OPERATIONAL GUIDE TO THE REVENUE MODEL PACKAGE

The purpose of this document is to provide a detailed operational guideline for the Revenue Model Package. It is meant to be paired with the paper called "An Overview of the Unemployment Insurance Revenue Forecasting Model", hereafter referred to as "Overview", which provides a more general description of the model.

The Revenue Model Package is a large series of seven linked, semi-iterative spreadsheet models that ultimately produces a 10-year forecast of the revenue stream from Unemployment Insurance (UI) taxes. The structure of the model has two main applications: 1) the semi-annual budget exercises for OMB (called the President's Budget and the Midsession Review), and 2) various scenarios and analyses that require a revenue response to given sets of (or changes in) assumptions. The model has flexibility built into it for the second application. We can easily change the basic assumptions going into the model and store various scenarios in order to compare the effects on the revenue stream.

The model has several component spreadsheets, each with its own specific functions. The two largest components are: the "tax rate model" which forecasts average UI tax rates on taxable wages and the "loan model", which generates a monthly revenue stream, calculates interest, and provides the trust fund balances back to the tax rate model. The specific excel spreadsheets included and their tasks are described below:

Import.xls: The beginning source of data for the model package. Includes historical state data and national level assumptions for the forecast period.

> Historical State data in the import sheet include: Taxable Wage Base (TWB); Average Annual Wage (AAW); The Ratio of Taxable to Covered Wages (TAXTOT); Average Tax Rates on Taxable Wages (TR); UI Benefits (BEN); CY Trust Fund Balance (BAL); Covered Wages and 1 year lag of Covered Wages (CWG, LCWG); Covered Employment (CE); Average proportion of Reimbursements to taxed Contributions/Benefits (located in columns B and C on the page called Rmbrs); and state estimated average tax rates for the first and second forecasted year, as available (on Rmbrs page)

> National level data include estimated FUTA receipts for the latest Calendar Year available (on futarec page); Covered Wages & Salaries; Covered employment; Ratio of Taxable to Total Wages; and Taxable Wages. The last 4 data items are quarterly national figures and are found on the page called USHist in rows 39-42.

> National level economic assumptions for the forecast period include Wages & Salaries, Civilian Employment; Unemployment Rate Civilian; Interest Rate; Benefits (all on the USHist page), and Reed Act Distributions (on USAnnual page) (see description in "Overview").

UScalc.xls: Disaggregates the forecast period assumptions into state proportions. This component also houses the above-mentioned flexible aspect of the model, which allows the analyst to run and store scenarios. There is an assumptions block (cells A5-G17, Assumptions page) that is treated as "home base" by all other models. All forecast assumptions are derived from this box of cells. There is also a "scenario block" (on the mod page), which allows temporary adjustments to assumptions while storing the base-line numbers in order to compare resulting revenues. The assumptions block takes note of whether there are changes in the scenario block. If there is anything in the scenario block, that is used throughout the model. Otherwise, the assumptions block defaults to the assumptions in the Import spreadsheet.

Taxrate.xls: Uses regression equations to predict the Calendar Year (CY) Average Tax Rates on Taxable Wages (ATR) for each state. The regression equations generally use lagged variations of Reserve Ratios (BAL/LCWG), and Benefit Ratios (BEN/CWG) as the independent variables. Benefit Ratios in the forecast period are derived from the national economic assumptions; Reserve Ratios come from the forecasted state Unemployment Trust Fund balances, which are calculated in the Loan model. There are also simple regression equations to forecast the ratio of taxable wages to covered wages for each state. This is necessary because the assumptions provide only covered wages and revenues are based on taxable

wages. The two final tabs in this spreadsheet host the list of variables used for each state and their corresponding coefficients. The tabs are labeled "coefficients" and "coefficients (taxtot)".

Output.xls: Printable summary of the tax rate model output. Shows State and US Total CY values for taxable wages, contributions (in the form of CY liabilities), ATR, and the CY reserve ratio.

