User's Guide
Autobox 7.0 Dot Net – Command Line

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Set up

If you are having any difficulties please email or call us and we will address your questions immediately. Refer to “Report Errors” section as well and then email us at sales@autobox.com so we can address any issues you might have.

This is a DOT NET compiled version which is a 64 bit application.

When you install the software, choose “CHANGE” and install it to a folder off the "root folder" (ie c:\AUTOBOXDN). This will make things easier for you in the process.

You can run Autobox in a few ways. Call us to discuss what makes the most sense for your situation:

1. Run many series with the names stored in a “LST” file with all output written back to the installation folder.

2. Run many series stored in a zip file with all output written back to a subfolder with the output in ZIP files. This run could be customized by how the modeling is done, the use of parent to child modeling optionally can also be used here.

3. Saving models and reusing them to save processing time. This makes sense for when you have daily or hourly problem sets.

There are a couple of ways to run Autobox and make it work best for you. We list out the approaches from slowest to fastest in terms of bottom line turnaround time. Yes, it might take you a little to setup the faster options, but it's worth it. There are some advantages of these schemes in speed, ability to tailor Autobox options for one specific group of SKUs, reusing of models. Now for example, let's assume you have 50,000 SKUs to model/forecast.

1)Keep all 50,000 SKUs in one folder and run Autobox and concatenate the forecasts into one file for further processing. This approach is the simplest, but doesn't take full advantage of running Autobox in separate folders to utilize your computers multiple CPUs. You could copy the Autoboxdn folder to 9 other folders that you would create and parallel process and split the 5,000 SKUs into each folder. The forecasts are then concatenated into one file for further processing.

2)Turn off all report files and jpg files, but keep just the forecast by creating a file named 'noaux.afs'

3)Layer in the idea of Saving models and reuse them

4)Layer in the idea of Saving models and just tune the coefficients

5)Layer in the idea of segmenting some of your problem sets and run them with different conditions. Perhaps use a predetermined model (ie mean model) for a certain group of SKUs that only have for example 5 observations. Or perhaps turning off the identification of pulse outliers as “buyins” occur and shouldn’t be adjusted for as they are not outliers and will happen in the future by just by creating a file named 'nopulse.afs'

6)Forecast hourly data(ie “children”) using daily totals(ie “parent”) or states using national forecasts as a “parent” to forecast the “child”. The key is that you can reconcile the forecasts bottom up or top down.

7)You can use Windows Task Scheduler to kick off the process each month so you can truly productionize the process.

Here is a quick summary of general steps to get started and up and running. The process follows like this(we'll show you a more detailed view in a few pages):
1)The series to be forecast (and any causal variables) are created in separate flat files called ASC files.
2)The user chooses how he wants to run the how the model/forecasts are generated (using our conditions or making some overrides for your specific purposes).
3)The flat files are gathered into a “ZIP file" or a "lst" file
4)Running the batch process
5)Forecast files (again flat files) are created which you can then use

Autobox can be used with any “time series” data in 5 broad ways:

- Data Cleansing (i.e. Identify outliers and correct the data for it’s errors)
- Modeling past behavior (i.e. Did the Promotion Coupon work?)
- Forecasting (i.e. Extrapolate a series of numbers into the future)
- Exception Reporting (i.e. Which series are out of control? What time period has the most outliers across my different SKUs?)
- Simulation/Scenario Analysis (i.e. What would happen if I lowered the price down to $xx?)

Autobox uses automatic modeling heuristics (not pick best) with intervention detection. It tailors the forecast model to the problem at hand including selecting the best lead and lag structures for each input series. It corrects for omitted variables (e.g., holidays or price changes that have affected the historical data that the system has no knowledge of) by identifying pulses, seasonal pulses, level shifts and local time trends, and then adding the needed structure through surrogate variables.

Autobox provides many reports/graphs and early warning system reports along with a verbal description of the model that explain the model in a sentence format. Graphs of autocorrelation, partial-autocorrelation and cross-correlation functions are also available.

The installation included some examples using product(ie country level data to help forecast state level data) and time oriented (ie daily to help forecast hourly). You should open some of the folders and files to become familiar with the native format for Autobox which is called an "ASC" file as you would need to create the ASC files. You can generate themselves or rely upon our simple Excel Macro –see Inputmacro.zip in the installation folder.

When you go to model, you can include causal variables, retain future observations for error analysis, provide future values of the causal variables or tweak the modeling process that Autobox uses.

Autobox will **automatically** aid the modeling process for weekly, daily, hourly and semi-hourly data. If you have weekly, daily or hourly data, Autobox will add 51 dummy variables for the different weeks of the year. You need at least 1 1/2 year of historical data for this to happen. If you have daily, hourly or semi-hourly data Autobox will add 6 dummy variables for day of the week. If you have hourly data Autobox will add 23 dummy variables for hour of the day. If you have semi-hourly data Autobox will add 47 dummy variables for each half-hour of the day.

For daily data that covers all 7 days(Monday to Sunday), Autobox will different modeling approaches. You trigger Autobox to do this by providing a series name like this "__040106Y11". To tell Autobox to look for these daily effects, just add two "_" before the date and the name of the series where 040106 represents April 1, 2006 and the series(SKU) name is "Y11", for example.

- If a holiday lands on a weekend, Autobox will look for a "Friday before" and "Monday after" effect automatically.
- Search for a day of the month effect.
- Search for an "End of the Month" effect when the month ends on a Friday, Saturday and Sunday.
- Automatically add in U.S. holidays. Note that you can always create variables like this yourself and add them in as a causal variable.
- Monthly Fixed Effects for daily data given that there 78(52*1.5) weeks of data

Autobox will look for Weeks of the Year when the series name does not have an underscore and date "__010108" and 78 weeks of data.

If you have a time series that is not annual, quarterly, daily or monthly, then Autobox will search for **interactions** between "fixed effects" automatically.

Note: If you have data that is very different in scale, we recommend scaling your data(by dividing or multiplying) when you have small values and large values. If your Y is 10,000,000 and your causal is .075 then you should scale. You should keep a gap of 6 digits or smaller between the size of the variables (ie 1,000 in sales and causal variable .07 is ok). This is not a "quirk" of Autobox, but rather a common issue for everyone trying to estimate.

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About AFS

AFS has been in business since 1976 and has many business and academic customers. Also check out Chris Chatfield's book where he cites in his 2001 book "Time Series Forecasting" on p. 176 as AUTOBOX BATCH as the package for Box-Jenkins modeling software. AFS was also bestowed the honor (2001) in the text by J. Scott Armstrong "Principles of Forecasting" as the 'BEST DEDICATED FORECASTING PACKAGE' See table 8 (http://www-marketing.wharton.upenn.edu/forecast/paperpdf/Tashman-Hoover%20Tables.pdf).

Process Flow

We will walk you through the steps you will follow throughout this process. This describes the major ***steps*** during the entire process:

1)Create ASC files – one file for each time series in a specific format that Autobox requires

2)Verify that the ASC files are created properly (FYI: You can download the Interactive version of Autobox and install it and try and open your ASC files to check).

3)Create the List of series to be modeled

- Create LST files - used only for bare bones (we will explain later)

or

- Create Zip files - used for comprehensive and multiple batch runs (we will explain later)

4)Choose what mode you want to run in – bare bones, comprehensive, multiple batch runs, parent to child

5)Choose what modeling options to run with (Optional) – we recommend that you use our options and create “AFS” files to override so you can have some customization of Autobox.

6)Output is generated – Forecasts, Graphs, Adjusted for outliers and detailed reports on the modeling process

Quick Start

Data Preparation

It is quite easy to create one example with your data in Interactive Autobox, but for multiple you could write a SAS macro or more easily use our import function in our Interactive Batch Version (aboxb.exe)

The easiest way to take your data of (let's say 5 examples columnwise with only data) is to Open the Interactive Batch(download for free from Autobox.com) and choose File/Import and Autobox will create ASC files on the disk ready for Autobox.

Copy those ASC files into the Autobox DOS command installation directory.

Autobox Preparation

We need to run a simple DOS command to create a list of what needs to be run:

dir *.asc /b >jpm.lst ←--------This creates the fle jpm.lst

Autobox Execution

Type the following command

aboxdn ./ jpm.lst" ← A batch run will begin You can Type just "aboxdn" at the dos prompt and you will see that you can select which graphing options you have We like using the " autoboxdn ./ jpm.lst –aff" option to get just the "actual, fit and forecast" graph.

Assembling the Forecasts

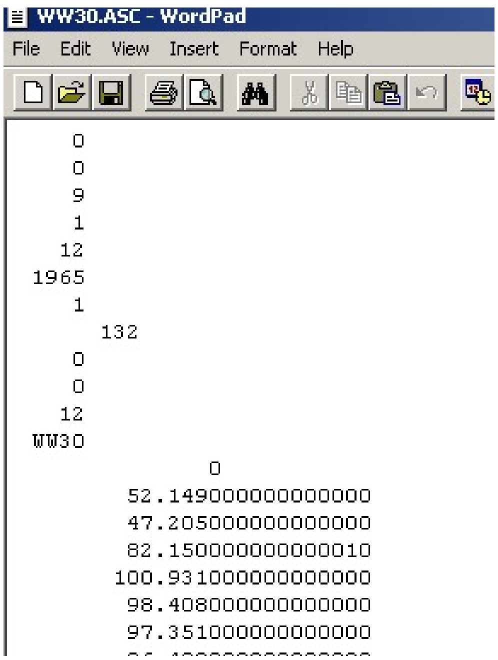
After running created a oneline file with anything in it called "temp.txt", the forecasts can be concatenated easily by using the copy command at DOS:

copy temp.txt+*.pro all.pro ← All.pro will be created

All.pro can be imported into Excel and then saved as CSV for easy import into the next step of the process.

Step 1
Create your ASC files

The installation included some test datasets and examples to show you how you will need to prepare the data to submit to Autobox batch. The files must have a name of "ASC". Here is an example of the "WW30.ASC" file (which you should use as a reference). Information like the number of series, the length of the series, # of forecasts, starting month, starting year are defined here (13 header fields). We strongly recommend that you refer to the ***appendix*** where a full explanation is available on how to create an ASC file. This data preparation will take you some time so it would make sense to get that process underway. We have an XLS macro if you don't have any way of scripting out these files. Just ask us and we'll send it to you!



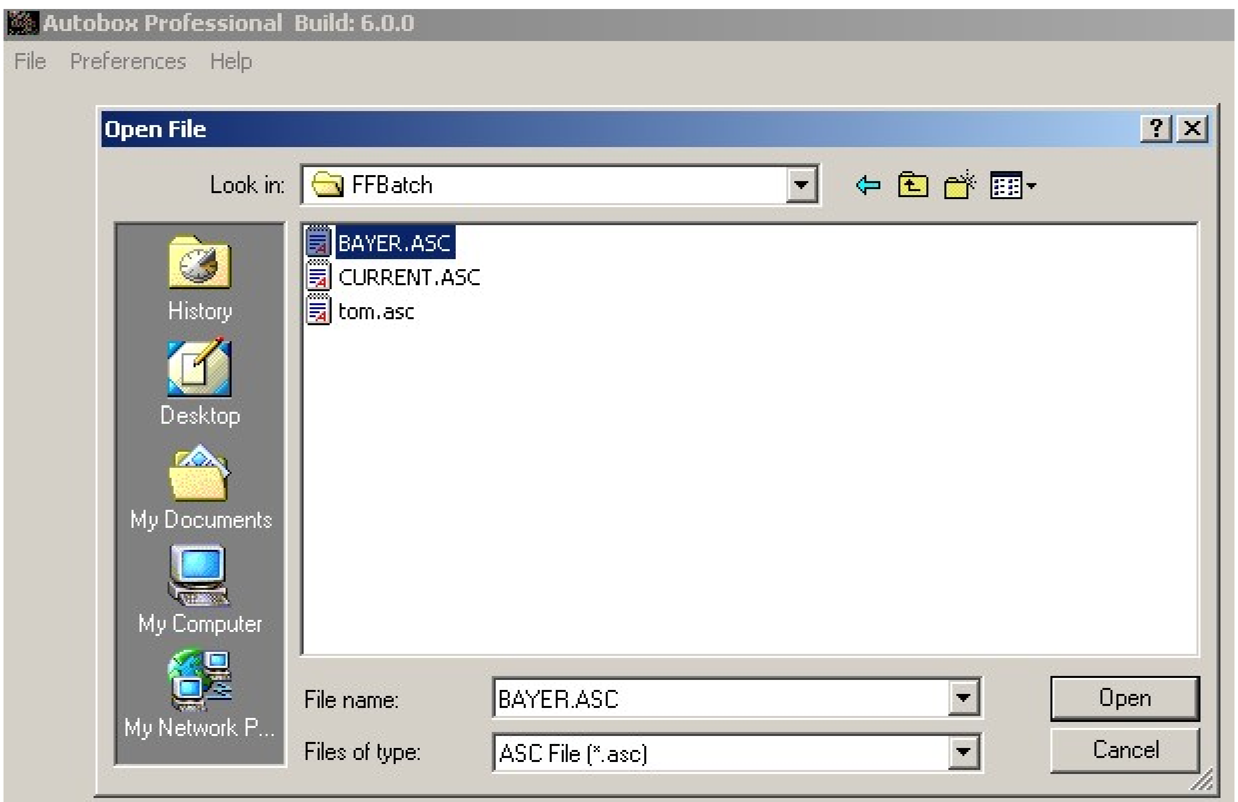
You will need to convert all of your data from SAS, Oracle, Excel, etc into an "ASCII" or "Flat file" format. Each dependent time series will need to be saved into a separate file for each series to be modeled. Note that if you have supporting series e.g. price, promotions, events these also need to be stored in each of the files. The file needs to have an extension of ASC (ie ww30.asc).

Note: There is one very special Autobox trick that we want to discuss up front. For example, if you have a "dynamic" promotion over a period of two weeks (and you had daily data) that causes demand to shoot way up and it slowly ramps down back to the mean (decays). If you specify the causal series name with the words “DYN14” for example, Autobox will react by modeling the promotion to slowly decay over the next 14 periods the promotion was running.

Step 2
Verify your ASC file creation process

Verify your ASC file creating is working as well as you had hoped. Download our free interactive version at http://www.autobox.com/abox.exe. Install it and click on "File/open"(see screen shot below) and select an asc file you created and try and open it and/or run it to see if you get any errors. Call us if you have any problems.

There are ASC files that came with the installation that you should examine and use to test things out. The three files are WW30.ASC, WW31.ASC, WW32.ASC are included in the zip file named WEI3.ZIP.



Step 3
Running the Example Data that comes with Autobox

You can run one of the examples that we provided (see the ZIP files.) that contains multiple problems. It is as easy as typing this :

C:\aboxdn\makesub (to extract the datasets)<<<<PLEASE RUN THIS ONCE. YOU NEED TO RUN THIS ONE TIME AND THEN NEVER AGAIN.

C:\aboxdn\DOABOXDN WW1

This will unzip and run the problems and then clean up any unneeded files.

It makes a lot of sense to begin to explore what "mixed frequency" or "parent to child" problem is and introduce you to where you might use it with Autobox . You can use Notepad to open ptc.bat which has a set of instructions to run all of the test examples to see what commands are being issues behind the scenes.

If you type this below at a DOS prompt(click start, type cmd and cd\autoboxdn for example), it will run a bat file (ie bat language) that will run all of the examples. This example is semi-hourly data. You can hit the two keys "ctrl' and "c" after a minute to stop the process, but this will give you an idea of what you should expect if you are using Autobox. Don't run the WU example using GOPTC as it is not a parent to child example.

C:\autoboxdn/ptc

To run just ONE of the examples, run our "start" program at a DOS prompt and type the command below. This command tells the system to use the folder "PROJ-WW" as the work area and use the file WW1.zip as the source of the data to run the analysis on.

C:\Autoboxdn\GOPTC PROJ-WW WW1 A

You can use and modify the bat file GOPTC.BAT and save it with a different name to use as a template for your own runs. It can also be a clickable event from Explorer.

1)Create a bat file (using Notepad.exe) and place 1 or more lines in this file. For example PTC.BAT (delivered) might contain a line where "A" reflects a totally new automatic run. Other options are "I","E","F", "L" as discussed above. To run a problem in the BAT file you need the word "CALL" before the GOPTC :

"CALL GOPTC PROJ-WW WW1 A" where WW1 is a zip file containing children files (ie you must use CAPS!)

Let's discuss two additional options that could be added after the "A" in the above example only if you are interested in seeing what is going on behind the scenes for error diagnostics. These two options are for any error tracking that AFS can help you with!
The 4th OPTIONAL argument "S" allows optional reporting of the progress from the dll.
The 5th OPTIONAL argument "D" allows tracing bat file activity

2) The # of forecasts in the con file must match the number of forecasts in each of the asc files. If either the groupt.asc file exists or the groupt.pro file exists there should also be an agreement with the # of forecasts specification.

3) The # of observations in each asc file have to be identical each other.

4) If you want to speed things up:

The existence of a file called NOSTORE in the installation folder will speed things up by NOT zipping or archiving and consequently no detail info will be available other than the forecasts.

LET'S DISCUSS OUTPUT

Summary output will be available in subfolder (ie PROJ-TEST).

Let's assume we ran using the example SJ1.ZIP and the output was written to c:\autoboxdn\proj-sj

You will see 9 ZIP files that all begin with SJ1.

If you open an output file in Excel or Word, for example, and try and run it may cause problems as you have the file open! So, be careful not to do that.

