Documentation for:
Crises and Recoveries in an Empirical Model of Consumption Disasters

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1 Overview

The estimation of the empirical model is carried out using the Winbugs software package. We call Winbugs from R and do post estimation analysis in R. We also perform a few calculations using Stata. When you unzip the DisastersDataAndPrograms.zip file, you will find this readme file and two folders called bugsForDist and stataForDist. bugsForDist contains data and programs to replicate the part of our analysis that we performed in Winbugs and R. stataForDist contains files to perform the analysis that we did in Stata.

2 Needed Software

You will need to install R. This software is freely available on the internet. You will also need to install Winbugs. This software is also freely available on the internet. Our model contains a truncated normal distribution. This distribution is not among the distributions that are available by default on Winbugs. However, by installing WBDev shared components, you can us this distribution. At the time of writing, WBDev shared components is available at `http://www.winbugs-development.org.uk/download_shared_code.html`. You will also need Stata.

3 Directory Structure of bugsForDist

The directory bugsForDist contains two directories: "data" and "sandbox". The folder "sandbox" contains our code and the data. The folder "data" is where outputs are saved. Within each of sandbox and data there are two directories: v6 and v7. Within v6, there is a directory v6.23. This directory contains files for the baseline version of the model. Within v7, there is a directory v7.9. This directory contains files for the version of the model with gamma distributed shocks. The directories /bugsForDist/sandbox/v6 and /bugsForDist/sandbox/v7 contain the file cdata20080607.tex. This file contains the consumption data used in the estimation.

4 Files in /bugsForDist/sandbox/v6/v6.23

This folder contains the files that estimate the baseline version of the model and calculate asset prices for the resulting consumption process. Here is a brief description of how to perform different parts of the analysis in our paper for this version of the model. Similar steps should be taken for estimation of the version with gamma distributed shocks.

4.1 Estimate the model

Estimating the model involves using three files: disastermodel.bug, runModel.R and funcs.R. disastermodel.bug contains a description of the model in Winbugs notation. runModel.R is the R program you run to estimate the model. runModel.R makes use of R functions contained in funcs.R.

The core of runModel.R is a loop. Each iteration of the loop calls Winbugs and asks it to return nIter draws from the posterior distribution of the unknown parameters, where nIter is specified at the top of funcs.R. The loop runs for nRuns iterations, where nRuns is also specified towards the top of funcs.R. After each iteration of the loop, runModel.R saves the output of that iteration in a file named something like bugsSimSave.XX1.1.Rda. We typically set nIter to 50,000 and nRuns to 40 (but this take about two days on a standard desktop, so start with something smaller). We have adopted this setup to be able to stop the estimation before it finishes without loosing too much output. You should also specify the prior type towards the top of funcs.R by setting priorType to 'XX', 'ZZ', or 'ZB'. The results in the paper are based on two chains with prior type 'XX' and two chains with prior type 'ZB'. If you are interested in running more than one chain and saving the output from these chains in the same folder for aggregation, you should use nOfChain to give each chain a number. In addition to changing these variables in getControlVar (the first function in funcs.R), you will need to change the directories in getDirInfo (the second function in funcs.R), and perhaps change the “bugs.directory” line in runModel.R.

4.2 Aggregating Output and Calculating Results

Suppose you have run runModel.R with nIter = 50,000, NRuns = 40, priorType = ’XX’, and nOfChain = 1. Then /bugsForDist/data/v6/v6.23 will contain fourty files with names bugsSimSave.XX1.1.Rda, ..., bugsSimSave.XX1.40.Rda. The next step is to aggregate these files. This is done using the files runAgg.R and funcsAgg.R. runAgg.R is the file you run and funcsAgg.R is a support file with a bunch of function that perform the aggregation and produce various results using the aggregated output.

The first step of this process is to open funcsAgg.R and change XX1ToUse to 1:40 in the function getRunsToUse (the second function in funcsAgg.R). Then you should be able to run runAgg.R. If you want to drop some output from the beginning of the Markov chain as burnin, you can do this, e.g., by not using the first two batches and thus set XX1ToUse to 3:40. The last seven lines of runAgg.R call various functions in funcsAgg.R that produce various results. Some results are printed on the screen. But all results are also saved into /bugsForDist/data/v6/v6.23. Here is a brief description of what these functions do:

- simSummaryDisasterParMulti produces the results reported in table 1 of the paper and saves them in a file named bigDataParamsSummary.txt’.
- simSummaryCountryParMulti produces the results reported in table 3 and 4 of the paper and saves them in several files (one for each parameter) with names such as bigDataParamsSummaryMuPre.txt.
- simPlotMany produces a large number of plots and in particular the plots that are reports in figures 4 and 5 of the paper. These plots are saved as pdf files with names such as bigData.Argentina.pdf, bigData.disasterPar.pdf, and bigData.WorldDisaster.pdf.
- plotTypicalDisasterImpulseResponseMany produces the results reported in figure 2 of the paper and saves them in a file named TypicalDisasterImpulseResponse.6.Per.tex.
- plotDistributionDisasterImpulseResponseMany produces the results reported in figure 3 of the paper and saves them in a file named BigDataDistDisasterIR.txt. This function also produces results on the distribution of the size of disasters and saves them in distBeginEnd.txt,

histBeginEnd.txt, distPeakTrough.txt, histPeakTrough.txt, distLongRun.txt, and histLongRun.txt.