Loan.xls: Monthly model that acts as a projected a financial ledger, calculating interest, loans, and ultimately determining each state's trust fund balance and loan status for the years in the forecast window. The loan model gets CY liabilities from the Output sheet and converts them to monthly state collections. This conversion involves lagging the liabilities by 3 months to predict collections, and using state-specific "monthly splits", based on historical data, to parse the annual collections into monthly flows. It also generates a monthly flow for annual benefits used in the Taxrate spreadsheet. The trust fund balance is then passed back to the Taxrate spreadsheet for the calculation of the next year's reserve ratios in each state's ATR equation.

USLOAN.xls: Printable summary of the loan model output for the US Aggregate.

Revenue.xls: Displays FY State UI and FUTA Deposits. Also displays assumptions used throughout the model package.

The following flow chart demonstrates the links that exist between the above spreadsheets:
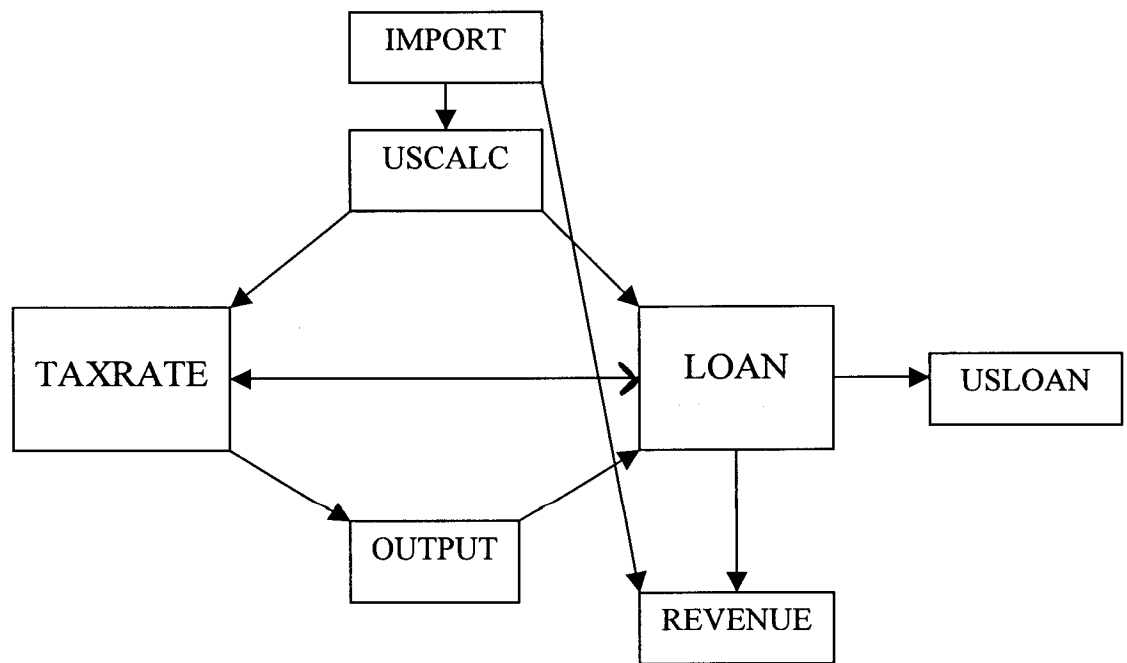
Running the Revenue Model Package

A simple run of an existing model can be manipulated from the "USCalc" spreadsheet, using the "mod" and "scenario" pages. The default *scenario block* on the "mod" page looks like this:

SCENARIO BLOCK – ZERO OR "NO CHANGE" IS DEFAULT						
	Current Scenario:	base scenario				
ST	YEAR	CWG (mil.)	BEN (mil.)	CE (thous.)	INT	REED
US	2001	$0	$0	0	0	no change
US	2002	$0	$0	0	0	no change
US	2003	$0	$0	0	0	no change
US	2004	$0	$0	0	0	no change
US	2005	$0	$0	0	0	no change
US	2006	$0	$0	0	0	no change
US	2007	$0	$0	0	0	no change
US	2008	$0	$0	0	0	no change
US	2009	$0	$0	0	0	no change
US	2010	$0	$0	0	0	no change
US	2011	$0	$0	0	0	no change
US	2012	$0	$0	0	0	no change