ADJ zip - file contains the history cleansed of outliers. We will explain each of the ZIP files generated down below. These files could be concatenated for further use.

ASCMOD.ZIP – contains the ASC file modified to include the causal(left is the ASC file before Autobox ran and the right now includes the parent (ie causal "GROUPT" and the child "HALF03" "groupt" is the sum of all the children). This file is kept just so for documentation.

HTM.ZIP – Shows ALL of the modeling steps in sequence for documentation.

MOD.ZIP - Contains *.MOD files which are the saved models so they can be reused using the options "I", "E", "F".

PNG.ZIP – Contains the Actual, Fit and Forecast Graph.

PRO.ZIP – Contains the forecasts for each of the analysis(there is another forecast file that is interlaced file with all forecasts in one file for further processing into your ERP).

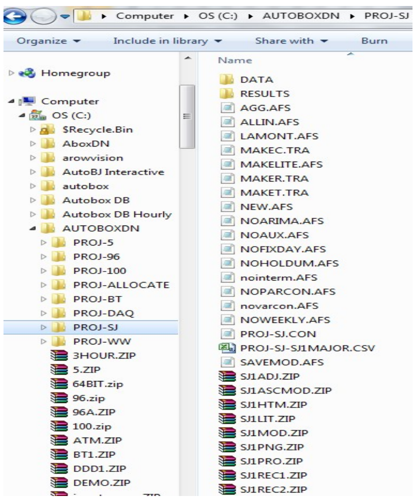
Click on the windows Start Icon (bottom left of screen) and type 'cmd'. Create a file with one blank line named "dummy" using notepad or text pad then issue the next command to concatenate all TRA files into one file::
Copy dummy+*.tra all.tra

*.PMM – When a file called "weights.afs" exists in the directory, a 4.1 PMML file is generated with the model built by Autobox ready to be imported into a post processor. See more at www.dmg.org Copy all pmm files to pmml after a run using the DOS copy command (ie copy *.pmm *.pmml)

*.PMD – When a file called "weights.afs" exists in the directory, a 4.1 PMML file is generated that is the dataset accompanying the pmml file ready to be imported into a post processor. See more at www.dmg.org

*.SAF – Safety Stock showing inventory to keep a 90% service level. (put nosim.afs in the autobox folder to get this)

LIT.ZIP – Contains *.ABL files which are the saved models so they can be reused using the very FAST option “L”.



Step 4
Create the List of series to be Modeled

To get to a DOS prompt, click on Start and type in "CMD" and hit enter.

Change to the installation folder(assume it is AUTOBOXDN) by typing 'cd\AUTOBOXDN' and hitting enter

Issue a folder command at the DOS prompt for mode 1 (Bare Bones Mode) and all the ASC file names will be generated in namel.lst(kind of like a shopping list of what will be executed)

DIR *.ASC /B > NAME.LST

The alternative way to setup for a run is to actually ZIP up the ASC files which is a more organized way of working, but you may not even need that additional level of complexity so maybe start simple using the lst file first.

For modes 2 and 3 (Comprehensive and Multiple Batch Run”). Note that the name of the zip file (weinew in this case) must be 8 or less characters. Download and install the program “7z” program to c:\autoboxdn folder. We use this program to manage data and output.

Use this link if you have a 64 bit machine
http://download.cnet.com/7-Zip-64-bit/3001-2250_4-75133313.html?spi=e8392889b9496b6869bcb80fe22b96f9

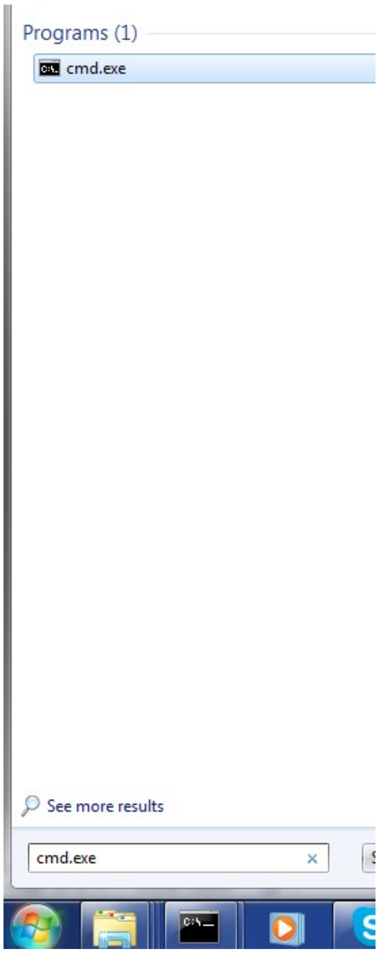
Use this link if you have a 32 bit machine
http://download.cnet.com/7-Zip/3000-2250_4-11655052.html

7z A WEINEW WW*.ASC

There are 3 ***modes*** in which you can run the batch version of Autobox batch:

1. Bare Bones – No Browser showing graphs and reports, one group of series (ie. wei1.zip) to be Forecasted – In essence, faster
2. Comprehensive Run – Browser showing graphs and reports, one group of series (ie. wei1.zip) to be Forecasted
3. Multiple Batch Run – No graphs or reports generated so that it runs fast, Many Groups of Series to be Forecast (ie. wei1.zip, wei2, etc.)

All work is initiated at the DOS Prompt. Choose “Start/Run/CMD” click OK or ENTER, and then type “cd\AUTOBOXDN” to transfer to the subfolder where you installed Autobox batch. This is not the subfolder where you installed from but rather where you extracted the files. You might need to type Command instead of CMD if you are running on an older platform like ME, NT or 98.



Step 5
How to run each of the modes

1. Bare Bones

STEP#1 CREATE A NEW SUBFOLDER AND COPY THESE FILES THERE
Make a subfolder called c:\BAREBONE and copy the following files to that subfolder from the installation folder
ALL FILES WITH A “DLL” FILE NAME (IE FFBATCH.DLL)
ABOXDN.EXE
Save your license files (ie new.afs) to this folder
Save your ASC files here

Change to the folder by typing “CD\BAREBONE” to the BAREBONE subfolder

STEP #2 CREATE THE LST FILE
You will need to issue the command below to create the “TO DO” list for Autobox batch. The goal of this step is to create the list of series (even if it is only 1 series!!!!) that need to be modeled.

DIR *.ASC /B > NAME.LST

STEP #3 RUN IT
Run Autobox batch by typing in the following command. You need a space after “ABOXDN” and a ‘./’ and then the series or list to run. Try entering aboxdn and you will see the different options that you can run with like “aboxdn ./ -aff” would run giving just one type of graph.

```
C:\AUTOBOXDN>aboxdn
usage: directory asc_file or asc_filelist
       directory  - required path where files are located
       asc_file   - required file with a file extention of .asc

       asc_filelist   - required file containing a list of the ASC files

       -ng              No Graphs will be displayed overides all settings.

       -nl              No Limits will be displayed on forecast graphs

       -a               Create the Actuals graph
       -ac              Create the Actuals Cleansed graph
       -af              Create the Actuals and Forecast graph
       -aff             Create the Actuals Fit and Forecast graph
       -ar              Create the Actuals Residuals graph
       -f               Create the Forecast graph
       -ff              Create the Fitted Values and Forecast graph
       -p               Will pause till a key is pressed after each series.
       -r               Create the Residuals graph
```

You can hit 'Enter' and the system will now begin to process each ASC file and provide summary information. You could run one series like this:

ABOXDN . /TEST.ASC –aff

You could run a list of series like this:

ABOXDN ./ NAME.LST –aff

If you want to run Autobox using data in a subfolder(ie dairy), you can point to that folder by adding the name of the folder after the slash(ie ABOXDN ./dairy dairy.lst). You must copy all files with "DLL" filename into dairy for this to work. Some information is printed on the screen during the run to show you which series is being run and the time it took to execute it. If you wanted to run in a folder off the root (ie c:\test) you can use two periods ".."

ABOXDN ../TEST test.lst

STEP #4 REVIEW THE OUTPUT (Check out the actual fit and forecast graphs for Quality Control).

Unlike the Comprehensive Run approach this execution does not automatically open up a web browser in order for you to review the results. You will need to open up the JPG to view graphs and HTM files to review the forecast process yourself. We suggest that you use "Windows Explorer" to review the contents of the subfolder in order to peruse the results. You can use "Google's Picasa" to review the graphs (we use the slideshow to QC when we have massive Autobox output to review!).

You will find the following types of files:

*.HTM - audit of how the model was built
*.PRO - forecasts for each of the series being modeled
*.JPG - graph files (forecasts, fitted values, cleansed data, residuals etc.)
*.ADJ - historical data adjusted for outliers

*.TRA – Ready to be imported to BI Tools like Tableau, Spotfire, etc. with name of series, actual, fit, forecasts, confidence limits, flag indicating if seasonality was found. These files can be concatenated easily using the Dos copy command into one file to be imported.

*.OUT – Reports all of the outliers sorted by size.

*.PEK – Shows the largest and and smallest values in the forecast. It's called "Peaks and Valleys" to show what the highs and the lows might be in the future.

*.INT - list of the outliers
*.FIT - historical fit
*.ERR - historical errors or residuals
*.EQU – equation built for the data
*.CAN – various probabilities of forecasts for the month end – only for daily data
*.BIN – shows the how the fit is actually calculated using the equation
*.BOT – shows the how the forecast is actually calculated using the equation

There are a few options that you can add to the end of the AUTOBOXDN to customize your run:

-ng No graphs will be displayed
-nl No limits will be displayed on forecast graphs
-a Create the Actual graph
-ac Create the Actuals Cleansed Graph
-aff Create the Actuals Fit and Forecast Graph
-ar Create the Actuals Residuals Graph
-f Create the Forecast graph
-ff Create the fitted Values and Forecast graph
-p Will pause till a key is pressed after each series
-r Create the residuals graph

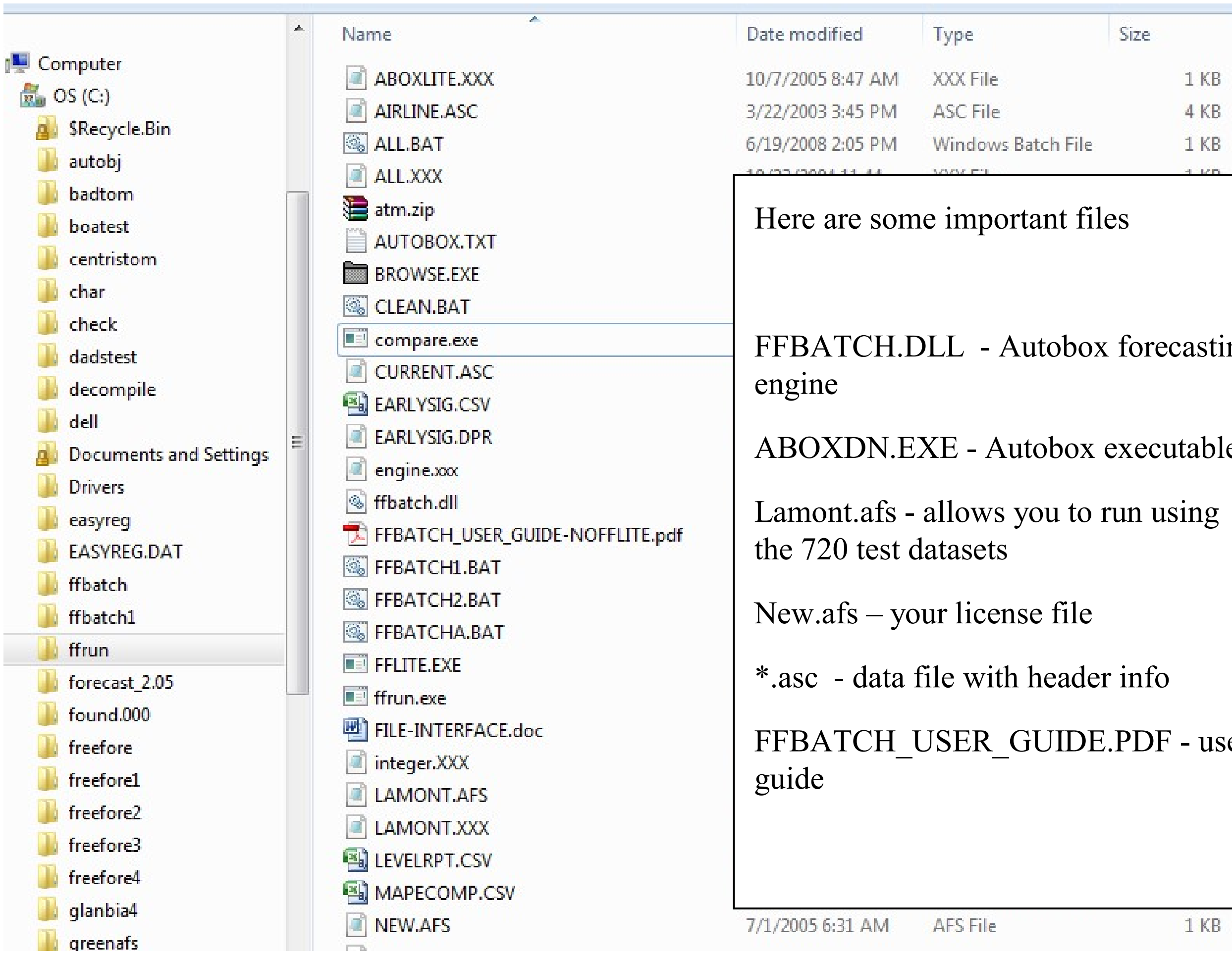
So, if you wanted to get just the actuals and the actual fit and forecast graphs you would run it like this:
ABOXDN ./ NAME.LST -a –aff

If you wanted to run ASC files in a different folder named demand (ie a folder under the Autobox installation folder), you could run it like this: ABOXDN ./ demand name.lst –aff Just note that you would need to copy the AFS files from the installation folder to make this work.

You can suppress all reports by creating a file called mute.afs which will make Autobox to run faster and you will have "less clutter".

STEP #5 **<u>Concatenate</u>** the forecast files into one file (all.pro in the example below) for importing the forecasts into the next step in your process (ie supply chain – Oracle, SAP, etc.) Create a file with one blank line named “dummy” using notepad or text pad then issue the next command to concatenate all forecasts into the file all.pro(you can import this into Excel):
Copy dummy+*.pro all.pro

Below is a sample listing of the files that are on the hard drive after an execution.



Here are some important files

FFBATCH.DLL - Autobox forecasting engine

ABOXDN.EXE - Autobox executable

Lamont.afs - allows you to run using the 720 test datasets

New.afs – your license file

*.asc - data file with header info

FFBATCH_USER_GUIDE.PDF - user guide

2. Comprehensive Run

The difference between this and the "Bare Bone approach" is that this mode provides more functionality by way of providing:

- A file (ALLCAST.DEV) with all forecasts for all modeled/forecasted series providing a direct link for importing forecasts into your ERP system (SAP, Oracle etc.)
- Opens a browser in order to review the graphs (JPG files) and reports (HTM files)
- It also does disk cleanup by deleting old JPG, HTM files

STEP #1 CREATE THE ZIP FILE

You will need to create zip file by issuing the command below to create the zip file containing all of the series that you wish to model/forecast. We suggest that you limit the number of series in one Zip file, (eg. 10,000 series would be large) since zipping and unzipping large number of files can become slow. The zip file "NAME" should be something sensible like "WEINEW". The goal of this step is to create the "container" or "database" of the series to be analyzed (even if it is only 1 series!!!!). Note that the name of the zip file (weinew in this case) must be 8 or less characters

```
7z  A  WEINEW WW*.ASC
```

STEP #2 RUN IT

Run the command:

```
FFBATCH1 WEINEW
```

STEP #3 REVIEW IT

A browser is opened in order to review the forecast results. It allows you to browse the graph files and the details file documenting the actual analysis process. Note that the subfolder is now populated with a number of output files from each of the separate analyses. Note that some users will have to "ALLOW BLOCKED CONTENT" in order to proceed. This is accomplished by clicking on the box "to help protect your security …." advisory.

Please review the contents of the subfolder after you have exited from the browser. You will find a file called ALLCAST.DEV containing all the generated forecasts.

3. Multiple Batch Runs

The difference between this and the “Comprehensive Run” mode is that this approach enables you to process many zip files, without the ability to browse the results so it is more of a production environment. Graph generation will be disabled to simulate a production environment, but can be enabled by removing the command “ovr nographs” on the line that has the “AUTOBOXDN” command in the file FFBATCHA.BAT.

STEP #1 CREATE THE FILE ALL.BAT for N ZIP FILES

LINE 1 CALL FFBATCHA WEINEW1
LINE 2 CALL FFBATCHA WEINEW2
LINE 3 CALL FFBATCHA WEINEW3
….
LINE N CALL FFBATCHA WEINEWN

When you are finished ALL.BAT will look like (this file exists in the folder already)

```
if exist weinew1.zip del weinew1.zip >null
if exist weinew2.zip del weinew2.zip >null
if exist weinew3.zip del weinew3.zip >null
copy wei.zip weinew1.zip >null
copy wei.zip weinew2.zip >null
copy wei.zip weinew3.zip >null
CALL FFBATCHA WEINEW1
CALL FFBATCHA WEINEW2
CALL FFBATCHA WEINEW3
CALL FFBATCHA WEINEW4
```

The first 6 lines are for creating a backup of the zip files ….you can never be too careful!

Of course, you have already prepared the files WEINEW1.ZIP, WEINEW2.ZIP, WEINEW3.ZIP and WEINEWN.ZIP.

