TEACHING MACROECONOMICS WITH MICROSOFT EXCEL®

Humberto Barreto strives to deliver fundamental content for an undergraduate macroeconomics course via Microsoft Excel® that any economist can easily use in the classroom. His contribution is to provide a complement to conventional teaching that gives professors a different way to present macro models and incorporate data into their courses. The Excel files are meant for students, while the audience for this book is professors.

The Excel workbooks and add-ins available on the Web at www.depauw.edu/learn/macroexcel are designed to be used by students with any textbook. Each Excel workbook contains links to screencasts: recordings of the computer screen, also known as a video screen capture, with audio narration. Each screencast is short, approximately five to ten minutes in duration, and walks the student through the steps needed to complete a task.

Humberto Barreto is Elizabeth P. Allen Distinguished University Professor at DePauw University, Greencastle, Indiana. Born in Camagüey, Cuba, Dr Barreto earned his PhD from the University of North Carolina at Chapel Hill. He is co-author (with Frank M. Howland) of *Introductory Econometrics Using Monte Carlo Simulation with Microsoft Excel®* and author of *Intermediate Microeconomics with Microsoft Excel®*. Dr Barreto has been a Fulbright Scholar in the Dominican Republic, has won several teaching awards, and has given workshops all over the world on how to improve the teaching of economics and econometrics. He has also written several articles on pedagogical applications of Excel®.

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CAMBRIDGE UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of
education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107584983

First published 2016

A catalogue record for this publication is available from the British Library

Library of Congress Cataloging-in-Publication data
Names: Barreto, Humberto, 1960– author.
Title: Teaching macroeconomics with Microsoft Excel / by Humberto Barreto.
Description: New York, NY : Cambridge University Press, 2016.
Identifiers: LCCN 2015040091 | ISBN 9781107584983 (paperback)
Subjects: LCSH:Macroeconomics – Study and teaching. | Microsoft Excel (Computer file)
Classification: LCC HB172.5 .B359 2016 | DDC 339.0285/554–dc23
LC record available at http://lccn.loc.gov/2015040091

ISBN 978-1-107-58498-3 Paperback

Additional resources for this publication at www.depauw.edu/learn/macroexcel

Para mi familia:

Tami, Tyler, Nicolas, y Jonah

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All files are freely available online at
www.depauw.edu/learn/macroexcel

Preface

My simple idea is to deliver fundamental content in an undergraduate macroeconomics course via Microsoft Excel® in a way that any economist can easily use for teaching purposes. My contribution is to provide a complement to conventional teaching that gives professors a different way to present macro models and incorporate data into their courses. The Excel files are meant for students, whereas the audience for this book is fellow professors.

A series of implications flow from the decision to target this book toward professors:

- A great deal of basic information can be safely omitted.
- Content is modular and stand-alone, so teachers can pick and choose what to use.
- Explanations are less detailed.
- Mathematics is used to present models compactly.
- Successful pedagogical practices or suggestions are included.
- Focus is placed on implementing models in Excel, including modifying the models.
- There is an emphasis on data sources and ways to quickly update data for class presentation.
- The writing style is more conversational because target readers are my peers.

The Excel workbooks and add-ins, available on the Web at www.depauw.edu/learn/macroexcel, are designed to be used by students with any textbook. Each Excel workbook contains links to *screencasts*: recordings of the computer screen, also known as a video screen capture, with audio narration. Each screencast is short, approximately five to ten minutes in duration, and walks the student through the steps needed to complete a task. All videos are grouped in a channel, available at vimeo.com/channels/macroexcel. A complete listing of all screencasts, organized by workbook, is available at www.depauw.edu/learn/macroexcel/screencasts.

This printed book describes each screencast, highlighting important points, as a way to minimize the time needed to choose which ones to use. It is recommended, however, that you view screencasts selected for your students to

make sure you are familiar with the material, especially Excel functions and add-ins.

Although primarily designed with a course in intermediate macro in mind, many of the files and screencasts are useful for other courses. *MaddisonData.xls*, for example, could be used in introductory economics, development, and growth theory courses. *Unem.xls* could serve as a supplement for any labor economics textbook. Because the content is modular, the professor can pick and choose what, when, and how to use a particular Excel file or screencast. For intermediate macro, simply plug workbooks as appropriate into an existing syllabus – there is no need to follow the order in which the files are listed. If your course begins with a review of key macro variables, then it would make sense to jump right into the workbooks that use the FRED Excel add-in to download data.

The innovation and unique contribution of this book and the associated Excel files springs from my ability to recast existing knowledge into Excel, which turns out to have powerful advantages for communicating ideas and displaying data to students. Through using these macro-enhanced workbooks and materials, students will more fully learn sophisticated concepts that are often poorly absorbed through conventional books and lectures.

One powerful advantage of delivering the material to students via Excel is that the files can be easily updated by me or modified by you. Parameters can be quickly changed to create new questions, text can be altered or augmented as needed, and entirely new worksheets can be inserted with new material. If a workbook is used as an in-class lecture, you can simply delete or hide unwanted sheets, such as the *ToDo* sheet (which has video links and a list of tasks for students).