The year column automatically shows the current forecast window. If any of the cells to the right of the years in this block are changed from 0 or "no change" to a value, that value will replace the baseline value throughout the model. The resulting revenue stream can be found in the Revenue sheet. For archival purposes, the sheet titled "recessions" located after the "mod" sheet can be used to store different scenarios of interest. There are specified blocks for "mild" and "deep" recessions, as those are common scenarios used in the model.

Updating the Revenue Model Package

Twice a year, the models are updated, coinciding with the President's Budget and the Midsession Review exercises. The model update consists of adding new data and making structural changes to the model as the need arises. As a result of a model update, the "baseline" revenue stream will be altered. This contrasts with an interim run of the model where components of the assumptions would be altered in order to determine the change (delta) from the baseline. Note that each new baseline is stored as a separate copy of the model package. These can be stored on a CD or a ZIP disk. So far I've archived these copies on 2 ZIP disks labeled "models" and "models II".

There are 2 main steps to updating the models, and each step is reviewed with Treasury. When working with Treasury, discuss what steps need to be broken out for review of the updates. At this point (7/02), the contact at Treasury is Andrew Bershadker (202) 622-4981. He usually asks for 4 steps:
1. Technicals: Includes all data updates and all structural changes to the models, but keeps the previous national economic assumptions constant.
2. Economics: Stems from the budget forecast from OMB – two main budget exercises are the President's Budget (PB - sometime in January) and the Midsession Review (MSR - sometime in June). There are often other sets of assumptions that need to be run as well, including recession scenarios, various legislative proposals, etc. Often those scenarios are compared to the last PB or MSR exercise, so they don't involve a Technicals run. Within the Economics layer, Treasury often wants 3 things broken out:
   a. Wage, Employment, and Interest Earnings
   b. Benefits (including Extended Benefits)
   c. Reed Act Distributions

Updating Directions: "Technicals"

1.Technical updates: Data retrieval

All data is found in the UIDB (Unemployment Insurance Database), and will be imported to the IMPORT excel spreadsheet. There are SPSS files set up for the updating process. They can be found in ui/fhome/leachm/Taxfin, and there are comments in each file, which provide detailed explanations of the code.

The two files you need to run are **update.prog** and then **txrt.prog**. They are umbrella shell files that manipulate the following specific files and produce the needed text files.

RUNNING FILES	UPDATING FILES
sttx.cod	
hist.code	
Revup.code	
Estim.code	estim.reg
Est205.code	est205.reg
Rmbnew.code	rmbnew.reg
Rev.code	rev.reg

The first three files on the above table, sttx.cod, hist.code, and revup.code automatically include the latest data and don't need to be updated.

The last four files, estim.code, rmbnew.code, rev.code, and est205.code request specific dates or time periods. These dates need to be changed *only* for the President' s Budget (PB) run, when the forecast window changes. To change these dates, open **update.prog**, in which there are directions for changing the dates for each of the files. For reference purposes, two terms should be clarified: First Forecast Year (FFY), and Last Historical Year (LHY). The FFY is the year (in 4 digits) that the 10-year forecast window of the model will start. With each new PB, this forecast window will change. The FFY is used throughout the model as a reference point. The LHY is one calendar year prior to the FFY. The directions in update.prog use these reference points as an aid to guide the user to make the correct date changes. After making these changes, the user can run **update.prog** and all of the dates will be updated in each of the code files. The .reg files that correspond to these .code files are used by update.prog to create files with the correct time periods. The next several paragraphs provide explanations of the component files and the dates used.