NOTE: The BAT file does not delete any ZIP files.

STEP #2 RUN IT

Execute the command “ALL” at the DOS prompt which will process multiple calls to FFBATCHA.BAT

STEP #3 REVIEW IT (All on your own)

Note that the files WEINEW1P.ZIP , etc. and WEI1NEW1.H.ZIP , etc .exist in the subfolder along with WEI1ALLCAST.DEV, ….etc .

WEINEW1P will contain all the .PRO files (individual forecast files *.pro)

WEINEW1.H will contain all the audit trail files (?.htm)
WEINEW1ALLCAST will contain all the forecasts for WEINEW1

Some Important Items to be aware of:

- Name the ASC file the same as the dependent variable.
- Don't use spaces or non-standard characters as Filenames
- Make sure that you don't have extra blank records (lines) at the end of each ASC file
- Keep all series names to 8 characters or less
- Upon completion FFBATCH1/FFBATCHA deletes all *.LST files and all *.ASC in the subfolder so be sure to back up any needed *.LST OR *.ASC FILES that you have prepared. For security purposes, AFS has included in the distribution a file containing all the delivered ASC files. It is called ALLASC.ZIP. In order to recover the original ASC files, if necessary, just use the command "7z x ALLASC".

Now, the previous section ran Autobox with all of the data kept in one subfolder. We explained in the very beginning of the manual that you can make Autobox work faster and smarter. Here's how:

1)Keep all 50,000 SKUs in one folder and run Autobox and concatenate the forecasts into one file for further processing. This approach is the simplest, but doesn't take full advantage of customization and CPU speed optimization.

2)Create 10 different folders with 5,000 SKUs in each folder and run one version of Autobox which navigates to each of the folders, all forecast files created get copied back to the main Autobox folder and concatenated into one file for further processing.
------- You will need to copy all of the ASC files and create a LST file for each in each folder(let's call them satellites). Copy all *.AFS files from the installation folder to each of the satellites. Create a text file named 'go.bat' with textpad/notepad with these two lines and save it:

```
ABOXDN c:\target %1.lst
COPY *.pro C:\TARGET
```

Click on the windows Start Icon (bottom left of screen) and type 'cmd'. Now change to the Autobox Installation folder by typing 'cd\autoboxdn' and hitting enter. Now type 'go only hit 'Enter'. Now let's assume that there is only 1 ASC file so this pretend example would run just 1 problem. Autobox will go to the folder 'target' and run Autobox using the LST file and create a forecast. It will then by automatically copied back to the installation folder. That's an easy one now let's try something more useful. If you create a text file named go1.bat with these two lines and save it:

ABOXDN c:\%1 %2.lst
COPY C:\%1*.PRO

Type 'go1 target only' target hit 'Enter'. This will make Autobox go to the folder target and run the Lst file only.lst and all forecasts copied back to the installation folder. Now, in theory, we would have the same results, but this go1.bat is generalized. We have been using the "Batch Language" which is very powerful and its predecessor was in the UNIX environment.

So, we could create a 3rd bat file named 'go2.bat' with these lines and run it. Notice that the first line is what we used to run the last example?? We could just click on 'go2.at' using Windows Explorer to kick this run off. It would go off and look into 4 different folders(target, target1, target2, and target3) and run the autobox using the lst file "only" and then copy all of the forecasts back to the Installation folder. You can concatenate them and import them into Excel. Voila.

Go1 target only
Go1 target1 only
Go1 target2 only
Go1 target3 only

3)Create 10 different folders with 5,000 SKUs in each folder with the Autobox "engine" in each of the 10 folders and then run 10 different instances of Autobox simultaneously with all forecast files created and then copied back to the main Autobox installation folder and then concatenated into one file for further processing.
------- Same rules as #2, but you need to copy all of the EXE and DLL files to all of the satellites

4)Turn off all report files and jpg files, but keep just the forecast by creating a file named 'mute.afs'
5)Layer in the idea of Saving models and reuse them(discussed later)
6)Layer in the idea of Saving models and just tune the coefficients (discussed later)7)Layer in the idea of using a predetermined model (ie mean model) for a certain group of SKUs that only have for example 5 observations. Building a model for this short time series is just nonsense in all practicality. (discussed later - see 'objective 1' when building your own ASC file)

Step 6
Choose what modeling options to run with – Control the statistical options

There are two ways to control the options.

1)ENGINE.GO – A template file comes with the installation called "Engine.xxx". Edit this file and review – FYI: These options are ***NOT*** the default options Autobox uses in automatic modeling (ie expert system) process. If you want to override Autobox's options save this file as **'Engine.go'** and they will override the internal rules.

Refer to the section on "Engine.afs" in the Appendix for a complete description of each of the options.

2)TRIGGER FILES – Copy or create "*.AFS" files to override the Autobox options. When running using a "LST" file they must be in the folder where the data is located for them to be used. When running Parent to Child, they need to be in the "PROJ-"folder which will be explained later.

Copy specific "XXX" files to "AFS" to make them active.(ie copy integer.xxx to integer.afs). Delete the "AFS" file if you no longer which to use it.

Noparcon.xxx – Stops the testing for constancy of parameters (ie CHOW test see line 35 page 40 of this manual or line 35 of engine.xxx). For daily data, we recommend using this override.

Novarcon.xxx – Stops the testing for constancy of variance (TSAY test see line 33 page 40 of this manual or line 33 of engine.xxx). For daily data, we recommend using this override.

Integer.xxx – Converts forecasts to integers (see line 43 page 42 of this manual or line 43 of engine.xxx)

Positive.xxx – Converts forecasts to positive values (see line 42 page 42 of this manual or line 42 of engine.xxx)

AFS2SIP.afs – This is called “Simulated Forecasting” or bootstrapping via Monte Carlo methods. This comes with the Enterprise + version of Autobox. Autobox generates Sipmath 2.0 ready XML files(see probabilitymanagement.org for more on their free and very useful simulation tool). Put “1000” in this file and Autobox will generate 1,000 simulations for each of the forecasting periods(see image below). The second line can have a 0 or 1. This determines if outliers will be allowed to exist in the future or not. We recommend you put a 1 in the second line so that outliers that were identified and adjusted for in the history will be allowed to occur in the forecast and in effect widen the confidence limits providing more realistic version of uncertainty! If you put a 0 on the second line then then no outliers are used in the forecast(more for educational use to show you the old vs the new). We recommend using 1,000 so that there are enough samples/trials are drawn to provide good results. If you are forecasting out 36 months then you will have a total of 36,000 forecasts along with the average, standard deviation, min and max. After running, look for a file in the Autobox folder with an “XML” file extension (ie.Sales.XML). The sampling needs a “seed value” which we use the clock to drive from. If you run an example, you will not get the same results as the time of day changes. If you want to reproduce, you can create a file called “seed.afs” and put a number in it so that the results don’t change. We report the seed at the bottom of details.htm that was used in the simulation which you can post to seed.afs if you want to use that same outcome. You need to delete nosim.afs from the Autobox folder as there is some additional compute time to do this step. 500 would work fine and 1,000 gives similar results. 1,000 is actually testing the limits(think possible crash?) of Autobox with all of the memory that it uses with complicated algorithms.

Autobox generates *.FUM files(forecast univariate model) for each of the causal variables. Make sure to delete the previous *.FUM files if you made a change to the data.


```
<SLURP name="Example" coherent="True" about="Example SLURP of forecasts" origin="Autobox">
<SIP name="Forecast00001" Base="    58324.   " SipMean="    58296.   " SipStd="    596.99   " SipMin="    57140.   " SipMax="    59326.   " type="CSV"
 count=" 1000" csvr="02" about="Example SIP">
   58127.00,   58221.00,   58576.00,   58565.00,   57532.46,   58324.18,   59326.46,   58216.92,   57947.00,   58127.00,   58221.00,   57532.46,   58979.00,   57436.
</SIP>
<SIP name="Forecast00002" Base="    55810.   " SipMean="    55783.   " SipStd="    599.30   " SipMin="    54626.   " SipMax="    56812.   " type="CSV"
 count=" 1000" csvr="02" about="Example SIP">
   55702.92,   55433.00,   55613.00,   55707.00,   55018.46,   56465.00,   54922.00,   55925.00,   56170.50,   55810.18,   54922.00,   56074.92,   55810.18,   55810.
</SIP>
<SIP name="Forecast00003" Base="    58451.   " SipMean="    58437.   " SipStd="    602.39   " SipMin="    57267.   " SipMax="    59453.   " type="CSV"
 count=" 1000" csvr="02" about="Example SIP">
   58566.00,   58811.50,   58451.18,   57563.00,   58715.92,   58451.18,   58451.18,   57358.00,   57659.46,   59426.50,   58074.00,   59106.00,   59106.00,   58625.
</SIP>
<SIP name="Forecast00004" Base="    59824.   " SipMean="    59807.   " SipStd="    603.81   " SipMin="    58640.   " SipMax="    60826.   " type="CSV"
```


If retained data is in effect then simulation is disabled
If # of forecasts is greater than the maximum allowed # of series then simulation is disabled.
If intermittent demand is in effect then simulation is disabled (note nointerm.afs could control for this)
If non-constant variance is detected (tsay test) then simulation is disabled is disabled (note notsay.afs could control for this)

If power transform is in effect then simulation is disabled (note novarcon.afs could control for this)
If maximum # of allowed series is less than 150 (enterprise or Pro versions) then then causal simulation is disabled.

Causal simulation is only available for type “0” series or type “2” series

This suppresses the breakin.txt and breakout.txt reports which detail how the fit and forecast are generated. To suppress simulation create n override called nosim.afs.

Stepupde.xxx – THIS IS NOT JUST A TRIGGER FILE, BUT ALSO HAS CONTENT. This defines the number of interventions (see line 23 page 38 of this manual or line 23 of engine.xxx For 5 interventions put a ’5’ in this file). For daily data, we recommend 80.

Numbfore.xxx – THIS IS NOT JUST A TRIGGER FILE, BUT ALSO HAS CONTENT. This defines the number of forecasts (see line 40 page 40 of this manual or line 40 of engine.xxx For 24 forecasts put a ‘24’ in this file)

Foreconf.xxx – THIS IS NOT JUST A TRIGGER FILE, BUT ALSO HAS CONTENT. This determines the confidence level for the confidence limits (see line 42 page 40 of this manual or line 40 of engine.xxx. For 80% confidence limits put a ‘80.0’)

Mute.afs - This suppresses all reports and graphs except the forecast file thereby reducing run-time.

Country.afs – Place the phone code into this file. Selected top 20 countries holidays will be brought in for evaluation automatically.

Noholdum.afs – Suppresses use of Autobox’s automatic inclusion of USA Holidays. If you run Autobox using a tiny country like Ivory Coast, you wouldn’t to use USA Holidays. You should create your own causals holidays.

Nofixday.afs - Suppresses Autobox searching for a specific day of the month effect. If you don't think this occurs in your data, then turn it off as "false positives" can possibly occur.

Nopulse.afs - Series can heavily HUGE spikes which are caused by “buyins” which you might not want to fix with an outlier adjustment so in this case turn off pulses.

Norule.afs – To stop these two overrides use this file. For daily data, Autobox will check if all weekends are zero and force the forecast weekends to be zero and for holidays the day of the week is not included to avoid double counting.

Noweekly.afs – When you want to force monthly dummies for short daily data. FYI: Autobox flips between monthly dummies and weekly dummies based on the length of the series.

Makealli.af s – Constrains all causals into the model plus any automatic day of the week dummies or month of the year, holidays when dealing with daily data.

Weekinmo.afs – Creates weekly dummy effects – Good for daily data that has a big month end, for example.

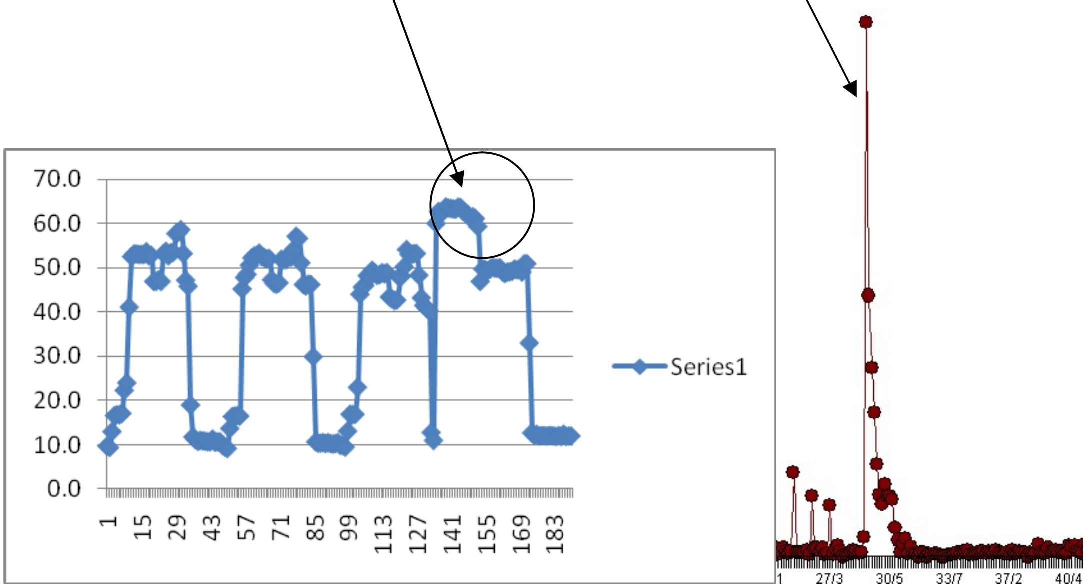
Noarima.afs – Suppresses the use of ARIMA modeling. With daily data you don't want to overreact to the most recent data too much as the level shifts will do that for you. Daily data relies on monthly and daily dummies (ie deterministic) behavior.

Parpharm.afs - Put a '1' for a mean model. Refer to the Appendix "Creating your ASC file" and you will see that "Objective 1" has a list of different prespecified models that can be used to override Autobox.

Nointerm.afs – suppresses Intermittent demand. This is helpful when you have daily that has a lot of zeroes on weekends, but doesn't really qualify as intermittent.

Let’s discuss a special way to allow Autobox to model the decay of a promotion like that of an “Ad Stock” approach.

There is one trigger based on the name of the causal variable. If you have a “dynamic” promotion over a period of two weeks (and you have daily data) that causes demand to shoot way up and it slowly ramps down back to the mean (decays). If you specify the causal series name with the words “DYN14” for example, Autobox will react by modeling the promotion to decay over the next 14 periods the promotion was running. Note that the data type(SEE THE SECTION ON CREATING YOUR OWN ASC FILE FOR MORE ON DATA TYPE) MUST be ‘3’ for this to work. Also, if you have a “patch of outliers” that are in the same range (ie all zeroes) then you can use a ‘1’ indicator during that patch. If you have a “patch of outliers” that varies wildly (ie high, low, etc.) then use “DYN” and the length and again data type must be equal to ’3’.



Control of Autobox Graphing Options

Edit these two files(ie ffbach1.bat & ffbatcha.bat) using Notepad.exe and review them and modify them for your needs:

FFbatch1 – Comprehensive mode creates graph files

FFbatcha – Multiple Batch Run mode creates no graph files (there is an override in the BATfile that stops the graphs)

If you wanted to control what graphs come out of the process by following these steps:

You can modify which graphs will generated by editing the ffbatch1(comprehensive mode) or ffbatcha(multiple batch runs mode) "BAT" files and adding the options below to the end of the ABOXDN line generated make the execution run faster by not including the different options, but you may also want to get a finer detail to review each and every model.

If you want to modify the bat file, edit the "BAT" file and add an option to the end of the line

ABOXDN ./ wei3 –ac –ar This would show only cleansed and residuals

There are a few options that you can add to the end of the ABOXDN to customize your run:

-ng No graphs will be displayed
-nl No limits will be displayed on forecast graphs
-a Create the Actual graph
-ac Create the Actuals Cleansed Graph
-aff Create the Actuals Fit and Forecast Graph
-ar Create the Actuals Residuals Graph
-f Create the Forecast graph
-ff Create the fitted Values and Forecast graph
-p Will pause till a key is pressed after each series
-r Create the residuals graph

So, if you wanted to get just the actuals and the actual fit and forecast graphs you would run it like this:

ABOXDN ./ NAME.LST -a -aff

Step 7 Output

If you open an output file in Excel or Word, for example, and try and run it may cause problems as you have the file open! So, be careful not to do that.

Graph Files – “JPG” files of the various "actuals, fit, forecasts", etc. We recommend using Google's Picasa to easily review the JPGs!

Forecast files – “PRO” file – Forecast for the series – mode 1 only

Allcast.dev – For modes 2 and 3 only, shows all the series and all forecasts in one file for ease of integrating the forecasts into the next step in the forecasting process

Detail File – “HTML” file – Tracks the steps and decisions to create the model

The model is described in the html file near the bottom.

Cleansed Historical Data - "ADJ" files containing the historical data adjusted for outliers

For Daily data(seasonality of 5 or 7), Autobox will search for different types of “fixed effects”. Autobox will report a variable that is has created to account for(we show the way Autobox presents it here):

a)Day of the week - Fixed_eff_n20507 - The last two positions (07) tell you that this is a daily effect. The 05 tells you that it is day 5 in the week has an effect.

b)Week of the Year - Fixed_eff_n22452 - The last two positions (52) tell you that this is a weekly effect. The 24 tells you that it is week 24 that has an effect.

c)Day of the month - Fixed_day15 – This would mean that there is an effect on the 15^{th} of the month. This is only for seasonality of 7 as you need to have all the days in the month to do this!