I will keep the Excel workbooks updated, correcting mistakes and adding buttons and other features. I will not update the screencasts as frequently, and they may not look exactly like the latest version of the Excel files. Of course, if major changes are made and the screencast is badly out of date, I will redo it.

I assume my audience (both student and professor) has used Excel but is unfamiliar with advanced Excel functionality and has never opened Visual Basic or written a macro. The workbooks cover a wide range of Excel skills, such as basic and advanced charting (e.g., making a graph with two *y* axes, adding recession bars to a chart, and creating a population pyramid), pivot tables, conditional formatting, and using *Solver* and other add-ins. All code is open source and can be viewed by pressing ALT-F11 while in Excel with a macro-enhanced workbook open.

I want to thank many people for contributions to this work, including generations of students and many colleagues. They had to listen to me complain about how economists had failed to take advantage of technology to improve

their teaching and then put up with many Visual Basic errors and crashes. I thank the many colleagues and students on whom I imposed to read drafts and test drive Excel files. The following helped me by sending me specific comments and suggestions: Sean Brocklebank, Mary Dixon, Bill Goffe, Peter Mikek, Imad Moosa, Kerry Pannell, Alberto Posso, Guangjun Qu, Tikhon Savrasov, George Tawadros, and Dan Wachter. I also benefited from the criticisms and comments of four anonymous reviewers.

In addition, three others deserve special thanks: Frank Howland, Kay Widdows, and Tami Barreto. Frank and I collaborated on an econometrics book that uses Excel, and we worked closely together for many years. A long time ago, he helped me implement and solve the Solow Model in Excel. He does not know this, but when I write something, I think of him reading and criticizing it, which then forces me to make it better. Kay and I team-taught several courses and created a series of Excel-based labs for Principles of Economics. She is neither a macroeconomist nor a programmer but has a sharp eye for clear explanation and organization of ideas. I learned a great deal from both of them, and much of the material in these workbooks and screencasts bears their imprint. Tami copyedited this book and the Excel files, greatly improving the exposition by toning down my colloquial style and pushing for clarity in expression. She has edited just about everything I have ever written, and I am glad to be able to recognize her contribution.

Finally, I thank DePauw University, RMIT, and Cambridge University Press. DePauw's Elizabeth P. Allen Endowed Chair and Allen A. Wilkinson Faculty Fellowship programs provided generous financial and course release support for this project. RMIT provided a supportive environment that helped me work on this book during a productive and enjoyable sabbatical year in Melbourne, Australia. I remain surprised that Cambridge University Press is willing to publish this book. The Press will not make much money, because students do not have to buy this book, and it really is quite weird. Taking a chance on this unorthodox work is a testament to the Press's mission as a publisher of high-quality, innovative material. I deeply thank my editor, Karen Maloney, for all her support.

I welcome all questions, criticisms, and suggestions. I hope my mistakes and deficiencies in exposition do not prevent you from helping your students learn.

Software Requirements and Opening a Macro-Enhanced Workbook

> The idea for the electronic spreadsheet came to me while I was a student at the Harvard Business School, working on my MBA degree, in the spring of 1978.
> – Dan Bricklin

The materials in this book will work on any Windows Excel version all the way back to 1997 (version 8). The workbooks and add-ins were created and are optimized for use with Windows Excel, but they can be accessed with a Macintosh computer. Microsoft removed Visual Basic from Mac Excel 2008 but reversed that decision in Mac Excel 2011, so this version should work. *Solver* in Mac Excel 2011 remains as temperamental as ever. The best solution for Mac users is to emulate Windows with software such as Parallels or Boot Camp. For on-campus users, accessing Excel from a server (see, e.g., VMWare's Horizon View client) is an easy solution for Mac users. This is my default method for enabling students with Macs and tablets to access the files.

To ensure that older versions of Excel can open these files, workbooks have been saved in "compatibility mode" (Excel 97–2003 Workbook) with the .xls filename extension. In Excel 2007 (version 12) or later, be sure to save the workbooks as .xls files or in the special "excel macro-enabled workbook" format, which carries the .xlsm extension. If you save the workbook as an Excel workbook with the .xlsx extension, the macros will not be saved, and functionality will be lost.

There was a substantial jump from Excel 2003 to Excel 2007. The interface was radically rearranged, with the Ribbon replacing menus and toolbars, while under the hood the charting engine was completely overhauled and the maximum size of a sheet was increased to 1,048,576 (2^{20}) rows by 16,384 (2^{14}) columns. The instructions in the files refer to Excel 2007 and later versions, using the Ribbon. The screencasts were made with Excel 2010 (version 14) and Excel 2013 (version 15), but other versions are similar enough that you can figure out what to do and the files will work on any version based on