Note: Because of this setup, if you are changing the structure of any of these 4 files (for example, changing a formula), you must change it in the .reg file. Otherwise, the change will lost the next time **update.prog** *is run.*

The purpose of estim.code is mainly to replace missing values in the ar2112 table with estimated ones. The dates for this file should select the last 5 years of historical data, and forecast through the first forecast year. For example, if the FFY is 2001, the LHY is 2000, the code selects historical data that are >= 1996, <=2000, then predicts through 2001. Note, there is another select command to create a file with dates up until the 5 year window, that would select dates <1996 in this example. In update.prog, you can change the 3 dates explained here and run it and it will create an updated estim.code file. (Note: there are also leap year dates in the code. 1996 and 2000 are already listed. Update program to include 2004 when necessary.)

The file called rev.code gets monthly benefits and revenues by State for the loan model to use. The 1st 15 months in the loan model are actuals for PB, the first 2 calendar years are actuals for MSR. Explanations of the dates used are in comments in the rev.code file.

The file called rmbnew.code retrieves the ratio of reimbursable benefits to total benefits, and the ratio of reimbursable contributions to regular benefits. The file called est205.code retrieves the state estimated tax rates for the first and second forecast year. For a more detailed explanation of reimbursable ratios and estimated tax rates, see the "Overview" document. The dates for rmbnew.code should be the last 3 years of historical data. For est205.code, the dates needed are the first and second forecasted year. At the same time, check the dates on the Rmbrs page in the IMPORT spreadsheet, cells B1 and E1. SPSS codes rmbnew.code and est205.code should request the years shown in cells B1 and E1 respectively. If not, figure out which one is correct and adjust the other.

After revising and running **update.prog**, all of the above files should be automatically updated, and you're ready to run **txrt.prog**. **Txrt.prog** runs all of the "running files" in the correct order, and extracts the data needed in the form of text files listed below. Again, for the PB run, you need to run both **update.prog** and **txrt.prog**. For MSR, only run **txrt.prog**.

FTP the following text files to windows (in the folder that the user has set up to house the revenue model package):

> Hist.txt
> Rmbrs.txt
> Est.txt: the first forecast year estimated tax rates
> Est2.txt: the second forecast year estimated tax rates (will be sparse for PB; more complete for
> MSR, but most often not complete then either)
> Revup.txt
> Rev.txt
> Rev2.txt (MSR only)

2. Technical Updates: Import Spreadsheet

The Import spreadsheet houses the source data for the rest of the spreadsheets in the Revenue Model Package. Once the data retrieval is complete, the text files may be "imported" to this spreadsheet.

It is important to have all other spreadsheets closed when updating Import.xls, because that prevents errors from occurring when linked cells are changed.

There are updating macros for most of the data updates. These can be found by going to the Tools menu, choosing Macro, then choosing Visual Basic Editor (VBE). The pages in the VBE correspond to the tabs in the excel spreadsheet, and the macros housed on each VBE sheet run updates for the corresponding spreadsheet page.

Sheet 1 (HistImport) in the VBE window houses the bulk of the updating macros. The macro called "order" at the top of the page will run all of the macros needed to bring in the above text files to the correct locations. In order to run all of the macros on that first page at once, you can go to the "order" macro and hit the play button on the tool bar. The macros on this page import hist.txt** and arrange the data in the formats, columns, and pages that are used by the rest of the model.

***Note: The macros will have to be edited by a new user to retrieve text files from the specific folder the user has set up. This is just a matter of changing path names. However, some troubleshooting skills are needed here. Sometimes the error "file not found" is displayed despite the correctly named file being in the specified location. I have yet to figure out how to fix this bug, so in these cases the macros can be used as directions to manually update data. Also, once you manually import a text file you can re-arrange or change the macro to follow the directions after importing. In order to go through a macro line by line, you can go to the macro desired and hit F8 for as many times as there are lines in the macro. This is a handy*

general instructional tool as well, as you can walk through the steps necessary to update the model and better understand the input. For the most part, the macros have basic descriptions at the top of each of them as a guide to their purpose.