There are a few types of interventions so let's define them here:

a)Pulse - This means that at week 102 day 3 the observation was high by 3.89. A pulse is an intervention that has happened once. (i.e. 0,0,0,0,0,0,0,0,1,0,0,0,0,0,etc)

b)Seasonal Pulse – This means that there was an effect at the same time every season (i.e. every January for monthly data) (i.e. 0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,etc)

b)Level – This means that there was an mean change at a given point (i.e. 0,0,0,0,0,0,0,0,1,1,1,1,1,1,etc)

b)Time Trend – This means that there was a trend detected starting a given point (i.e. 0,0,0,0,0,0,0,1,2,3,4,5,6,etc)

Here is an example of model output:

```
 MODEL COMPONENT      LAG    COEFF     STANDARD      P       T
 #                  (BOP)            ERROR      VALUE   VALUE
  1CONSTANT                    8.66
   2Autoregressive-Factor #  1    1   .244

 INPUT SERIES X1  FIXED_EFF_N22452
  3Omega (input) -Factor #  2    0  -.862
INPUT SERIES X2  FIXED_EFF_N23352
  4Omega (input) -Factor #  3    0  -.529
 INPUT SERIES X3  FIXED_EFF_N23652
  5Omega (input) -Factor #  4    0   .602
 INPUT SERIES X4  I~P00608  102/  3    PULSE
   6Omega (input) -Factor #  5    0   3.89
```

The 24th week in the year is -.862 lower than usual

The 3rd day in the 102nd week had a high value of 3.89

Step 8 Exception Reports

Autobox creates a number of reports to help you understand your data and track the quality of the forecasts being generated so that you can review them for accuracy.

- Outlier Exception Reports - Macro view of where outliers occurred which can suggest that "maybe something happened in the history". It may also trigger you to realize that it was due to a marketing campaign and then realize to bring these in as causal variables when modeling the data into the future

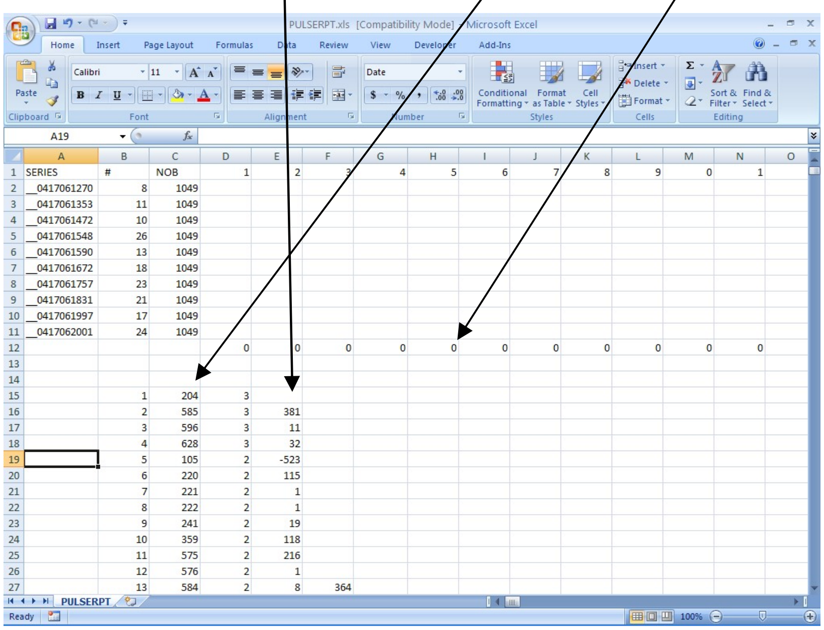
- Forecast Monitoring Report - Quick check to make sure the Autobox forecast is reasonable vs. a simple averaging method of your choosing (ie 4 period equally weighted average) as a baseline for comparison

- Forecasting Fit Exception Report - Compare Autobox fit vs 2 simple methods

Outlier Exception Reports

Pulserpt.csv, Trendrpt.csv, Levelrpt.csv – Log file showing a Table of a pulse(or trend or level) outlier at different time periods(see the first 11 rows to see what it looks like in the picture below). If you have 200 series and you find that 150 have an outlier at time period 02 then it might cause you to think about what happened at this point in time that you failed to include as a variable in the model from the beginning for these 150 series(possibly for all 200 series?). In a couple of steps you can find if these occurrences also occurred annually suggesting that it was a holiday that was omitted in the modeling process. Open the file in Excel and sum each of the periods. Copy and transpose that row to a column. Create the counting numbers next to this column (1,2,3,4, etc). Sort the two columns by the count largest to smallest. Now you have the count of the time period with the most outliers at the top. Below is an example with 10 SKU's with 1,049 daily observations. We did some investigation by subtracting different time periods to identify a missing holiday variable but we didn't find any differentials of 365 so given that we conclude that these are just interventions and not a systematic pattern since 3 out of 10 could randomly occur at a given time period by chance. Note that the series need to all start at the same time period so that the data is aligned! Also, this file is a log file so you need to delete it once in a while to keep the size down.

The level and trend don't show the sign of the coefficient making their report more ambiguous. You can turn off these reports by creating a file named "nocsv.afs" in the installation folder. This file is a log file so you can delete it once in a while to start fresh.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SERIES	#	NOB	1	2	3	4	5	6	7	8	9	0	1	
2	__0417061270	8	1049												
3	__0417061353	11	1049												
4	__0417061472	10	1049												
5	__0417061548	26	1049												
6	__0417061590	13	1049												
7	__0417061672	18	1049												
8	__0417061757	23	1049												
9	__0417061831	21	1049												
10	__0417061997	17	1049												
11	__0417062001	24	1049												
12				0	0	0	0	0	0	0	0	0	0	0	
13															
14															
15		1	204	3											
16		2	585	3	381										
17		3	596	3	11										
18		4	628	3	32										
19		5	105	2	-523										
20		6	220	2	115										
21		7	221	2	1										
22		8	222	2	1										
23		9	241	2	19										
24		10	359	2	118										
25		11	575	2	216										
26		12	576	2	1										
27		13	584	2	8	364									

Early Warning System Report

The report "earlysig.txt" provides R-squared and some other helpful information.

```
   ITEM         TIME  TIME   R2  FORE      NOB  REG   ERR TR  #        ACF(1)   AUTOID   VAR CHANGE    SOURCE FILE
M2828              1     1 0.00 0.102E+06   53    1    0  0   7        0.000    1        0              NOFILE



ITEM         NAME OF SERIES
TIME         ELAPSED TOME
TIME         TOTAL ELAPSED TIME
R2           R-SQUARE
FORE         FORECAST
NOB          # OF OBSERVATIONS
REG          BEGINNING POINT IN TIME WHERE OUTLIER WAS USED
ERR          RETURN CODE (ZERO IS GOOD, NON-ZERO IS AN ERROR CODE)
TR           # OF TIME TRENDS
#            TOTAL # OF INTEREVENTION VARIABLES
ACF(1)       AUTOCORRELATION LAG 1
AUTOID       0 FOR USER SPECIFIED STARTING MODEL : 1 FOR AUTOMATIC MODELING
VAR CHANG    1 IF VARIANCE CHANGE DETECTED AND IMPLEMENTED
SOURCE FILE  NAME OF ASC FILE
```

The report "earlysig.csv" is created to help find out if the last observation is "out of control". The report tells you the name of the series, the last observations number, the probability of out being out of control, the observation, and what the observation was expected to be. There is one record added to this file every time (up to 20 series and then the file is purged to avoid a large file—the batch version will continue to write out to this file so if you have 50,000 series this file will have 50,000 records). Note: This report is saved to your installation folder NOT the OUTPUT folder.

You can bring this file into Excel and sort on probability (ascending) to find the series that seem to be "out of control". I ran the series inlier and there was nothing found to be "out of control in the last observation" as you can see here. However, I went and I changed the last observation from a 9 to 5,555 and then reran Autobox. The second row shows a low p-value to show that there is something wrong. It prints out what the value should have been here. This file is a log file so you can delete it once in a while to start fresh.

```
EARLYSIG.TXT
ITEM           NOB  PROBABILITY         ACTUAL               EXPECTED
inlier                                 9.0000000000
inlier          10   .0000          5555.00000           5.0000000000
```

Forecast Monitoring Report

This report gives you a way to check that the forecast from Autobox compared to a simple method to locate if there are any forecasts that are very low or very high. The report takes the ratio of the two forecasts so that you can locate very low or very high ratios to inspect. This report has many false positives as a simple method is in fact that, simple.

You can create a file named "fore-mon.afs" in the installation folder and if you wanted your simple forecast benchmark to be a weighted average of the last 4 periods you would have a total of 5 rows in the file:

4

.25

.25

.25

.25

You would save this file and run Autobox and a report would be created named "fore-mon.csv". You can sort on the field "Autobox/base" to identify low and high differences in baseline forecasts. This file is a log file so you can delete it once in a while to start fresh.

ITEM	NOB		BASE	AUTOBOX	DIFFERENCE	AUTOBOX/BASE
REGION1	147		1025	500	-525	0.49
REGION10	147		0	341		
REGION11	147		225	58	-167	0.26
REGION12	147		12516	11477	-1039	0.92
REGION13	147		7642	7072	-570	0.93
REGION14	147		2342	4739	2397	2.02
REGION15	40		0	19		
REGION16	142		150	0	-150	0
REGION17	147		7213	6319	-894	0.88
REGION18	131		424	611	187	1.44
REGION19	91		0	0		

Forecasting Fit Exception Report

This report gives you a comparison of the fitted MAPE between the Autobox model, the naive model and a mean model. You create a file in the installation folder named "mapecomp.afs" and a report will be generated named "mapecomp.csv". The Autobox model column could be sorted and used to compare to the simple methods to provide a check that Autobox is doing better than the simple methods. Of course, like always you can have false positives. This file is a log file so you can delete it once in a while to start fresh.

ITEM	NOB	AUTOBOX MODEL	NAIVE	MEAN
REGION1	147	0.374	0.911	0.724
REGION10	147	0.225	0.376	0.162
REGION15	40	0.046	0.224	0.228

Measuring Accuracy

This utility is for evaluating forecasting accuracy from many withheld periods. The number of forecasts in the ASC file will determine how this will all behave.

Create a file in the Autobox folder called “Rolling.afs” using “Notepad”. There will be 2 rows in the file. The first row tells the system how many period back you want to withhold. The 2nd row defines the periods out between each withheld amount. If you have 23 as the number of forecasts and have a 1 in each of the two rows, one snapshot will be produced from 23 periods back.

You would typically want the second row to be a “1” so you could evaluate each period getting a “rolling accuracy” from many origins, but if you wanted to get only every other period you could put a “2” for example, but this isn’t usual to do. The # of forecasts in the ASC file needs to match the second row. In this example, we used 20 and a 1. If we have 144 observations and we have 12 forecast periods, the first observation you can withhold is 132 as you can see from the file created “summape.csv” as shown below. The max is 52 for row 1 as the maximum seasonality is 52 IN Autobox so 52 is the furthest out you can run a forecast when doing this.

20

1

ITEM	NOB	NF	MAPE	ACTUAL	FORECAST
BJ07	132	12	2.75	5714	5797
BJ07	131	12	2.74	5687	5649
BJ07	130	12	3.27	5659	5540
BJ07	129	12	3.34	5605	5526
BJ07	128	12	3.6	5560	5462
BJ07	127	12	3.41	5513	5427
BJ07	126	12	4.73	5439	5218
BJ07	125	12	3.61	5376	5274
BJ07	124	12	3.29	5324	5285
BJ07	123	12	3.73	5259	5101
BJ07	122	12	5.18	5246	4974

Autobox will run many different analysis from different origins and generate a CSV file to show accuracies. You will need to delete this output file (ie summape.csv) after your analysis as it will just grow and grow. The HTM files generated on the disk are the analysis files if you want to review. This can’t be used with Simulated forecasting. This can be done using causal problems, but with no searching for day of the month impacts (ie nofixday.afs) due to complications.

Running and Running multiple instances

We have found that by simply creating copies of the Autobox run-time folder and running Autobox simultaneously you can greatly reduce the execution time. Our benchmarks have found that running two Autobox sessions simultaneously yields almost a 50% reduction time.

You can set up multiple simultaneous runs of Autobox batch by following two approaches steps.

The Quick Way

You can copy everything from the installation folder to a new folder, but there are some files that you don't need everywhere (like this manual) but it really isn't that much of a great waste of space.

The Efficient Way

1. Create a new folder (ex: C:\Abox1) and copy the following files to it. We will call this the program folder.

   ABOXDN.EXE
   FFBATCH.DLL

2. Put the program folder into the systems path (ie c:\windows).
   (instructions for Windows 2000 and XP)
   You MUST have administrator right on your machine to do this!
   From the desktop right click My Computer and click properties.
   In the System Properties window click on the Advanced tab.
   In the Advanced section, click the Environment Variables button.
   Finally, in the Environment Variables window, highlight the path variable in the Systems Variable section and click edit. Add or modify the path lines with the path you wish the computer to access. Each different folder is separated with a semicolon as shown below.
   ex: c:\windows\system32;c:\windows;c:\ffb

3. Create another folder (ex: C:\Abox2) and copy the following files to it. We will call this the data folder.
   LAMONT.AFS
   NEW.AFS
   any .ASC files
   any .LST files
   Create a separate data folder for each instance you would like to run.

To create a .LST file (if you don't already have one)

You will need to issue the command below to create the "TO DO" list for Autobox batch. The goal of this step is to create the list of series (even if it is only 1 series!!!!) that need to be modeled.

DIR *.ASC /B > NAME.LST

To run each instance:

In the data folder issue the command below to run

ABOXDN .\ REMOTE.LST (unix/linux systems)
ABOXDN ./ REMOTE.LST (windows systems)
Syntax: ABOXDN [data folder] [List File (TEST.LST)]

Mixed Frequency Modeling or “Parent to Child” Modeling

Let’s discuss the two ways to use this powerful feature:

1. When you are trying to forecast hourly data, Autobox will use the daily data(ie “parent”) and forecast as a causal variable to help forecast each of the hours (or “child”). This is called a “MIXED FREQUENCY” or a “TIME” oriented problem. The daily data is a seasonality of 7 and the daily data has a seasonality of 24 so the seasonalities are in fact “mixed” which should explain why we call it this!
2. When you are trying to forecast a state it might be helpful to use the national forecast to guide the process. This is called a “GROUP” oriented problem and has none of the complications of mixed frequency of seasonality, but has a hierarchial relationship. When you are trying to forecast a product it might be helpful to use the product family total to forecast.

As discussed at the beginning of the manual, you need to have downloaded and installed 7z into the installation folder. Download and install the program “7z” program to c:\autoboxdn folder. We use this program to manage data and output in a very creative way.

Use this link if you have a 64 bit machine
http://download.cnet.com/7-Zip-64-bit/3001-2250_4-75133313.html?spi=e8392889b9496b6869bcb80fe22b96f9

Use this link if you have a 32 bit machine
http://download.cnet.com/7-Zip/3000-2250_4-11655052.html

ONE-TIME SETUP

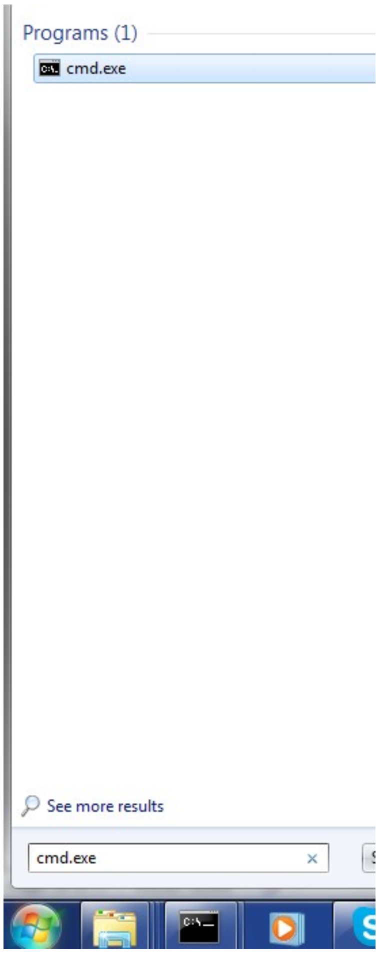
Do you have a 64 bit machine?

If you are using a 64 BIT machine then you need to type this command at DOS (in the installation folder) to use 7z’s 64 bit version. The e means extract and 64bit.zip contains some files we will use to run and manage the process:

C:\aboxdn\7z e 64bit.zip

We will create some example folders to show you how you would run Autobox.

You enter this next command only once in order for us to set up of some example folders with data to show how to run this type of data. These folders will be created from the zip files in the installation folder(ie ww1.zip, etc.). You would need to create these folders yourself you're your data and some other files that will be explained. Click start and type cmd.exe and hit enter to launch a DOS box.



Type "cd\autoboxdn" and hit enter

Type "makesub" and hit enter and the process will begin

PROCESS FLOW

(Make sure you use UPPER CASE when creating the folder names)

1)The data you want to analyze should be stored in the Autobox installation folder(ie Autoboxdn). You will have your data in a ZIP file called "TEST.zip", for example. The Autobox "ready" files are called "ASC" files as discussed earlier.

2)You will need to create a folder with a name that makes sense to you, but we recommend a prefix of "PROJ-" at the beginning. Let's call this new folder "PROJ-001". Autobox will post the results to this folder when it is finished executing.

