building and forecasting, the original SC-VAR is modified and a Correlation-Constrained SC-VAR (CCSC-VAR) is proposed based on spatial correlation information about wind farms. Our approach is evaluated based on a case study of very-short-term forecasting for 25 wind farms in Denmark. Comparison is performed with a set of traditional local methods and spatio-temporal methods. The results obtained show the proposed CCSC-VAR has better overall performance than both the original SC-VAR and other benchmark methods, taking into account all evaluation indicators, including sparsity control ability, sparsity, accuracy, and efficiency.

**General information**

State: Accepted/In press  
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy Analytics and Markets, China Agricultural University, China Electric Power Research Institute  
Contributors: Zhao, Y., Ye, L., Pinson, P., Tang, Y.  
Number of pages: 12  
Publication date: 2018  
Peer-reviewed: Yes

**Publication information**

Journal: IEEE Transactions on Power Systems  
ISSN (Print): 0885-8950  
Ratings:  
BFI (2018): BFI-level 2  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 2  
Scopus rating (2017): CiteScore 6.58 SJR 2.742 SNIP 2.662  
Web of Science (2017): Impact factor 5.255  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 2  
Scopus rating (2016): CiteScore 8.17 SJR 3.368 SNIP 3.584  
Web of Science (2016): Impact factor 5.68  
Web of Science (2016): Indexed yes  
BFI (2015): BFI-level 2  
Scopus rating (2015): CiteScore 6.6 SJR 3.315 SNIP 3.386  
Web of Science (2015): Impact factor 3.342  
Web of Science (2015): Indexed yes  
BFI (2014): BFI-level 2  
Scopus rating (2014): CiteScore 5.31 SJR 2.475 SNIP 3.485  
Web of Science (2014): Impact factor 2.814  
Web of Science (2014): Indexed yes  
BFI (2013): BFI-level 2  
Scopus rating (2013): CiteScore 6.33 SJR 2.523 SNIP 4.243  
Web of Science (2013): Impact factor 3.53  
ISI indexed (2013): ISI indexed yes  
Web of Science (2013): Indexed yes  
BFI (2012): BFI-level 2  
Scopus rating (2012): CiteScore 5.84 SJR 1.941 SNIP 3.387  
Web of Science (2012): Impact factor 2.921  
ISI indexed (2012): ISI indexed yes  
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.34 SJR 1.586 SNIP 3.205
Web of Science (2011): Impact factor 2.678
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.708 SNIP 2.759
Web of Science (2010): Impact factor 2.355
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.622 SNIP 2.675
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.309 SNIP 2.45
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.12 SNIP 2.48
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.147 SNIP 2.259
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.41 SNIP 2.482
Scopus rating (2004): SJR 0.938 SNIP 2.807
Scopus rating (2003): SJR 2.078 SNIP 2.607
Scopus rating (2002): SJR 1.404 SNIP 2.284
Scopus rating (2001): SJR 1.553 SNIP 1.847
Scopus rating (2000): SJR 0.515 SNIP 3.179
Scopus rating (1999): SJR 0.475 SNIP 1.644
Original language: English
Keywords: Wind power, Power system operations, Forecasting, Spatial correlation, Sparsity
DOI:s:
10.1109/TPWRS.2018.2794450
Source: PublicationPreSubmission
Source-ID: 142166783
Research output: Research - peer-review > Journal article – Annual report year: 2018