Sheet 2 (Rmbrs) houses the importing and formatting macros for the rmbrs.txt and est.txt. These macros import the text files to the first 5 columns of the Rmbrs page, then format them and replace missing values.

There is no macro for importing est2.txt. This holds the second forecast year state estimated tax rates (ESTTR), and they are not consistently available, so it is manually updated. The data can be copied from the est2.txt file, and pasted in the Rmbrs page, columns U-V. The data from the text file is already formatted in 2 columns, so no re-formatting is needed. It is important to go through the states manually and make sure the missing states are shown as skipped rows, so that the states' estimated tax rates for the first and second forecasted year are aligned in the same rows.

Sheet 4 (USHist) houses the updating macros for revup.txt. These macros import the quarterly data in revup.txt, then transpose them and insert them in rows 39-42 of the USHist page, starting in column H.

Sheet 255 (histrev) houses the updating macros for rev.txt and rev2.txt. Rev.txt doesn't really need a macro – just open rev.txt, copy the data and paste into cell "A2" of the histrev sheet. If it's a MSR run and you're using rev2.txt, that's a more complex update so it's easier to use the macros.

Sheet 256 (futarec): There are no macros for this sheet, but once a year it is likely to need a manual update. The input is the latest CY estimated FUTA receipts – published in a UIPL (Unemployment Insurance Program Letter) but preferably acquired in spreadsheet format from Scott Gibbons, or whoever is handling the FUTA UIPL in the office.

Manual update: Interest Rates on the USHist page may need an update for the lastest June value. This will probably be available for the MSR run. Andrew from Treasury got this interest rate for us this year, and the excel spreadsheet that he sent is called Trust2002.xls. He would be the contact for the new June rate for 2003 for the next MSR run.

3. Technical Updates: USCalc Spreadsheet

After all of the updates have been completed in Import.xls, open USCalc.xls. Many of the cells in the USCalc spreadsheet are linked to the Import spreadsheet, and will automatically update. There are also some minor manual updates needed in USCalc.xls. Light green shaded cells note manual updates.

The first manual updates are the Taxable Wage Bases (TWB), found on the Assumptions page, columns Z and AA. Taxable wage bases for the first and second forecast years are available in the green law books by Sylvia's desk. For each state, the taxable wage base is found in the table of contents heading "BASIS OF TAXES- WAGES", then under the sub-heading "Amount of Remuneration Subject to Taxes". Here, the calculation for TWB is also described, as well as any changes in the laws that are effective either on a temporary or permanent basis. The Significant Provisions publication also provides TWB by state, and can be obtained from Suzanne Simonetta. Usually you can find taxable wage bases in the law books before the significant provisions table is available. This is really only necessary for those states with flexible TWB's.

Second, check cells U6 and V6 on the same page. In the columns below these cells, there will be benefits and/or balances for the first forecast year (FFY) for each state, if it's available. This will happen automatically because of the updates that already occurred in Import.xls. If there are benefits and/or balances available for states in those columns, then the corresponding cell in row 6 should have a "1" in it. Otherwise, they should display "0"'s. The function of these cells is to trigger the use of actual benefits and balances for the FFY on or off according to availability.

Third, only for MSR runs, get the CY Trust Fund Balances for the FFY from treasury by State (this is also obtained from treasury for the UI Data Summary. Tom Stengle is able to get access to the treasury system for this data). Add this data to columns AC-AD. Make sure to keep the data in the same state order as was

there previously, because a different order will cause states to refer to each others' initial trust fund balances. For PB, just check to make sure the balances are cleared (keep the state order in column AC).

It's also useful to double-check the "mod" page to make sure that some old scenarios are not still in place.