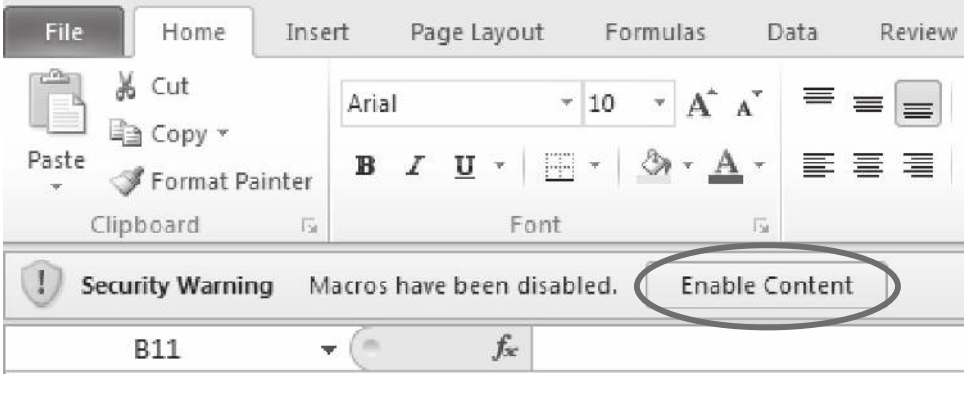

Figure 1. Opening a workbook with macros in Excel 2013.

Visual Basic. (You probably did not notice, but Excel 2007, version 12, was followed by Excel 2013, version 14. It turns out that Microsoft decided to skip version 13 because it is an unlucky number.)

For non-English versions of Excel, the files will work in the sense that buttons, scroll bars, and macros will function; however, the add-ins and other content will not be translated. Fortunately, you can easily add text boxes or other explanatory text in cells, as needed.

Finally, while OpenOffice did not provide much of a challenge, Google Docs caught Microsoft's attention. OneDrive.com and Office365.com offer cloud alternatives to traditional installations of software on your machine. Regrettably, as of this writing, because of security concerns, they do not support Visual Basic, a limitation that renders these options useless for working with these macro-enhanced files from within a Web browser. You can save a file with macros in your favorite storage area in the cloud, but you will need to download and open it with desktop Excel to run the macros. Within a browser, as of this writing, macros cannot be executed.

Accessing and Using the Excel Workbooks

Visit http://www.depauw.edu/learn/macroexcel to download the files that accompany this book. You may download files as needed, to as many different computers or devices as required. For security and efficiency in transmission (some files are quite large and should not be e-mailed), it is best if you send links to screencasts and Excel workbooks to students and colleagues.

Figure 1 shows that, when opening a workbook with macros, Excel will alert you to their presence with a security warning under the Ribbon (and right above the formula bar).

Click *Enable Content* to allow the buttons and other controls in the workbook to function properly. You may also be asked if you want to enable editing on the file – you should accept this offer.

If you do not see the security warning or have no opportunity to enable content, your security level has been set to block all files with macros. Although malicious code can be harmful, you must dial down the safety measures to allow Excel to utilize fully the information in the workbook. Close the file and change the security setting to allow Excel to open files with macros. In Excel 2010 and 2013, open the Excel Options dialog box (execute **File** → **Options**). Click **Trust Center** and then the **Trust Center Setting** button. In the **Trust Center** dialog box, click **Macro Settings** and select **Disable all macros with notification**. Click **OK** twice to return to Excel and reopen the file, which should now offer the enable content option displayed in Figure 1.

If buttons or other controls do not work, the first thing to check is that you have enabled macros. Another simple fix for many problems is to quit Excel and start over. Visit http://www.depauw.edu/learn/macroexcel to see a list of problems and solutions. Contact me and I will do my best to help you. If you get a Visual Basic error, click **Debug** and carefully note the text in the yellow-highlighted line – this is the where the code crashed and where the search for a fix begins.

The screencast links embedded in the workbooks do not require any special software or other preparation. Simply click on a link and the user's default browser is used to display the video, streamed from Vimeo.com. A complete listing of all screencasts, organized by workbook, is available at http://www.depauw.edu/learn/macroexcel/screencasts. Links can be sent via e-mail or placed on your course web page.

Modifying Visual Basic Code

Although the macros in the workbooks are meant simply to be run by button clicks, they can be viewed and modified. Most users would never have occasion to examine the code, but if you are able to read and write in Visual Basic, all of the macros are open and accessible.

Of course, the code from any button (or other object, such as a scroll bar) can also be accessed via right clicking and editing the assigned macro. It is not expected that a student or professor will need to modify a macro, but the potential is there. Examining the code in these workbooks can be an excellent way to learn Visual Basic.

Sources and Further Reading

For more on the history of the electronic spreadsheet, as told by one of its creators, see http://bricklin.com/visicalc.htm. This is the source for the epigraph.

On Microsoft skipping version 13, see www.neowin.net/news/office-14-slated-for-a-20092010-release: "In December 2006, Eric Vigesaa, Program

Manager for Office system client applications, stated during a TechNet radio chat: '13 is unlucky, so we're calling it Office 14.'"

Visit Office.com to determine your version number, download updates, and more.

I recommend the following websites for Excel tips and tricks, workbook and add-in downloads, and Visual Basic code snippets:

- Ron de Bruin: www.rondebruin.nl
- Charley Kyd: www.exceluser.com
- Tushar Mehta: www.tushar-mehta.com/excel
- Chip Pearson: www.cpearson.com/excel
- Jon Peltier: http://peltiertech.com/Excel
- Andy Pope: www.andypope.info