3)You can make use of certain AFS override files in the newly created folder that will govern how Autobox will execute on this data. Take note of the files with an XXX file name. You can copy these to the "PROJ" folder and change the XXX to AFS.

4)You will create/modify a CON(ie conditions) file that will govern how Autobox is run (ie is it time or mixed frequency?, or do I want to reconcile the forecast top down or bottom up?). Make sure to save the name of the file as "test.con ", for example, to match your zip file that you are running.

6)To run the project, open a DOS Window and enter "cd\autoboxdn" and hit enter.

"GOPTC PROJ-001 TEST A"

PROJ-001 is the folder you are going to write your output, TEST is the name of the zip file that contains the problem sets. The last option is an A and can be one of five run options A,I,E,F, or L. If you recall the steps in Box-Jenkins modeling where you identify, estimate and forecast. I, E, F, L reuse the model. You will likely just use the A and maybe the L options.

The output is written to the PROJ-001 folder. Forecasts are saved to a ZIP file. There is also some output found in the installation directory. There is a log file in the installation directory that shows if Autobox crashed or ran through ok(ie log-file.txt).

When you run "GOPTC", the license files (ie *.AFS file extension) are backedup. If Autobox happens to crash(ie machine crashes or Autobox), you can restore these license files by copying all of the SFA file extension files to AFS.

LET'S DISCUSS THE THREE OPTIONS YOU CAN RUN:

1)You might have a forecast that you want all of the children to match to. You can provide this override forecast in a file called PLAN.PRO. This file is in the same format as the Autobox forecast file (ie AB50PRO.123). The PLAN.PRO file needs to exist in the project folder (ie PROJ-001).

2)If you would like to build a customized model for the parent that uses causal variables(ie holidays, promotions, etc), you can create an ASC file called GROUPT.ASC. This ASC file will be used, analyzed and a forecast made and then used as a causal variable to forecast each of the children problem sets. The GROUPT.ASC file needs to exist in the project folder (ie PROJ-001).

3)If you provide no PLAN.PRO or GROUPT.ASC, then the system will sum the children automatically and then model the total (ie parent) and create a forecast on its own.

DON'T BE SLOPPY! - Just remember that if you leave PLAN.PRO and GROUPT.ASC in the project folder this will confuse the system as to what you want as you shouldn't have both. If both exist, we will delete GROUPT.ASC so that the system can proceed.

FORECASTING OPTIONS

Option "A" is for analysis - will do a complete analysis.

Option "I" is for Identification - will reuse the model from a previous analysis and bring in the most recent data to revise the model and then forecast.

Option "E" is for Estimation - will reuse the model from a previous analysis and bring in the most recent data and estimate the model and forecast.

Option "F" is for Forecasting - will reuse the model and forecast.

Option "L" will reuse the saved model and forecast with no capability of graphs or reports as only forecasting being done. The strength of the L option is that it is only forecasting so speed is the key here when you have a large number of series to process. For some analysis, the L option increases speed by10x to 30x.

If you have tens of thousands of problems (ie millions?) and you need results faster, here are some ways to speed up the process while not reducing functionality (too much!). Buying faster machines and multiple licenses of Autobox to run a new model with every new observation may be the best solution, but budgets sometimes are limited.

If you need to reduce the time spent on remodeling when new data comes in, you can tailor the process to NOT remodel and just reuse the previous model and use it with the latest data. The downside is that you are not using the latest information, but there are tradeoffs in all decisions as you already know!

You can also use this feature to perform “what-if” analysis using different future values of the causal variables. This same feature can be found in the Autobox Interactive version. You can do by doing the following. You first have Autobox run and save all the model files. You can then have Autobox run using an alternate set of future values(i.e. different ASC files with different future values of the causals) that represent an “upside” scenario or a “downside” scenario. Run Autobox using those various ASC files to get your “what-if” analysis.

Let’s describe the slowest to fastest options

A (slowest), I,E,F, L(fastest). You need to run option A first to build the model before you run options I, E, F, L to reuse the model.

If you had 10,000 series and wanted to use hourly data, you would create 10,000*24=240,000 problem sets (ie ASC files). There would be 10,000 ZIP files that would be created and stored in the installation folder.

HIERARCHIAL FORECASTING

If you had hierarchies that you wanted to use total company sales, regional sales, product family as a causal variable to predict the SKU level data, you would need to first forecast the highest level first and the next levels and so on. You would forecast total company sales (and forecast!) and use it as a causal to forecast each of the regions. From there you could use the total company sales and the regional (forecasts!) as a causal to predict the product family or just a little simpler the regional to predict the product family.

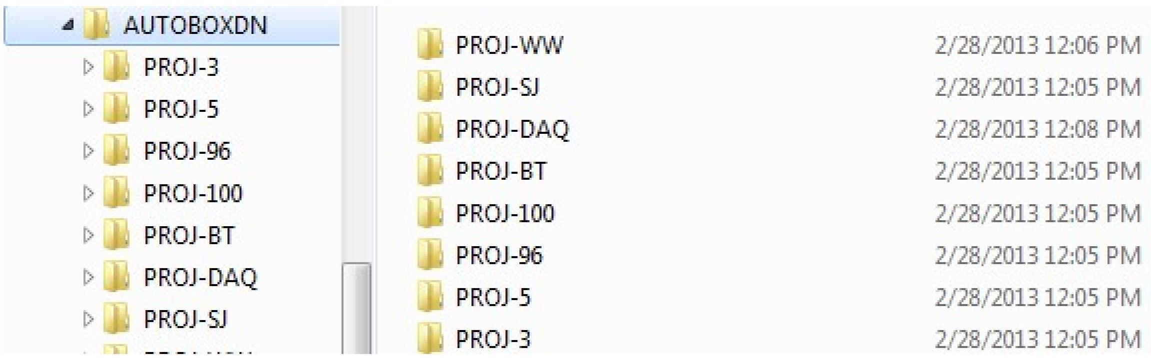
LIMITATIONS

When you create the ASC files, the name of the series inside of the ASC file for the “children” data should not exceed 18 CHARACTERS. The maximum number of children is 1,000, but this can be modified by us, if necessary. The maximum number of children would have no impact on a “time problem” like hourly modeling, for example.

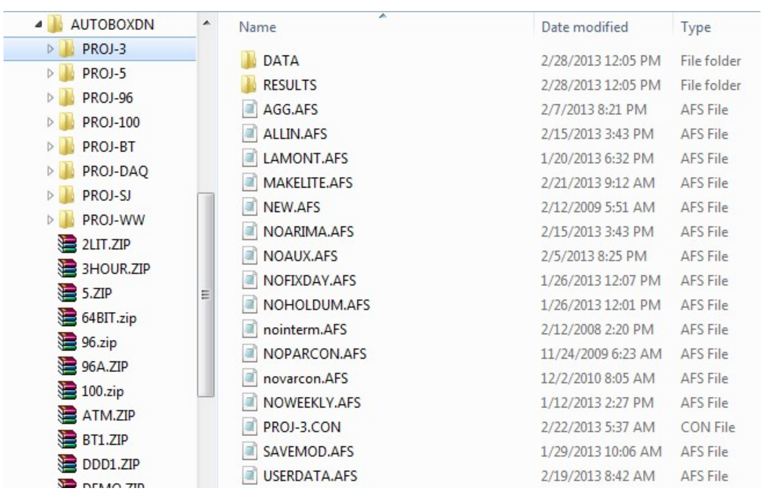
The number of observations used in the analysis is subject to the version of Autobox that you have purchased (ie Pro, Enterprise, Enterprise +) and as seen on our price page on our website http://www.autobox.com/cms/index.php/products/autobox/pricing

REVIEW EXAMPLE FOLDERS CREATED

Take a moment to review the example folders that were created so that you can better understand what you need to do! You will notice that there are AFS files and one CON file in the folders. The data folder will hold the results after you run containing the forecasts. The AFS files help to govern the execution of Autobox. These files can be removed or other ones added to change the way the modeling process works. The original data that Autobox reads comes from the installation folder and the data is stored in a zip file. The data inside the zip file are the "Autobox ready" ASC files.



There are AFS files and a CON file that we have already placed in this folder for example. We have already created the data and results files as well.



LET’S REVIEW THE EXAMPLE DATASETS

PROJ-3 - These are 2 examples of monthly data from the William Wei textbook meant for a “product oriented” parent to child.

PROJ-5 - These is an example of 5 monthly datasets meant for a “product oriented” parent to child.

PROJ-96 - These is an example of semi-hourly data meant for a “time oriented” parent to child.

PROJ-DAQ - These is an example of hourly data meant for a “time oriented” parent to child.

PROJ-SJ – This is an example of hourly data meant for a “time oriented” parent to child.

PROJ-WW – This is an example 2 monthly data from the William Wei textbook meant for a “product oriented” parent to child. We have provided an example of a management override here. We have a file called GROUPT.ww1 that exists in the installation directory that can be copied to PROJ-WW as the name GROUPT.PRO. Note there are two very high values in the first two forecast periods. Management thinks things will be high here despite no statistical support for this. When you run, since GROUPT.PRO exists, this file will be used to override the forecasts and the allocation to the children files will be made from this file. You can verify this in the WW1PARENTPRO.ZIP file that will be generated. You can also rename the GROUPT.PRO file if you want to see what happens without the overbearing management override.

WW30.PRO - Notepad

File Edit Format View Help

DATE	FORECAST	LOWER 80% LIMIT	UPPER 80% LIMIT	FORE STAND
1976/ 1	340.8006961126	263.3330885574	418.2683036671	60.52156
1976/ 2	346.2867619943	251.7506232788	440.8229007091	73.85636
1976/ 3	70.7813828383	55.4132797825	86.1494858943	12.00633
1976/ 4	84.7656750324	69.1246067157	100.4067433491	12.21958
1976/ 5	86.9032632183	70.6378994240	103.1686270127	12.70731
1976/ 6	85.3379133882	69.2620401516	101.4137866248	12.55927
1976/ 7	84.5831234739	68.6039371716	100.5623097760	12.48373
1976/ 8	82.7815334206	67.1242642744	98.4388025669	12.23224
1976/ 9	79.4266938179	64.3976808890	94.4557067467	11.74141
1976/ 10	79.6267892556	64.5585845233	94.6949939878	11.77203
1976/ 11	70.1961879857	54.3914661655	86.0009098061	12.34743
1976/ 12	58.8704478111	41.9351761025	75.8057195196	13.23068

WW31.PRO - Notepad

File Edit Format View Help

DATE	FORECAST	LOWER 80% LIMIT	UPPER 80% LIMIT	FORE STAND
1976/ 1	254.6618997610	189.3639767454	326.4896150783	51.01400
1976/ 2	253.6066629548	169.0711086365	338.1422172731	66.04340
1976/ 3	38.1541122762	22.5011431372	53.8070814151	12.22888
1976/ 4	37.5051835869	20.1950988545	54.8152683193	13.52350
1976/ 5	38.3613389249	18.6888574250	58.0338204249	15.36912
1976/ 6	37.6082593411	17.3576581574	58.8231748668	15.82078
1976/ 7	37.2321580470	15.2747315065	59.1895845876	17.15423
1976/ 8	36.4090565629	13.0699177405	59.7481953852	18.23370
1976/ 9	34.9131223332	11.6377074444	58.1885372220	18.18391
1976/ 10	34.9866029406	10.7651085971	60.1051896671	18.92304
1976/ 11	36.6874784725	9.4070457622	63.9679111827	21.31283
1976/ 12	39.3068635509	9.0708146656	69.5429124363	23.62191

GROUPT.PRO - Notepad

File Edit Format View Help

DATE	FORECAST	LOWER 80% LIMIT	UPPER 80% LIMIT	FORE STAND
1976/ 1	595.4625958736	73.6924969256	117.2326948217	17.00789
1976/ 2	599.8934249491	69.1058557625	130.6809941356	24.05278
1976/ 3	108.9354951145	71.2285776507	146.6424125783	29.45852
1976/ 4	122.2708586193	78.7306607232	165.8110565153	34.01578
1976/ 5	125.2646021432	76.5851810185	173.9440232679	38.03079
1976/ 6	122.9461727293	69.6205386567	176.2718068019	41.66065
1976/ 7	121.8152815209	64.2170136871	179.4135493547	44.99864
1976/ 8	119.1905899835	57.6154516104	180.7657283565	48.10557
1976/ 9	114.3398161511	49.0295193070	179.6501129953	51.02367
1976/ 10	114.6133921962	45.7702946332	183.4564897593	53.78367
1976/ 11	106.8836664582	34.6804165987	179.0869163178	56.40879
1976/ 12	98.1773113620	22.7634764344	173.5911462896	58.91705

HOW TO SPECIFY THE CONDITIONS IN THE "*.CON" FILE

Let's review how you should set up the 6 lines required in the "*.CON" file (ie proj-5.con) that governs the conditions for your run. We have an explanation what each line in the example files of each line after the ";". Let's discuss what each of the 5 lines tells the system how to run Autobox:

1st line – Parent to Child? You would use a 0 when the series have no common relationship. You would use a 1 to do parent to child modeling.

1 ; 0=PARENT WILL NOT BE USED TO MODEL CHILD; 1=YES

2nd line – Define the seasonality for the problem. Use a 1 if the parent's seasonal, day of the week and holiday patterns were sufficient with no need to additionally model these same effects for each hour child. This is the fastest mode and we have found the most needed.

2 ; 1 CHILD USES SEASONALITY = 1 ;2 USES FIXED DUMMIES;3= FULL SEASONAL

If you specify a "1" then the child model will not have any search for seasonal impacts. This means that you think that the parents seasonality will be enough. This would be rare use in our opinion

If you specify a "2" then the child model will search for AR(7) and/or daily fixed dummies. No monthly dummies would be included. This would be the most common usage. All test examples are set to "2".

If you specify a "3" then the child model will search for daily fixed dummies and holidays which assumes that the child's data pattern is completely differen then the parents. This would be a rare need and only if "2" output didn't make sense. You would need to also put the date (ie __01012) as a prefix to the series name in the ASC file for option 3 to work.

3rd line – Number of Forecasts that you want generated. The # of forecasts in the con file must match the number of forecasts in each of the asc files. If either the groupt.asc file exists or the groupt.pro file exists there should also be an agreement with the # of forecasts specification. Note that by rule, the number of observations in each asc file have to be identical each other. THE FORECASTS IN THIS FILE MUST MATCH THE NUMBER IN THE ASC FILES!!!!!!

60 ; NUMBER OF FORECASTS

4th line – Type of reconciliation

LEAVE THIS LINE BLANK AS BOTH PARENT TO CHILD AND CHILD TO PARENT ARE DELIVERED AUTOMATICALLY

5th line –If you have a “TIME” oriented problem and are trying to forecast hourly data using the family parent then choose MIXEDF. If you have a “GROUP” oriented problem and are trying to forecast states and using the nation as a parent then choose GROUP. If you have chosen ‘0’ on the first line, then put GROUP here, but it won’t matter which one as it is not needed.

GROUP ; MIXEDF OR GROUP

6th line – Provide the beginning date of the data for a mixed frequency type of problem. You can leave this line blank if this doesn’t apply:

__012809 ; OPTIONAL DATE INFO FOR MIXEDF DATA

Top Down or Bottom Forecast reconciliation are standard forecasting concepts. The need to have the forecasts match different hierarchies is the goal of this step. There is time and effort to reconcile and sometimes you have series that have nothing in common so no need to reconcile so this is a way to skip the run time.

HERE IS AN EXAMPLE CONDITIONS FILE (*.CON) that needs to exist. In this example when Parent not used to model child and no reconciliation. The second line should be 1

0 ; 0= PARENT WILL NOT BE USED TO MODEL CHILD;1=1 PARENT WILL BE
2 ; 1 CHILD USES SEASONALITY = 1 ;2 USES FIXED DUMMIES;3= FULL SEASONAL
21 ; NUMBER OF FORECASTS
THIS LINE IS LEFT BLANK FOR FUTURE USE
MIXEDF ; EITHER MIXEDF OR GROUP
__012809 ; OPTIONAL DATE INFO FOR MIXEDF DATA

RECOMMENDED AFS FILES

For hourly or semi-hourly data, we recommend having nointerm.afs, noparcon.afs, novarcon.afs, noweekly.afs, nofixday.afs, noarima.afs, noholdum.afs and stepupde.afs with a "100" inside of it.

For daily, data we recommend noarima.afs, noholdum.afs and stepupde.afs with a "100" inside of it

ERROR RECOVERY

If you are running and your machine crashes, then you need to do this before starting the run over. You should delete all PRO files and ASC files in the installation folder.

HOW DO I CHANGE THE LENGTH OF THE FORECAST PERIOD EASILY?

If Groupt.asc is not provided by the user and the specified number of forecasts in the control file is different from the specified number of forecasts in each child asc file and there are no causals in each of the child asc files then the program will use the number of forecasts specified in the con file. The problem set PROJ-3 with a target zip file of 3HOUR.ZIP is an example of this. The con file specifies 100 forecasts while the individual asc files for the 3 children specify a forecast of 21. It is much simpler to change the number of requested forecasts in the con file. Note that there are no causal series in the children asc files.

As a counter example consider the problem set PROJ-BT with a target zip file of bt1.zip which has 12 children files. Three of them have causal (predictor) variables included. You could not simply change the required number of forecasts via the con file as this could be a potential violation of the content of the three asc files which may have contained future values for one or more of the predictors.