4. Technical Updates: Taxrate Spreadsheet

Each state page in the Taxrate spreadsheet is set up with 5 basic sections:
1. Taxtot/ATR equations (A1-N45) Includes historical data used in the equations and LINEST statements deriving the coefficients used in the forecast.
2. Historical data and variables (O1-AO45) Includes all of the historical data from the Import sheet, as well as derived variables. The columns designated by a yellow shaded heading are data from the Import sheet; those with the purple headings are formulas. Some of the formulas used in the latter columns vary by state. The data from the Import sheet, as well as columns Z, AA, AB, and AD (TBAWW, BR, AV5BR, RR) are the same for each state. Sometimes if there is a problem with parts of state data, the links to the import sheet will be overridden with hard-coded estimates or corrections. This is rare, and the questionable data should be checked with each update. (CA now has estimates for TAXTOT in the last 4 years of its historical data).
3. Query blocks (AR1-BJ9) allow for state specific time windows for use in the regression equations. Macros refer to these cells and extract the data needed for the taxtot and ATR equations. The extracted data is held in section 1.
4. Formula block (M48-AP61) This section is necessary because of the rolling nature of these models. Each year, a transition is made to add the latest historical year to the historical data and move the forecast window forward one year. This formula block stores formulas for each of the variables according to individual state law and characteristics. The macros then take the formulas from this block and sync it to the historical data in order to easily make the transition to the new forecast period. More explanation of these macros to follow.
5. Output block (M63-AO75) This is the section that holds the model forecast, and the one responsible for links to the OUTPUT and LOAN spreadsheets.

The reason the historical block is separated from the Formula and Output blocks is because this model was set up to forecast a rolling window. With each new PB, the first year of the forecast window moves forward, and at the same time, the previous first forecast year becomes a year of "actuals", and is added at the end of the historical period. There is a rather complex macro whose task is to change all forecast windows and historical periods for all states, maintaining the individual differences, without costing the user a lot of time. As with the macros in the Import spreadsheet, the updating macros for the Taxrate spreadsheet can be accessed through the VBE.

Sheet 1 (Alabama) holds the macros for updating all of the states. The macro called "queries" refers to the "query block" on each state sheet for specific years to use for the state. It then extracts the needed data to columns B-D and H-M, starting in row 20. This extracted data is used for the regression equations in cells A5-B5 (TAXTOT) and G5-K5 (ATR). The next macro, called "reset" adds a new year of historical data depending on its availability from the Import sheet. The third macro, called "forecast" is the most complex of the three. The simple explanation of the macro is that it updates the "output block" on each state page. For more details on how this is achieved, see the comments in the macro.

After running the above macros, there are several manual updates needed. First, for both the TAXTOT and the ATR regression equations (In the first section of each state page), the LINEST statements need to be revised in order to include the latest row of data available. LINEST calculations are ARRAY formulas in excel, which means the calculation applies to more than one cell at a time. Each coefficient is housed in a different cell, and the ARRAY status allows for a change in the calculation to effect all coefficients and statistics involved. Because the LINEST statements are in ARRAY format, you need to select all of the cells in the ARRAY in order to change the calculation. After selecting all of the cells, change the rows used in the formula by using the search/replace function. For example, to change Alabama's TAXTOT calculation to include one extra row of data, first go to Alabama's page. Alabama's TAXTOT regression

calculation is in cells A5-B5. Then, if the last row used to be 40 and should now include 41, simply do a search for 40 and replace with 41.

The second manual update needed is in cells M76-N83 of each page. These cells house the Estimated State Tax Rates (ESTTR) for each state, if they've been provided by the state. There are two green boxes with bold borders on each state page (located in cells M79 and M83). These are trigger boxes. If there is a 1 in the box, the ESTTR above it will replace the model-estimated tax rate for the year indicated. If there is a 0, the forecast will use the model estimate. The green box should have a 0 in it if the ESTTR is not available, or if for some reason the ESTTR is deemed inaccurate.[1]

6. Technical Updates: LOAN Spreadsheet

Most updates in the Loan spreadsheet will occur automatically when Import, USCalc, and Taxrate have been updated. There are a couple of manual updates, however.