- getDisasterEpisodesMany and printDisasterEpisodesMany produce the results reported in table 2 of the paper and save them in a file named bigDataSummaryDisasterEpisodes.txt.

To produce the results reported in figure 6 of the paper, you need to run runStats.R (which makes use of a function in funcsStats.R). This program saves results in a file named PathDuringDisasters.txt. The program runSim.R (which makes use of functions in funcsSim.R) produces several statistics that are reported in section 5 of the paper.

4.3 Asset Pricing

The basic asset pricing results in the paper are produced using runAP.R and funcsAP.R. As with runModel.R, the file to run is runAP.R and the key variables that you need to vary are at the top of funcsAP.R (in the function getControlVarAP). The core of the asset pricing code is the function getPDivs_EZW in funcsAP.R, which calculated the price-dividend ratio over the state space for the assets that you are interested in doing asset pricing for. Most of the code above this function is a series of functions that are used in getPDivs_EZW. The output from getPDivs_EZW is saved in a file named outputEZW.Rda. This file is then used to simulate the model and calculate average asset returns.

Asset pricing results for cases in which disasters are assumed to be permanent (2nd case in Table 7) or permanent and one period (3rd case in Tables 6 and 7) are produced using runAPPerm.R and funcsAPPerm.R. To produce results for the permanent, one period disasters case, set onePerPermDis=1 (and MultiPerPermDis=0). To produce results for the permanent disasters case, set MultiPerPermDis=1 (and onePerPermDis=0).

Figures 8 and 10 are produced using runAPHist.R and funcsAPHist.R (see file histEP2.pdf), while Figure 9 is produced using runAPHistGamma.R and funcsAPHistGamma.R (see file histGamma.pdf). Figures 7, 11, and 12 are produced using runAP.R and funcsAP.R (TypDisPlot.EZW.pdf and TypDisPlot.CRRA.pdf).

5 Statistics on Asset Returns

In section 6.3 of the paper, we report a few statistics based on data on the real return on stocks and bills. The Stata code to produce these statistics is in stataForDist. The file create_assetdata.do reads the historical asset return data into stata and constructs a data file for analysis. The file create_simdata.do reads simulated asset pricing data from the model into stata and creates a comparable data set of asset prices during consumption disasters. The file analyze_crashes3.do calculates several statistics about the asset price declines during disasters in the actual and simulated data using the created datasets.

The data on asset returns that we use are the data on returns used in Barro and Ursua (2009). We use data on the total return on equity and government bills, and we use data on inflation to deflate these returns. The primary source of these data is Global Financial Data (described in Taylor (2005)). The data on total returns on equity can be found in GFD's "Equity Database," the data on yields of government bills can be found in their "Fixed Income Database," while information on consumer price indices is located with their Economic Database. The series are ordered by country and are available at yearly frequencies with varying starting dates. Barro and Ursua supplement the data from Global Financial Data with data from Dimson, Marsh, and Staunton (2008)—available through a special licence of the EnCorr international data module in Morningstar—for Canada 1900-13, Denmark 1900-14, Italy 1900-05, Netherlands 1900-19, Sweden 1900-01, Switzerland 1900-10, and South Africa 1900-10. Information in the EnCorr module is organized by series, including total equity returns, total returns on government bills, and inflation.[1] Care should be taken in using the Dimson, Marsh, and Staunton (2008) data for later periods, usually wars, with missing entries in Global Financial Data. These Dimson, Marsh, and Staunton (2008) data appear to be generated (for periods such as France 1940 and Portugal 1974-77 when stock-return data seem to be unavailable) by interpolation. Barro and Ursua do not use any of this information. They use stock-price data for Argentina 1900-35 from Nakamura and Zarazaga (2003), for Japan 1893-1914 from Fujino and Akiyama (1977), and for Mexico 1902-29 (missing 1915-18) from Haber, Razo, and Maurer (2003). For Brazil 1900-1942 they used data available from Aldo Musacchio, and for 1945-1953 they used data from Goldsmith (1986). See Barro and Ursua (2009) and Barro and Ursua (2008) for more detailed discussion of the construction of these data. These data are available upon request from the authors to researchers who have access to Global Financial Data and Morningstar.

[1] See further description at `http://datalab.morningstar.com/knowledgebase/aspx/files/DMS.doc`

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