SAVING AND REUSING MODELS TO RUN MILLIONS OF PROBLEM SETS

A)CREATE MULTIPLE DIRECTORIES

New Computers have multiple processors which allows you to run multiple sessions simultaneously. Just copy the Autobox installation directory to a new directory(ies?) and you can leverage this power.

B)SAVING AND REUSING MODELS – A DIFFERENT WAY TO RUN THAN THE PARENT TO CHILD MODE ALLOWING SOME DIFFERENT FLEXIBILITY

If you have a starting model that you insist on using and overriding the Autobox model with OR if you have very specific set of modeling conditions (ie level of confidence in removing variables for example) than use this approach to reusing models. If this is the case then this is an alternative to the "Parent to Child" way of running, but with no ability to run using the very fast forecasting option ("L").

Here is how to reuse models for the "Comprehensive and Multiple batch modes"

In order to let Autobox batch know if you would like to save a model you need to place a 0,1,2,3 after the name of the zip file. A '0' runs the entire process and saves the model only. If we wanted to save our model we could put a '0' as seen here.

Issue the command at the DOS prompt:

FFBATCH1 WEI3 0 (see next section on changing default modeling conditions).

When a '0' is used to run FFBATCH1 a file is saved with the model. The name of the file is the series name with a "MOD" as the extension (ie.We30.MOD). The MOD files are copied to MOZ files for backup purposes as the MOD files are deleted after being used via the model reuse (type 1,2,3). The contents of the saved model file (MOD) is discussed in Appendix 1 in the section "How to specify your own model".The three options to put at the end of the line which use an existing model:

Option/Goal	File Used
1. SIMPLY FORECAST	PREDICT.XXX
2. TUNE COEFFICIENTS AND THEN FORECAST	TUNE.XXX
3. TUNE COEFFICIENTS & POSSIBLY REMODEL THEN FORECAST	REMODEL.XXX

If we run Autobox batch with a '1' to run the R-squared is NOT CALCULATED as estimation is bypassed via PREDICT.XXX.

We now have a file named ALLCAST.USE which contains all the forecasts. The amount of time eliminated to develop the forecast versus just modeling and forecasting can be as much as 30:1 reduction, but in most cases it will be 20:1, a significant time saving feature especially when the modeling process is complex (ie. regression equations, daily time series, etc.).

Similarly, if you wish to have Autobox batch optimize the model coefficients and then forecast put a '2' at the end of the line:

FFBATCH1 WEI3 2

If you wish to both TUNE and RECONFIGURE the model then put a '3' at the end of the line:

FFBATCH WEI3 3

Here is how to reuse models for the "bare bones" approach

To save your model:

- Create a file named savemod.afs (copy savemod.xxx to savemod.afs)
- Run Autobox and the models will be created
- Create a Zip file of all of the *.mod files for archiving

To reuse your model using an existing model two things are necessary:

- We will assume it has been some time (1 month?) since you created the model so you should unzip the MOD files to the folder.
- To tell Autobox batch that there is a model saved and should be used:

Copy Engine.xxx to engine.go

and

Create a trigger file called USEMOD.AFS or just copy usemod.xxx to usemod.afs

You can run Autobox at this point but Autobox is default running conditions are using the expert system to build a model which means you aren't really reusing a model, but rather building it all over again. Here is how to tweak the conditions to just forecast(turn off "necessity" on line 17) for example.

- If you want to override AFS' expert system, edit Engine.xxx and modify any of the conditions as you see proper (see Appendix for more on Engine.afs) and save the file as "Engine.afs". Also, see predict.xxx for an example where we have restricted the analytics to just forecasting (note that estimation is turned off by setting it to '0'). Also, note that the structure is hierarchial. If an item is set to zero then any item that is indented underneath it will also not be executed.

Just a word of awareness regarding reusing models here. If you build a model using 1,000 observations and the first observation started on a Monday and you go to reuse the model, but you decide to remove the first 400 observations and just use the last 600 observations to forecast/tune/remodel and the model that was build originally had "fixed effects" (ie day of the week or week of the year) then there will be a misalignment in the data. You would need to remove observations so that they divided evenly into 7 (ie as it is daily data) with no remainder to make sure your data started on Monday.

Intermittent Demand

Autobox will check to see if more than 25% of the observations are zero and then run the following scheme to predict the intermittent demand.

Two new time series will be created: the interval and the rate. The interval series will be the number of periods with zero demand between periods where there is demand (i.e. If there is demand at every time period then the interval would be 1). The rate is the interval divided by the demand. We find this as a better alternative to Croston's method.

Autobox approaches the case of Intermittent or Sparse Demand by making the problem into a causal problem. Autobox tracks the count of how many periods were zero and creates an "interval" time series. It takes the volume and divides it by the interval to get a "rate". It projects out the interval and rate into the future and divides the two to get a forecast. Autobox will do all of this while still searching for level shifts. You need to have >25% zeroes in the series and 4 intervals to trigger intermittent demand.

You can override the % by creating a file in the installation directory named sparse.afs with .70 in the file to reflect a threshold of >70%.

You can also suppress intermittent demand by creating a file called "nointerm.afs" in the Autobox folder. We recommend creating an override file called "nopulse.afs" to NOT search for pulse outliers when dealing with intermittent data. We allow you decide which way to run it.

Warn Me (What Date We Would Have Need to Build that New Warehouse)

We have added a new feature to Autobox 7.0 that allows a Capacity minded user to define a specified number (ie threshold) and have Autobox tell you at what future date the Forecast's Upper Confidence level will exceed that threshold. When you are trying to determine when your Capacity will be pierced, you can easily do that now. Create a file called limitval.afs and put the statistical confidence level (ie 95.) and save the file to the Autobox folder.

limitval.afs - Notepad

File Edit Format View Help

```
95.0
```

Create a file called "limitdbm.afs" and put the name of the series and the limit to be flagged. If you have 100 series then create 100 rows with information.

limitdbm.afs - Notepad

File Edit Format View Help

```
"fathi",2.
```

After running, a file called Exceed.csv will now exist that tells you the date when the forecast's Upper Control Limit will exceed that limit that you specified.

1		95% FORECAST VERSUS CRITICAL VALUE				
2	NAME	PERIOD	DATE	FORECAST	CRITICAL VALUE	
3	fathi	169		80.16607141	2.0000000000	+

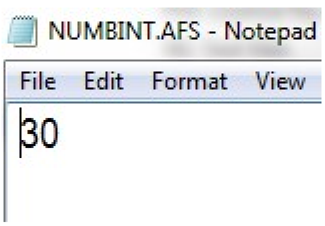
limitdbm.afs - Notepad

File Edit Format View Help

```
"fathi",2.
```

Tell Me Which Are The Largest Outliers that I Need To Research

We also added a feature to allow the user to specify the number of outliers to be reported to focus only on the **LARGEST** to research. Sure, Autobox will identify and adjust for your outliers, but what if you only have time to research, identify and correct for a limited amount? You need a way to sift through the models and equations easily and we have done that for you now. If you only want to see the top 5, you get the top 5! Create a file called numbint.afs and specify the number of outliers you want reported and save the file to the Autobox folder.



After running, a file called Numbint.csv will now exist that tells you the date when the forecast's Upper Control Limit will exceed that limit that you specified.

```
* * * Top of File * * *
          30
I~P00050094            0.7519D+03
I~P00006004            0.7357D+03
I~P00037070            0.6035D+03
I~P00016028            0.4779D+03
I~P00015095            0.4361D+03
I~P00015096            0.4349D+03
I~P00016029            0.4317D+03
I~P00016027            0.4278D+03
I~P00016026            0.4085D+03
I~P00016031            0.3952D+03
I~P00016030            0.3850D+03
I~P00015094            0.3811D+03
I~P00018060            0.3759D+03
```

Daily Data – Using Holidays & outside of the U.S.

If you want to specify a holiday on your own, make sure to start the series name with a "M_" as Autobox has a useful check of the history for all years having a zero to override the forecast to be a 0.

Autobox incorporates U.S. Holidays into the modeling and forecasting process. If you have data from outside of the U.S., create a file called "noholdum.afs" to suppress the search for U.S. in the Autobox folder.

The TOP GDP producing countries were selected and there are 16 Countries that we have set up which are ready to be used in Autobox from 2001 out to the year 2027. If your forecast is only out to 2020, there is no need to adjust. To apply India holidays, create a file called "country.afs" and put the code as seen below (ie 5 for India) into a file called "country.afs" and save it to the Autobox folder. Autobox will use the Holiday variables from that Country. We will explain how you can customize Autobox for a different country not listed or even perhaps a local area within a country which follows a more specific holiday list than what we have included.

Code	Country
1	USA
2	BRAZIL
3	FRANCE
4	GERMANY
5	INDIA
6	ISRAEL
7	ITALY
8	JAPAN
9	MEXICO
10	RUSSIA
11	RWA
12	SOUTH AFRICA
13	SOUTH KOREA
14	SPAIN
15	SWITZERLAND
16	AUSTRALIA
17	UNITED KINGDOM

If you want to create your own holiday file for a specific country, you can use another country's holiday file as a template. For example, open the file "ROS01.HLD" found in your Autobox folder (which is USA) and make changes to it and save it as ROS18.HLD. You can then create a file called "country.afs" with an "18" in it and Autobox will use that to bring in the custom holidays.

Let's discuss the file format. We will not show you the whole file as it is too large.

The 18 in the first row tells Autobox how many holidays exist. If your country has only 12 then change this number to 12 and then save this file with a new name with a number higher than the ones listed on the page before(ie ros17.hld). Row two will have the first holiday's name and a count of 27. The 27 represents that there are 27 years of this holiday in the file. The date in the next row, 37250, would be the 37250th day since 1/1/1900(our internal date reference point). The numbers below 27250 are increments of 365 and sometimes 366. Set row 3's date to match the holiday that you want to add and set the dates below it to match. Note: You don't need to set this up like we did to go out 27 years like we did. Just remember that you would need to change 27 down to a different number.

```
AXFBJR(  1)( 1:  ) ='18                    '
AXFBJR(  2)( 1:  ) ='M_CHRISTMAS           27'
AXFBJR(  3)( 1:  ) ='37250                 '
AXFBJR(  4)( 1:  ) ='37615                 '
AXFBJR(  5)( 1:  ) ='37980                 '
AXFBJR(  6)( 1:  ) ='38346                 '
AXFBJR(  7)( 1:  ) ='38711                 '
AXFBJR(  8)( 1:  ) ='39076                 '
AXFBJR(  9)( 1:  ) ='39441                 '
AXFBJR( 10)( 1:  ) ='39807                 '
AXFBJR( 11)( 1:  ) ='40172                 '
```

```
AXFBJR( 12)( 1:  ) ='40537                '
AXFBJR( 13)( 1:  ) ='40902                '
AXFBJR( 14)( 1:  ) ='41268                '
AXFBJR( 15)( 1:  ) ='41633                '
AXFBJR( 16)( 1:  ) ='41998                '
AXFBJR( 17)( 1:  ) ='42363                '
AXFBJR( 18)( 1:  ) ='42729                '
AXFBJR( 19)( 1:  ) ='43094                '
AXFBJR( 20)( 1:  ) ='43459                '
AXFBJR( 21)( 1:  ) ='43824                '
AXFBJR( 22)( 1:  ) ='44190                '
AXFBJR( 23)( 1:  ) ='44555                '
AXFBJR( 24)( 1:  ) ='44920                '
AXFBJR( 25)( 1:  ) ='45285                '
AXFBJR( 26)( 1:  ) ='45651                '
AXFBJR( 27)( 1:  ) ='46016                '
AXFBJR( 28)( 1:  ) ='46381                '
AXFBJR( 29)( 1:  ) ='46746                '
AXFBJR( 30)( 1:  ) ='M_CINCODEMAYO        27'
AXFBJR( 31)( 1:  ) ='37016                '
```

Many rows removed to avoid redundancy

```
          '

AXFBJR(503)( 1:  ) ='45972                '
AXFBJR(504)( 1:  ) ='46337                '
```

AXFBJR(505)(1:) ='46702   '

Change or make sure the numbers on the right are the counters for the first instance of a holiday. Note that Cinco De Mayo up above has a counter of 30 and 30 is in the second row shown below. Once you have done this, all you need to do is save the file and change the country.afs file and save it.

Simulation by Integrating Delphi Method Forecasts - Overview

If you want to use expert forecasts and the probability of ranges (ie a distribution) as a causal variable into a regression model and forecast and this explains how to do it.

This is a two-step process which can be scripted into a single step using R or the BAT language, but for this Windows version there are a few steps.

We talk about two steps for purposes to show you what clearly what is happening. The first step is to generate a 1,000 forecasts (ie a "simulated forecasts") for the causal variable and store them on the disk as a file called demand.fum. The user provides a file called "delphi.dat" which contains uncertain expectations for the next period and looks like something like this(table shown below). The first row specifies how many ranges and the next 6 rows specify the probability, min and max of the expected outcome. These will be used to generate 1,000 outcomes using this guesstimate.

6
.05 35 40
.05 40 45
.20 45 50
.20 50 55
.40 55 60
.10 60 65

The second step is to form a causal model and use the simulated forecasts from step 1(file named demand.fum) which was generated in the first step) to help generate an XML file containing a simulated forecasts for the Y variable (ie output/target series for the next period).

The expected forecasts/probability ranges for the causal series from your customer could be seen in the file Delphi.dat where for example 6 ranges are provided with the probability of that range in the first column and the ranges in column 2 and 3. We will copy the Delphi.dat(comes with the installation of Autobox) file to the name Delphi.afs which will trigger to Autobox to generate the simulated forecasts for this "delphi" approach in the first step.

FIRST STEP:

We first need to create an Autobox ASC file(ie template dat which comes with the installation of Autobox) and named it template.asc and then copy Delphi.dat to Delphi.afs to initiater the creation and the storage of simulated forecasts for the causal variable in demand.fum. When we go to run Autobox, the file AFS2SIP.AFS(see attached) will tell Autobox to run 1,000 simulations with the second row telling Autobox to ultimately let outliers play in the forecasts for the target series in step 2 and not be ignored Now it's time to run Autobox. 1)Run Autobox – aboxdn ./ template.asc creating demand.fum.

A file called Delphi.fum will be generated(you could create this output with a different application too!). These values will have a similar distribution as the contents of Delphi.dat as that is what was used to generate the 1,000 simulations.

We now delete the trigger file Delphi.afs now as we are further along the process and already have our "FUM" file which will now be used.

SECOND STEP:

If you look at Delphi.asc(came with the installation) and you will see that there is a causal called "Demand" with a 1 period out forecast. It has 60 months of historical data with a known future value of the causal named "Demand".

Use the Delphi.asc as an example file and note that the future value of the causal variable is just a placeholder and will not be used as the "FUM" file. Run Autobox again using aboxdn ./ Delphi.asc

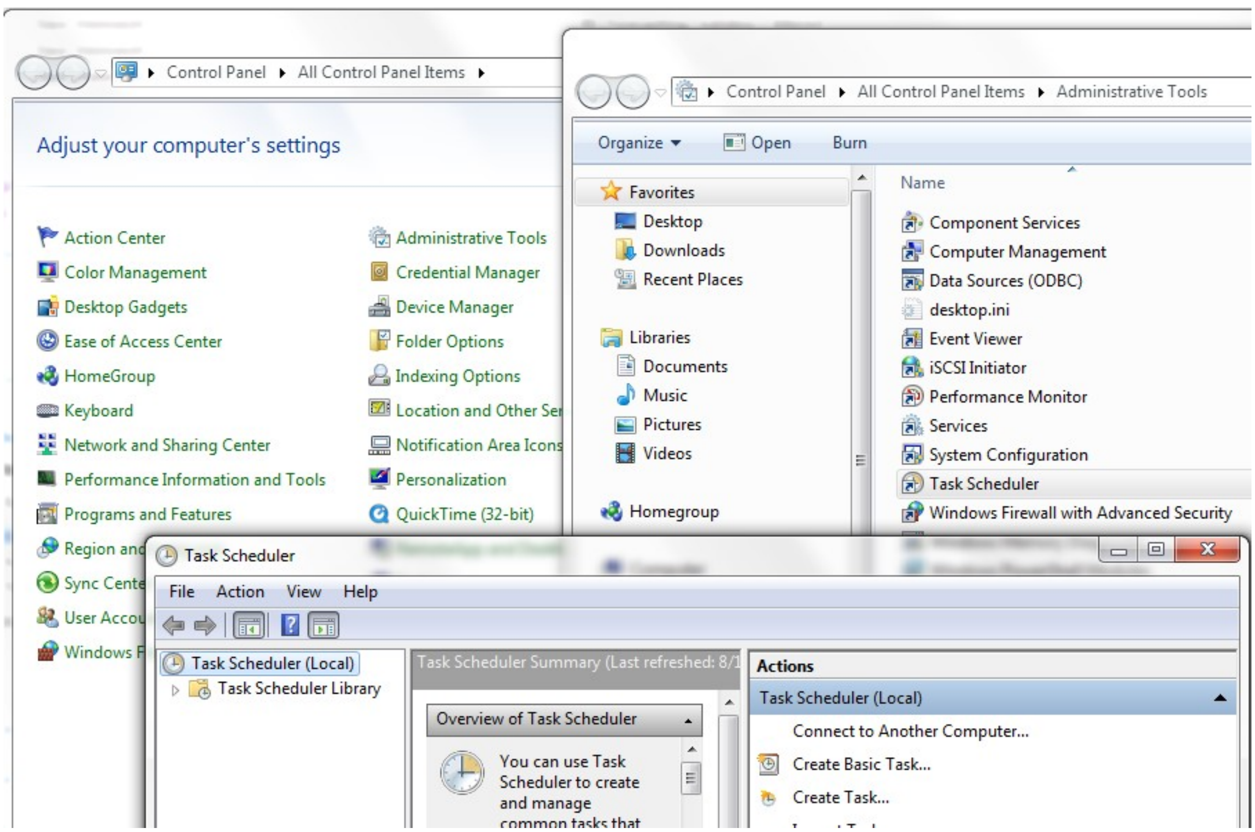
You will now have a details.htm and an XML file generated with simulated forecasts of the Y variable(ie demand).