One of the principal functions of the loan model is to take annual projections of revenues and benefits and break them into monthly flows. Once a year (for the PB run), the splits we use to disaggregate the annual numbers need to be updated. There are some marginally handy tools to make this process a little easier.

The first step is to download data from the UIDB. Use ISQL to download columns C9 (net contributions) and C51 (net UI benefits) from the ar2112 from 1994 to current. FTP the file from the unix system to your desktop. Open the file, parse it, and place it on the data page of the following:

s:\ois\dfas\acts\scott\common files\loan model splits.wb3 (Note – this is a Quattro pro file)

Put the data into columns A-D on the first spreadsheet page, called "data". You'll notice new values calculated from column G on. The splits for various time periods are available for all states. Splits for Alaska are in G3 through O14 (as indicated in column A for corresponding rows), splits for Alabama are in G113 through O124, and so on. If the cells in columns G through O reference Column D, you're looking at benefits. To switch to contributions, simply do a search and replace to switch D to C.

Once you have the state splits and have decided on a time period that's appropriate, copy and paste special (values) the block from A1 to AE5789 in another area. Delete the columns B-E and G-Z. Also add a counter column on the far left, which will increment in value and allow you to sort the data later. Copy and paste special (values) the counter column. The data should look very much like what's on pages 2 and 4 of the loan model splits spreadsheet. Pages 2 and 4 take this input and produce the proper set of monthly percentages (splits) for the variable that was input.

(Note: You can always verify that you have the right data by observing the seasonal pattern. Benefits always show a minimum around June and relative maximums at December and January. Contributions always show their maximums in April and March and should show decreasing seasonal spikes every three months.)

Feel free to use the last page, which allows comparison of new splits to old splits. This can be useful in diagnosing changes in model performance. This is especially true of states that have relatively low levels of solvency. Changing the monthly splits can alter revenue patterns and put them into loans where they were not borrowing previously.

Again, copy and paste the data (special:values) and sort by state abbreviation column to get rid of all the empty spaces. Check to be sure that the state order is correct.

7. Technical Updates: Revenue Spreadsheet

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[1] At this time, the ESTTR for Puerto Rico, though provided, is not being used in the model.

With each PB, the revenue sheet adds a year, rather than rolling years forward as the other models do. This requires some manual updating.

Updates on the spreadsheet page named "Quarterly"; Section FUTA CONSTANT LAW LIABILITY (Rows 4-12):

First, in rows 5-11 (Taxable wage cap through liability), copy the last 4 columns of cells and paste them in the first blank column. This will add the next four quarters for these variables.

Note: Rows 11 and 12 on the Quarterly page contain new formulas and features as of 5/02. Unfortunately, there are no macros and the setup of the spreadsheet may need some revision/reworking. I'll attempt to explain the setup in this section, but a more graceful solution may make the user's updating process a little easier in the future.

Row 11, "Liability before reduced state credits", uses actual FUTA collections (with a 1 quarter lead, to get liabilities) where available. These collections are found in the Monthly Treasury Statement (MTS), located on the web at http://www.fms.treas.gov/mts/index.html . The latest data is not only used for row 11, but it is also used in the calculation of row 12, "Quarterly Contribution Factors". Row 12 houses the projected quarterly splits for annual FUTA deposits. These splits are calculated in a separate spreadsheet called MTSqtr.xls. This spreadsheet uses historical FUTA collections data from to determine quarterly flow of FUTA revenues within a calendar year. To update these splits, first enter all new available FUTA monthly collections in column I.

Once these have been entered, sum the months to calculate the quarterly liabilities in the section labeled "QUARTERLY LIABILITIES". This block starts in cell P4. Go to the end of that row where the first blank quarter is (hit end, then the right arrow key), and calculate the liabilities for any extra quarters available. This is done by calculating the sum of the three months in the quarter. Note, the time period in these cells is for LIABILITIES, so the quarter LEADS the actual deposits by 3 months, or 1 quarter. To understand and double-check the timing, check the last imputed liability quarter and note the months used for it.

