

# Workshop Dynamic Linear Models

University of Zurich, 28-30 June, 2017

Prof. Dr. Harald J. van Heerde, Massey University, New Zealand

heerde@massey.ac.nz

## Workshop overview

This workshop runs from Wednesday 28 June (around 1pm) till Friday 30 June (around 5pm). The workshop covers Dynamic Linear Models. These are essentially linear regression models with time-varying parameters. The workshop will cover model specification and estimation (using Bayesian techniques) as well as marketing applications.

We will use the software package Gauss for coding your own DLM program. The code you will develop through a set of exercises will estimate DLMs based on both artificial data and actual data. The reason for Gauss is that it is a matrix language that has a direct match with the calculations that need to be made. In addition, the instructor (van Heerde) has all his code in Gauss and he has a lot of experience in Gauss. If you prefer to use another package such as R, Matlab or Stan, you are free to do the exercises in this package.

The workshop is structured as follows:

Day	Day part	Topic
Wednesday 28 June	Afternoon	Introduction to DLM, DLM applications in marketing
Thursday 29 June	Morning	Bayesian estimation
	Afternoon	DLM specification and estimation
Friday 30 June	Morning	DLM specification and estimation
	Afternoon	DLM applications in marketing

To prepare for this course, please study the three “Core DLM Texts” and the four “Focal DLM Applications in Marketing” listed below. In addition, please read at least the abstract and the model specification section of the “Other DLM applications in marketing”.

You will also need to have Gauss installed on your computer. There is a free trial version that will be organized centrally via <http://www.aptech.com/industry-solutions/gauss-in-education/gauss-in-the-classroom/>. There are also tutorials available at <http://www.aptech.com/resources/tutorials/>.

## Prerequisites

This workshop is developed for PhD students and staff members with a good grip on linear regression, ordinary least squares, the algebra behind it and matrices and vectors. There is no experience required in terms of Bayesian estimation or programming, although this experience would of course be beneficial.

## Core DLM texts

Hwang, Soosung (2001), *Gauss Programming for Econometricians*, City University Business School, London

Koop, Gary (2003), *Bayesian Econometrics*, Chapters 1-3, 6, John Wiley and Sons, Chichester England.

West, Mike and Jeff Harrison (1999), *Bayesian Forecasting and Dynamic Models*, 2<sup>nd</sup> edn., Springer-Verlag, New York, Chapters 1-4, 9, 15

## Focal DLM Applications in Marketing

Ataman, Berk, Harald J. van Heerde, and Carl. F. Mela (2010), "The Long-term Effect of Marketing Strategy on Brand Sales," *Journal of Marketing Research*, 47 (October), 866-882.

Bass, Frank M., Norris Bruce, Sumit Majumdar, and B. P. S. Murthi (2007, "Wearout effects of different advertising themes: A dynamic Bayesian model of the advertising-sales relationship," *Marketing Science* 26 (2), 179-195.

Peers, Yuri, Harald J. van Heerde, and Marnik G. Dekimpe (2017), "Marketing Budget Allocation Across Countries: The Role of International Business Cycles" forthcoming, *Marketing Science*.

Rutz, Oliver J., and Randolph E. Bucklin (2011), "From generic to branded: A model of spillover in paid search advertising." *Journal of Marketing Research* 48 (1), 87-102.

## Other DLM Applications in Marketing

Ataman, Berk, Carl. F. Mela, and Harald J. van Heerde (2008), "Building Brands," *Marketing Science*, 27 (November–December), 1036–1054.

Bruce, Norris I., Natasha Z. Foutz, Ceren Kolsarici (2012), "Dynamic Effectiveness of Advertising and Word of Mouth in Sequential Distribution of New Products," *Journal of Marketing Research* 49 (4), 469-486.

Gopinath, Shyam, Jacquelyn S. Thomas, and Lakshman Krishnamurthi (2014), "Investigating the relationship between the content of online word of mouth, advertising, and brand performance," *Marketing Science* 33 (2), 241-258.

Hu, Ye, Rex Yuxing Du, and Sina Damangir (2014) "Decomposing the impact of advertising: Augmenting sales with online search data," *Journal of Marketing Research* 51 (3), 300-319.

Lachaab, Mohamed, Asim Ansari, Kamel Jedidi, and Abdelwahed Trabelsi (2006), "Modeling Preference Evolution in Discrete Choice Models: A Bayesian State-space Approach," *Quantitative Marketing and Economics*, 4 (3), 57-81.

- Sonnier, Garrett P., Leigh McAlister, and Oliver J. Rutz (2011), "A dynamic model of the effect of online communications on firm sales," *Marketing Science* 30 (4), 702-716.
- Sriram, Srinivasaraghavan, Pradeep K. Chintagunta, and Ramya Neelamegham (2006), "Effects of brand preference, product attributes, and marketing mix variables in technology product market," *Marketing Science* 25 (5), 440-456.
- Van Heerde, Harald J., Kristiaan Helsen, and Marnik Dekimpe (2007), "The Impact of a Product-Harm Crisis on Marketing Effectiveness," *Marketing Science*, 26 (2), 230-245
- Van Heerde, Harald J., Carl F. Mela, and Puneet Manchanda (2004), "The Dynamic Effect of Innovation on Market Structure," *Journal of Marketing Research*, 41 (2), 166-183.
- Van Heerde, Harald J., Shuba Srinivasan, and Marnik G. Dekimpe (2010), "Estimating Cannibalization Rates for a Pioneering Innovation," *Marketing Science*, 29 (6), 1024-1039.