As you might know, statistical software will use the clock to get a random number. A file called "seed.afs" (comes with the installation) has a set number in it if you want to reproduce the same results which is really just for needing to reproduce results (ie for a journal article for example).

FYI: If you have predictor series that are stochastic(data type 0) the system will automatically generate fum files and use them.

Creating a Production Run using Windows Task Scheduler

If you click on Start/Control Panel/Task Scheduler, you can create a "Task" and set the reoccurrence and point to the bat file you want to run.



Reporting Errors / Anomalies

If you are experiencing an issue that you wish us to investigate, we will need to get some details from you. Email us at sales@autobox.com. Call us if you are confused how to do any of the procedures. PHONE 215-675-0652

Create a temporary file in your folder named “SNOOP.AFS” and “APUSH.AFS” and then run the process again.

1)Take a picture of the error using the Print-Screen key of the AFS message (if any) (Hit the “print screen” key and paste into a Word document)

2)The ASC file(s) that had been in the batch run. The ?.lst file that catalogues the series being analyzed.

3)Any and all files created in the folder after snoop.afs was created. You can sort the folder by time and zip these files using Windows Explorer.

4)All “AFS” files in the folder

5)Engine.go (if it existed)

6)A folder of all files - Go to the DOS prompt by Clicking “Start/Run” and type ‘cmd’ or ‘command’ to get the dos prompt and then type “dir *.* > direct”) and send the file named “direct”

7)Attach FFBATCH.DLL

Make sure you delete the file called SNOOP.AFS AND APUSH.AFS when you wish to resume normal processing.

8)It MIGHT be necessary to copy the output from a DOS session. You can email this easily, by clicking on the top left of the window and choosing “Edit/select all”. You can then choose “Edit/Copy” and then paste the content into an email.

APPENDIX

Creating your own .ASC file

The ASC file contains some header records and the time series. This is really an easy procedure; but the information and data must be entered in a text file in a very specific order in a single column. We would prefer to first show you an example of an ASC file. There is some text below this example that explains the options for each line in great detail. Call us if you are the slightest bit confused.

We highly recommend that you download/install our interactive version (http://www.Autobox.com/abox.exe) as a way of Quality Control on how you have built the ASC file. You can quickly establish if there are any problems by opening the ASC file that you have built.

0
0
0

These are the three "Objectives". We prefer to leave these options all at zero, but you can change these as you wish. They determine automatic modeling, how much output to show

1
12
1949
1
144
0
0
12

These are the 8 "Data Properties". They define the characteristics of the series like the seasonality, beginning year, beginning period, number of observations.

BJ07

This is where the name of the series is specified. This field is "variable" in that if you have a causal problem where you have many series then you would list all of the names of the series HERE BEFORE the data. YOU should not USE THE SAME SERIES NAME FOR A DEPENDENT SERIES IN TWO SEPARATE ASC FILES as the output from a modeling run will overwrite each other. Also, by specifying the date (January 1, 2006) with the name in this format "__010106Y11" and line 5 has a '7' then day of the month effect is analyzed

0
112.000000
118.000000
132.000000
129.000000
121.000000
135.000000
148.000000
148.000000
136.000000
119.000000
104.000000
118.000000

This is the famous Box-Jenkins airline series (abridged) with the data shown here. If you have a causal problem then each of the series are placed end-to-end downward in a Blocked rectangular historical array. The last series would be the dependent series.

BUT If you have future values, you place this future values series below the dependent series

BUT If you have retained values, you place this series below the future values series

- Output series
- Future
- Retained values

This is a summary of the ASC files major sections:

Objectives (all are required)

Data properties (all are required)

Data names (in the order of 1st input series to nth input series, if any; and then the output series)

Data type (in the same order as the data names)

Historical Data (in the same order as the data names)

Future Values (for all input series which have a data type of 1, 2, or 3, if any, in the same order as data names)

Retained Data (If any, in the same order as the data names)

The following structure tables indicate the parameters and/or limitations for each of the above categories. OBJECTIVE Structure:

Name	Description
OBJECTIVE(1)	Sets forth the model conditions as indicated by the following: 0 = Totally Automatic NONCAUSAL MODELS IN AUTOBOX BATCH MEMORY 1 = MEAN 2 = AUTOREGRESSIVE (1) WITH CONSTANT 3 = AUTOREGRESSIVE(2) WITH CONSTANT 4 = SIMPLE EXPONENTIAL SMOOTHING NO CONSTANT 5 = LINEAR (HOLT) EXPONENTIAL SMOOTHING NO CONSTANT 6 = RANDOM WALK NO CONSTANT 7 = RANDOM WALK WITH CONSTANT 8 = TIME TREND 9 = TIME TREND PLUS AR(1) CORRECTION 10 = FOURIER 11 = HOLT LINEAR TREND PLUS ADDITIVE SEASONAL FACTORS (TREND FORM) 12 = DAMPED TREND LINEAR EXPONENTIAL SMOOTHING NO CONSTANT 13= SEASONAL EXPONENTIAL SMOOTHING NO CONSTANT 14 = HOLT LINEAR TREND PLUS ADDITIVE SEASONAL FACTORS (ARIMA FORM) 91 = FIND HIDDDEN SEASONALITY THEN SET TO “BEST” 97 = IDENTIFICATION ONLY 98 = HOLT-WINTERS TREND PLUS MULTIPLICATIVE SEASONAL FACTORS (TREND FORM) CAUSAL MODELS IN AUTOBOX BATCH MEMORY 51 = REGRESSION 52 = REGRESSION WITH AR(1) CORRECTION 53 = STEPDOWN REGRESSION 54 = STEPDOWN REGRESSION WITH AR(1) CORRECTION STARTING MODEL SUPPLIED: 99 = STARTMOD.123 199 = STARTMOD.123 + SIM IF STARTING MODEL SUPPLIED = 99 or 199, STARTMOD.123 is required. 200 = TOTALLY AUTOMATIC + ABOXLITE model is developed

OBJECTIVE (2)	No longer used leave as a '0'
OBJECTIVE (3)	No longer used leave as a '0'

DATAPROP Structure:

Name	Description
DATAPROP(1)	Number of series in the problem
DATAPROP(2)	Seasonality. How often the data was sampled. (i.e. Choose 1 for annual, 4 for quarterly, 12 for monthly, 52 for weekly, 7 for daily(7 days in a week), 5 for daily(5 days in a week) and 24 for hourly.) Please note that all series in the model must have the same seasonality
DATAPROP(3)	Major Period -(ie Beginning year.) The year or major number identifying the starting point of the data. Please note that all series in the model must have the same Beginning Year. If you wish to use series whose original Beginning Year are different, you must determine the common matrix for the series and use that starting point as the Beginning Year.

DATAPROP(4)	Minor Period - (ie Beginning month) the starting point of the data. (i.e. 1 for the 1st week in the year) Please note that all series in the model must have the same Minor Period. If you wish to use series whose original Minor Period are different, you must determine the common matrix for the series and use that starting point as the Beginning Period. Here are some examples on the Major/Minor Period –For a monthly data problem let's assume the starting month is February and the year is 2006. The Minor would be a '2' and the Major would be '2006'. For a quarterly data problem let's assume the starting quarter is 3 and the year 1974. The Minor would be a '3' and the Major '1974'. For a daily data problem let's assume the starting week 35 and day 5. The Minor would be '5' and the major '35' . For a weekly problem, let's assume the starting week was the 34th of the year in year 1992. The minor would be '34' and the major '1992'. The Major and Minor are for helpful for reporting purposes only and not for the actual analysis. When we run daily data on test sets, we just put in a '1' and a '1' for each because it takes too much time to figure out the actual week and day so we don't bother with it.
DATAPROP(5)	Number of historical values in each of the time series in the model
DATAPROP(6)	Number of future values to be included for each applicable input series. If a causal model (includes a dependent and independent series) and the DATATYPE of any the input(independent) series is 1 , 2, or 3, enter DATAPROP(7) + Number of Future Values (this must equal the number of forecasts to be calculated) to be supplied by the user. If DATATYPE of all input series is 0, or if a noncausal model, this must show a 0.
DATAPROP(7)	The number of values retained from the end of the series to be used to evaluate prior forecasts (enter 0 if none)
DATAPROP(8)	Number of forecast values to be calculated

DATANAME Structure:

Name	Description
DATANAME	Actual name of each series in model in the order 1st Input series, 2d input series, …N input series, output series These names must be limited to 22 characters for Input series and 14 characters for the output series; and they cannot contain space(s), period(.), exclamation point(!), backquote('), brackets([]), wild card characters such as * or ?, and control characters(ASCII values 0 through 31). **Also, by specifying the date (January 1, 2006) with the name in this format "__010106Y11" and line 5 has a '7' then daily effects such as "day of the week", "week of the year", "day of the month" are analyzed.**

DATATYPE Structure:

Name	Description
DATATYPE	Integer value for series type. This can be 1 of 4 values 0 = Future Values are self-projected; contemporaneous and lag effects allowed. All output series must be 0. 1 = Future Values are user specified; contemporaneous effect allowed. 2 = Future values are user specified; contemporaneous and lag effects allowed . Series name must be 8 or less characters 3 = Future values are user specified; contemporaneous, lag and lead effects allowed. Series name must be 8 or less characters A '0' tells Autobox you want it to forecast future values of the causal. Types '1','2', and '3' are user supplied future values. In terms of effects on run-time Type '3' would take the longest, Type '1' takes the shortest and '2' and '3' would be similar. Note that if you have a promotion that if you have daily data and a promotion that goes on for many periods you would want to use a data type of '1' as you can't really look for lead/lag from multiple time periods.

The following is an example of an .ASC file for a noncausal (single) series{annotations are not included in the file}:

0	(objective(1) indicates totally automatic modeling)
0	(objective(2) indicates use default conditions in memory)
0	(objective(3) indicates full output)
1	(DataProp(1) number of series in the problem set)
52	(DataProp(2) seasonality of the series)
1998	(DataProp(3) beginning year or major period)
2	(DataProp(4) beginning or minor period)
67	(Dataprop(5) number of historical data in series)
0	(DataProp(6) number of future values)
0	(DataProp(7) number of retained data
24	(DataProp(8) number of forecasts to be calculated
pizza	(output series name)
0	(data type)
15	(historical data – 67 observations)
14	
6	
.	
.	
12	

How to Specify Your Own Model

You can outright specify what model you want to use. You would need to create a file named "startmod.123". Autobox batch will see that this file exists and then use it. The format shown below is also the same format as the "MOD" files that get created.

Record Layout for: MODEL FORM FILE

NOTE > Make each entry an integer unless it is decidedly real (a model coefficient for example).

Line 1 : contains 5 entries

```
entry 1:  Name of the dependent series        columns 1-12   left justified
entry 2:  Major Period ( example 1991 )       columns 27-30 right justified
entry 3:  Minor Period ( example 1    )       columns 35-38  ..
entry 4:  Seasonality  ( example 12   )       columns 43-46  ..
entry 5:  Number of Series in Model           columns 51-54  ..
```

Line 2 : Enter a zero to indicate that there is not a constant parameter in the model, enter a one otherwise

NOTE > Line 3 is only included when the value of the entry on line 2 is not zero.

Line 3 : Enter the coefficient value for the constant

Line 4 : Contains two values separated by a space or a comma

entry 1: Enter the lambda value (the transformation parameter).

For example , enter a 1 to indicate the original series, enter a 0 to indicate logs, enter a -1 to indicate reciprocals, etc.

entry 2: Enter the offset for the transformation (normally zero)

NOTE > Line 5-9 relate to the ARIMA structure of the model.

Line 5 : contains 3 entries separated by a space or a comma

entry 1: Enter the number of autoregressive factors in the model
entry 2: Enter the number of differencing factors in the model
entry 3: Enter the number of moving average factors in the model

NOTE > Line 6 is only included when entry 2 on Line 5 is greater than 0

Line 6 : Enter order of differencing factor(s) separated by a space or a comma

NOTE >   Skip Line 7,8 and 9 if entry 1 and 3 on Line 5 is zero.

Line 7 : Enter the number of parameters in each of the autoregressive factors specified in entry 1 on Line 5 followed by the number of parameters in each of the moving average factors specified by entry 3 on Line 5.

Line 8 : Enter the backorder powers (or the lag values) for each of the autoregressive parameters , followed by each of the backorder powers for each of the moving average parameters. Enter the lag values factor by factor in ascending order within each factor.

Line 9 : Enter the matching parameter values for each of the backorder powers specified in Line 8.

NOTE >   Line 10-9 relate to the CAUSAL structure of the model.

NOTE >   Repeat the sets of lines 10-16 for each input series. These lines represent the Causal Component in the Transfer Function Model

Line 10 : Enter the name of the input series in columns 1-22 (left justified)

Line 11 : Contains two values separated by a space or a comma

entry 1: Enter the lambda value (the transformation parameter). For example , enter a 1 to indicate the original series, enter a 0 to indicate logs, enter a -1 to indicate reciprocals, etc.

Line 12 : contains 3 entries separated by a space or a comma

entry 1: Enter the number of output lag   factors in the model
entry 2: Enter the number of differencing   factors in the model
entry 3: Enter the number of input lag   factors in the model

NOTE >   Line 13 is only included when entry 2 on Line 12 is greater than 0

Line 13 : Enter order of differencing factor(s) separated by a space or a comma

NOTE >   Skip Line 14,15 and 16 if entry 1 and 3 on Line 12 is zero.

Line 14 : Enter the number of parameters in each of the output lag   factors specified in entry 1 on Line 5 followed by the number of parameters in each of the input lag factors specified by entry 3 on Line 5.

Line 15 : Enter the backorder powers (or the lag values) for each of the output lag parameters , followed by each of the backorder powers for each of the input lag parameters. Enter the lag values factor by factor in ascending order within each factor.

Line 16 : Enter the matching parameter values for each of the backorder powers specified in Line 15.

Examples

Exponential 1- model (Univariate modeling)

```
ZZ              1998   6  12   1
       0
  1.000000000000000    0.0000000000000000E+000
       0        1        1
1
1
1
.5
```

Time plus Autoregressive 1 model(Causal modeling)

```
YTIME            1998   6  12   2
       1
  10.
  1.000000000000000    0.0000000000000000E+000
       1        0        0
1
1
.2
TIME
  1.000000000000000    0.0000000000000000E+000
       0        0        1
       1
       0
    .2
```

ENGINE.AFS

Listing of ENGINE.XXX which is copied to ENGINE.AFS to micro-manage the dll

```
NAME OF FILE CONTAINING INITIAL MODEL              |STARTMOD.123
 MONTE CARLO SIMULATION ENABLED (0=NO 1=YES)       |   0
  VARIANCE OF THE NOISE SERIES                     |01.0
  SEED VALUE TO START ( 0 FOR CLOCK )              |   0
NON-CAUSAL:                                        |
 EVALUATE THE NEED FOR INTERMITTENT DEMAND MODEL   |   0
CAUSAL:                                            |
 MAXIMUM LEAD FOR SERIES WITH POSSIBLE LEAD EFFECT|   0
 USE DIFFERENCE FACTORS FROM ARIMA IN TF MODEL     |   0
 CONSTRAIN ALL USER CAUSAL COEFFICIENTS IN MODEL   |   0
ENABLE MODEL ESTIMATION                            |   1
 # OF GROUPS IN POOLED-CROSS SECT. T/S (IF ANY)    |   0
  SAMPLE SIZE IN EACH OF THE GROUPS                |
 % CHANGE IN ERROR SUM OF SQUARES                  |00.0
 % CHANGE IN THE PARAMETER VALUES                  |00.1
 MAXIMUM # OF ITERATIONS                           |  20
 NECESSITY TEST:                                   |   1
  CONFIDENCE LEVEL FOR NECESSITY                   |95.0
 SUFFICIENCY TEST:(STOCHASTIC STRUCTURE )          |   1
  CONFIDENCE LEVEL FOR SUFFICIENCY (SS)            |95.0
 SUFFICIENCY TEST:(DETERMINISTIC STRUCTURE )       |   1
  CONFIDENCE LEVEL FOR SUFFICIENCY (DS)            |95.0
  MAXIMUM NUMBER OF OUTLIERS TO BE IDENTIFIED      |   7
  INCLUDE PULSE VARIABLES                          |   1
  INCLUDE STEP VARIABLES                           |   1
   MINIMUM NUMBER OF OBSERVATIONS IN GROUP         |   9
  INCLUDE SEASONAL PULSE VARIABLES                 |   1
  INCLUDE LOCAL TRENDS                             |   0
  ENABLE AUTOMATIC FIXUP FOR FIXED EFFECTS         |   0
  NUMBER OF LAMBDA VALUES TO EVALUATE IN EST       |   1
   LAMBDA VALUES TO EVALUATE (4F4.0)               |1.00
  DISCRETE CHANGE TEST FOR VARIANCE                |   1
   CONFIDENCE LEVEL FOR VARIANCE TEST              |99.0
   MINIMUM NUMBER OF OBSERVATIONS IN GROUP         |   5
 CONSTANCY OF PARAMETERS:                          |   1
  CONFIDENCE LEVEL FOR CONSTANCY TEST              |99.0
 STORE MODEL FORM (YES/NO)                         |   0
 DISPLAY MANAGEMENT ANALYSIS                       |   0
ENABLE MODEL FORECASTING                           |   1
 # OF FORECAST VALUES TO COMPUTE                   |  13
 CONFIDENCE LIMIT FOR THE FORECASTS (%)            |95.0
 CONVERT THE FORECAST VALUES TO POSITIVE VALUES    |   0
 CONVERT THE FORECAST VALUES TO INTEGERS           |   0
 CONVERT PULSE AT LAST OBSERVATION TO STEP         |   0
 CONVERT PULSE TO SEASONAL PULSE                   |   0
```

INTRODUCTION TO THE ENGINE.XXX FILE

HOW THE ENGINE VERSION WORKS

The Autobox batch version uses internal choices to model. If you would like to customize some of the choices, you can do so here by Editing a file named “Engine.xxx” and saving it as “Engine.go”. After the batch process runs it renames it as “Engine.afs” and will continue to use those overrides as long as “Engine.afs” exists. You can rename it to “Engine.old” if you want to stop using your overrides. The information seen to the right of the "|" character is where Autobox batch searches during an execution. A ‘0’ means not used and a ‘1’ means it is used.

Line 1 – Do not change this line

```
NAME OF FILE CONTAINING INITIAL MODEL            |STARTMOD.123
```

This points Autobox batch to the file use as the starting model. This is all handled in the “BAT” file process for you.

Line 2

```
MONTE CARLO SIMULATION ENABLED (0=NO 1=YES)      |0
```

Choose "1" to have Autobox batch create a time series based on a user specified model.

Line 3

```
VARIANCE OF THE NOISE SERIES                     |1.0
```

If you choose to simulate in line 2 then you will need to specify the amount of variance. The more variance the more randomness in the simulated data. The standard is 1.0.

Line 4

```
SEED VALUE TO START ( 0 FOR CLOCK )              |0
```

To start the simulation process, the program needs a starting point to iterate from. If you use the same seed value, then you can replicate your data. If you want persistent random simulated data, then use the "0" to use the time of day which is a pretty good random approximation.

Line 5 - Title only

NON-CAUSAL:

Line 6

EVALUATION THE NEED FOR INTERMITTENT DEMAND |0

If a 0 exists then the series will not be considered for intermittent demand modeling. If a 1 exists then if >25% of the data has a zero then intermittent demand modeling will proceed.

Line 7 - Title only

CAUSAL:

Line 8

```
MAXIMUM LEAD FOR SERIES WITH POSSIBLE LEAD EFFECT  |1
```

Enter the number of periods to search for a lead variable. This feature, if enabled, will evaluate possible leads for all input series that have names beginning with the string "MOVE". For example sales might arise the week before a holiday. To detect this temporal structure this option has to be enabled and the potential indicator series must have a name like MOVEX1 or MOVEX2.

Line 9

```
USE DIFFERENCE FACTORS FROM ARIMA IN TF MODEL     |1
```

A number or researchers have found that while differencing factors are important to Transfer Function Identification, they may be counter-productive when included in the actual estimated model. Since this version of AUTOBOX BATCH is rich in model augmentation procedures(step-up.... sufficiency), it may be possible to simplify the initial structure and then evolve via model augmentation procedures to the final model. The user has the choice of including the ARIMA model differences in the initially identified Automatic model. This feature only effects Automatic Transfer Function initial model identification.

Line 10

```
CONSTRAIN ALL USER CAUSAL COEFFICIENTS IN MODEL    |0
```

This option allows the user to constrain the final model such that all coefficients for user input series or model developed series, such as interventions, will be kept REGARDLESS of level of significance. Thus those coefficients that AUTOBOX BATCH would have considered insignificant and would have replaced with a zero instead become part of the model. This could be particularly interesting to the user who would like to see the affect of his causative input series instead of having them ignored be- cause of their perceived insignificance. This is then a CONSTRAINED REGRESSION option where certain coefficients are a permanent part of the model. Note that this does not constrain the actual values of the parameters.

Line 11

```
ENABLE MODEL ESTIMATION                             |1
```

Estimation and diagnostic checking represent the second phase of the B-J modeling procedure. The estimation option computes the model coefficients and the residual statistics via non-linear least squares.

Line 12

```
# OF GROUPS IN POOLED-CROSS SECT. T/S (IF ANY)    |   1
```

POOLED-CROSS SECTIONAL TIME SERIES

Consider the case where you have n distinct time series (max of 3) and you wish to test the hypothesis that the individual ARIMA models are equal to each other vs. the alternative that at least 1 model differs from the rest. This requires that 1 model be specified for all n and parameter estimation be done locally and compared to a global or generic set of coefficients. A STARTING MODEL MUST EXIST as this will be used. If AUTOMATIC MODELING IS DISABLED and this answer is greater than one (1) the program will: 1. disable all model modification options (sufficiency, necessity etc) 2. expect the time series to be a concatenated series of the n distinct time series and will estimate parameters without using the last set of group i to predict the start of i+1 , where i goes from 1 to 2 (max 3 groups). Hypothesis testing is done by summing the error sum of squares from the n local estimations (done separately) and divide by the total degrees of freedom to obtain a denominator mean square error. The numerator mean square error is the differential error sum of squares (composite estimation less the sum of the locals, divided by the number of groups see JOHNSTON : ECONOMETRIC METHODS 1963 Page 137)

Line 13

```
SAMPLE SIZE IN EACH OF THE GROUPS                 |
```

Enter the number of observations in each of the groups. If you specified n groups in the concatenated series then you must now enter the n values indicating the number in EACH group, in the same sequence the groups were entered into the concatenated series.

Line 14

```
% CHANGE IN ERROR SUM OF SQUARES                  |00.1
```

Parameter estimation is an iterative process that stops when one of three conditions is met. If the relative change in the residual sum of squares is less than the value specified here, then the parameter estimation will stop.

Line 15

```
% CHANGE IN THE PARAMETER VALUES                  |00.1
```

Parameter estimation is an iterative process that stops when one of three conditions is met.. If the relative change in each individual parameter is less than the value specified here, then the parameter estimation will stop.

Line 16

```
MAXIMUM # OF ITERATIONS                           |20
```

Parameter estimation is an iterative process that stops when one of three conditions is met.. If the number of iterations in the estimation process exceeds the value specified here, then the parameter estimation will stop.

Line 17

```
NECESSITY TEST:                                   |   1
```

Choose "1" to enable diagnostic checking. One phase of diagnostic checking entails deleting unnecessary parameters from the model. This normally requires you to re-specify the model form, and then to estimate this model. With this option on, the program automatically deletes the non-significant parameters (one at a time) and re-estimates the model. The test for necessity is performed by examining the T-ratios for the individual parameter estimates. Parameters with nonsignificant coefficients will be deleted from the model.

Line 18

```
CONFIDENCE LEVEL FOR NECESSITY                   |95.0
```

If you elected to turn the parameter deletion option on, then you have the option of specifying the confidence level value that will be used to determine the significance of a parameter. For example, 95% indicates that the program should delete all parameters that are not significant at the 95% level.

Line 19

```
SUFFICIENCY TEST(STOCHASTIC STRUCTURE)           |   1
```

The diagnostic checking phase requires the analyst to make sure that the residuals can not be predicted from themselves (ACF) and in the case of multivariate models the pre-whitened input series (CCF). In the latter case, the test also has to be reversed, i.e. the residuals can not predict the pre-whitened input, otherwise the condition of feedback is identified. The residuals are tested for white noise in much the same way as model identification is performed. If there are patterns in the residual autocorrelations and partial autocorrelations, then the analyst may need to add parameters to the model. One follows the pattern recognition rules described above when adding parameters to the model. A "yes" will request the program to guide these adjustments.

Line 20

```
CONFIDENCE LEVEL FOR SUFFICIENCY (SS)            |95.0
```

If you elect to augment an estimated model with additional ARIMA structure as evidenced by the sample ACF and PACF of the residuals, you must indicate the significance of a parameter. For example, 95%

Line 21

```
SUFFICIENCY TEST(DETERMINISTIC STRUCTURE)        |   1
```

Outliers can occur in many ways. They may be the result of a gross error, for example, a recording or transcript error. They may also occur by the effect of some exogenous intervention. These can be described by two different, but related, generating models discussed by Chang and Tiao (1983) and by

Tsay (1986).They are termed the innovational outlier (IO) and additive outlier (AO) models. AUTOBOX BATCH uses the AO approach due to estimation considerations. ARIMA modeling may be deficient when the series has been intervened with. This program will test the residuals from the ARIMA model for possible outlier (intervention) variables. We suggest that you modify either your model or your time series for any outlier variables that may be found. The automatic intervention detection option automatically determines the need for intervention variables using the residuals from an estimated model and automatically introduces them into the model.

Line 22

```
CONFIDENCE LEVEL FOR SUFFICIENCY (DS)           |90.0
```

If you select the outlier detection option, then you must specify the confidence limit to be used for detecting possible outlier variables. For example, .80 indicates that the program should identify all outliers that are significant at the 80% level.

Line 23

```
MAXIMUM NUMBER OF OUTLIERS TO BE IDENTIFIED     |   5
```

You may elect to limit AUTOBOX BATCH to a certain number of empirically identified outliers. As delivered, the standard product is limited to a maximum of 5 input series in a transfer function thus this integer can’t exceed that limit. AFS sells larger versions which allow up to 150 input series. This feature allows the user to control the incorporation of potentially spurious interventions leading to numerical instability.

Line 24

```
INCLUDE PULSE VARIABLES                         |   1
```

Select "1" to include pulse interventions.

Line 25

```
INCLUDE STEP VARIABLES                          |   1
```

Choose "1" to include step interventions.

Line 26

```
MINIMUM NUMBER OF OBSERVATIONS IN GROUP         |   2
```

The number entered determines how many successive values that are on a different level, before Autobox batch will consider there to be a level shift.

Line 27

```
INCLUDE SEASONAL PULSE VARIABLES                |   1
```

Choose "1" to include seasonal pulse interventions.

Line 28

```
INCLUDE LOCAL TRENDS                              |0
```

Choose "1" for Autobox batch to identify multiple trends.

Line 29

```
ENABLE AUTOMATIC FIXUP FOR SEASONAL DUMMIES      |0
```

Choose "1" to enable this option to test for the presence of a SEASONAL DETERMINISTIC VARIABLE which has a zero/one pattern according to the following:

a "1" in the corresponding period and a "0" in other periods

The formal test is outlined in Franses paper in the International Journal Of Forecasting, July 1991, pp 199-208 (see the help for the associated Confidence value indicates that the program should add all parameters that appear to be needed at the 95% level.

Line 30

```
NUMBER OF LAMBDA VALUES TO EVALUATE in EST       |0
```

Enter the number of values to be included in line 59. If you indicate 3, you must supply three values in the next prompt.

Line 31

```
LAMBDA VALUES TO EVALUATE                         |1.0 0 -.5
```

INITIAL MODEL IDENTIFICATION

The lambda value is the transformation parameter. In other words, the value that you specify here will be the exponent in the power transformation. Each data point in the time series is raised to the power lambda. The acceptable range of lambda values is from 1.0 to -1.0. For example, a lambda of 1.0 indicates that the original series is to be analyzed, a value of 0.0 indicates that the natural log of the series is to be analyzed, and a lambda of -1.0 indicates that the inverse of the series is to be analyzed. It represents the power transformation that is to the observed series in order to induce variance stationarity. Note however that this should only be applied when the non-constant variance is caused by a correlation between level and variability.

Line 32

```
DISCRETE CHANGE TEST FOR VARIANCE                 |   0
```

The residuals from a model may not have constant variance and consequently the standard estimation may be deficient. One form of non-constant variance is treated by the Box-Cox or lambda transformations. However, a different kind of non-constancy can occur if a series is affected by a period of unusual volatility. Consider the case where an upward trending series has a residual variance of say 10 for the first half and a variance of the residuals of 20 for the second half. It would be totally incorrect to either ignore the change in variance or to use the power transform procedures of Box-Cox. The suggested procedure is to simply identify a model and compute a vector of residuals. By breaking the residuals into consecutive but non-overlapping sections one can perform the standard F test for variance change. The time period with the greatest F value is then a potential point of variance change. There are cases in which the user has an "a priori" knowledge of the weights and wishes to estimate a user-specified model or to automatically build one using these weights or pre-assigned "degrees of believability". For example consider, the actuarial economist who has chronological data where the reading at time period t is based upon "n" samples. Thus a reading with a large "n" is more credible than one with small "n". The user can enter the weights in a disk file Weights.In . These weights will then be used and will be potentially modified if this test is enabled. The resultant weights are stored in Weights.Out, if the I/O option is specified.

Line 33

```
CONFIDENCE LEVEL FOR VARIANCE TEST           |90.0
```

If you select the variance stability test, then you must specify the confidence limit to be used for detecting possible change points. For example, .95 indicates that the program should identify all time periods that are significant at the 95% level. The interval for comparing variances (Variance Stability) is based on the number of forecasts. If you specify a 3 period forecast, then testing for variances (if enabled) will be done until a group of residuals is less than 3. If the number of forecasts is 0, the program defaults to a minimum of 10 residuals in a group.

Line 34

```
MINIMUM NUMBER OF RESIDUALS TO POOL          |    5
```

This entry controls the length of the interval for comparing variances . For example if you specify a 10 , then a minimum of 10 residuals will be pooled and compared against the remaining residuals.

Line 35

```
CONSTANCY OF PARAMETERS:                      |    0
```

Choose "1" to enable. Chow suggested a test to assess the statistical significance between two sets of regression coefficients. We have extended this to ARIMA/TF models and furthermore SEARCH for the point of maximum contrast thus identifying the local cluster of homogenous data. This is equivalent to pooled cross-sectional time series where the number of consecutive values in each of the two groups is unknown and to be determined.

Line 36

```
CONFIDENCE LEVEL FOR CONSTANCY TEST            |
```

If you select the variance stability test, then you must specify the confidence limit to be used for detecting possible change points. For example, .95 indicates that the program should identify all time periods that are significant at the 95% level. The interval for comparing variances (Variance Stability) is based on the number of forecasts. If you specify a 3 period forecast, then testing for variances (if enabled) will be done until a group of residuals is less than 3. If the number of forecasts is 0, the program defaults to a minimum of 10 residuals in a group.

Line 37

```
STORE MODEL FORM (YES/NO)                         |1
```

Choose '1' if you have a model saved and want to reuse it now.

Line 38

```
DISPLAY MANAGEMENT ANALYSIS                        |   0
```

```
If you want a report that tries to summarize "in english" information about
the time series from the model used to fit the data.
```

Line 39

```
ENABLE MODEL FORECASTING                           |   1
```

The forecasting program generates the forecast values for each time series. This option should be selected upon successful identification of the final Box-Jenkins model form.

Line 40

```
# OF FORECAST VALUES TO COMPUTE                   |  10
```

This entry indicates how many forecast values you want the program to compute. The accuracy of the forecasts can be assessed by the resulting errors. Since this entry measures the length of the interesting interval, it is also used to control the interval for comparing variances (Variance Stability). If you specify a 3 period forecast, then testing for variances (if enabled) will be done until a group of residuals is less than 3. If the entry here is 0, the program defaults to a minimum of 10 residuals in a group.

The maximum is the seasonality multiplied by 3. So if the maximum seasonality of 60 is used then the maximum number of forecasts to compute is 180.

Line 41

```
CONFIDENCE LIMIT FOR THE FORECASTS (%)            |80.0
```

The reliability of a forecast is measured in terms of its uncertainty. This program will compute the individual confidence limit of each forecast, given the information available at the forecast origin. You can specify whatever percent confidence limit you want the program to use.

Line 42

```
CONVERT THE FORECAST VALUES TO POSITIVE VALUES   |   0
```

If your data arises only in positive values then you might wish to constrain forecasts to the set of positive real numbers. A "YES" will convert the forecasts and confidence limits. All error reports are presented in terms of these rounded forecasts. Note that the aggregated sum is rounded after the aggregation thus the sum of the forecasts may not be equal to the aggregated sum.

Line 43

```
CONVERT THE FORECAST VALUES TO INTEGERS          |    0
```

If your data arises only in integer form, then it is known as DARMA or a discrete ARIMA problem. One can approximate a DARMA model by estimating as if the data were continuous and then integerizing the forecasts. This is an approximation and the user should be guided by the results. A 'yes' will convert the forecasts and confidence limits to the nearest integer. Thus the forecasts will be rounded off rather than truncated. All error reports are presented in terms of these rounded forecasts. Note that the aggregated sum is rounded after the aggregation thus the sum of the forecasts may not be equal to the aggregate of the forecasts. ARIMA models are also an approximation to a process that is continuous and is sampled at fixed intervals. Again the ARIMA model is an approximation and the user should be guided by the results.

Line 44

```
CONVERT PULSE AT LAST OBSERVATION TO STEP        |    0
```

Allows the user to apply his knowledge that the last observation is not a pulse but a permanent step that must be considered.

Line 45

```
CONVERT PULSE TO SEASONAL PULSE (SAVE LAST OBS   |    0
```

You may elect to convert an identified pulse at a particular time period to a SEASONAL PULSE. Consider where insufficient data exists to confirm a SEASONAL PATTERN. This feature allows the user to enforce the rule that all pulses, save a pulse at the last observation will be treated as the first point in a repetitive pattern.