Once a full new year of liabilities is available, that year becomes part of the "historical" period (marked in this area by black ink, and in the cells below by pink ink). The cells below (in rows 10-13) are formulas that calculate the quarterly splits. If the numbers are pink, they are calculated based on actual deposits above.

If the ink in the cell is blue, it refers to the projected quarterly split calculated in column AQ. This projected calculation takes the quarterly split from the same quarter, 1 year prior, and adds to it the average historical change in that quarter's split over the historical period. The cells in columns AQ and AP need to be adjusted when a new quarterly split year is available. Again, in these columns, the forecast period is marked by electric blue ink. To update, if there are new "actual" quarterly splits, use those in column AQ. Move the calculation of the average change in the first forecast year in column AP to the next year, adding the latest year to the calculation of the average change for the forecast period. Change the ink for the changed year to black to notate when the historical period ends and the forecast period begins. Finally, add an extra year at the end of the columns by copying the last 4 rows and pasting them on the bottom.

You can actually use column AQ for row 12 in the Quarterly page of the Revenue spreadsheet. Simply copy the forecast period, go to the correct cell in the Quarterly page, and paste special: values, while also checking "transpose". Again, a more graceful solution to this process may be a useful endeavor in the future.

Updates on the spreadsheet page named "Quarterly"; Section ANNUALIZED LIABILITY (Rows 14-31):

This section annualizes the quarterly liabilities in the section above it. The last year must be added with each new PB. It's not just a matter of copying the formulas from the previous year.

- Row 16: To add the next year's FUTA, calculate the sum of the 4 quarters added at the end of row 11.
- Row 17:Reduced State Credits refer to the rolling forecasted window imported from the Loan model on page "revloan". Since this rolling window automatically shifts with the PB updates in the rest of the model spreadsheets, the cells in row 17 need to be shifted manually one cell to the right. The references in these cells are absolute (as opposed to relative: eg A1 vs. A1), so in order to shift the years, copy the cells from the previous 10-year forecast window over one cell to the right. After you have shifted these cells, go back to what was the first year of the forecast window and hard-code the actual value in that cell.
- Row 18, 23,31: simply copy the last cell available and paste to the next blank cell
- Row 19: the next cell should reference the same column as the last cell in this row, but add one row. (ie: if the last cell references D75, the next cell should reference D76).
- Row 21, 22: State Deposits and "new reimbursables", like Reduced State Credits, refer to the rolling forecasted window. Follow the same updating process for these 2 rows as for row 17, copying the previous 10-year forecast window, moving it over one cell to the right and pasting. Again, go back to the previous first forecast year (which is now the last historical year) and hard-code the actual value in place of the reference.
- Rows 26-29: Railroad. This section is manually entered. The Railroad forecast is done exogenously and you can get it from Andrew Bershadker at treasury.

Updates on the spreadsheet page named "Quarterly"; Section FISCAL YEAR RECEIPTS BEFORE COLLECTIONS ADJUSTMENT (Rows 37-53):
- Rows 39: FUTA Deposits. This update is similar to the update for Row 16. Make sure the next cell in this row retrieves the 4 cells following the cells referenced in the previous cell.
- Row 40: State Deposits: This update is like row 17, 21, and 22 in the above section, shifting the cell references to match the rolled forecast window.
- Rows 41, 42, 50-53: simply copy the last cell available and paste to the next blank cell.

Updates on the spreadsheet page named "Quarterly"; Section ASSUMPTIONS (rows 59-68):

The purpose of this section is to summarize the assumptions that went into the Revenue Model Package. To keep the years in line with the year columns in the above yearly sections, select the entire section, CUT, and paste in one cell over to the right.

Updates in the page named "FUTA"

The FUTA page, like the Quarterly page, is not set up as a rolling forecast, so it also has to have years added on if the forecast window changes. There are updating directions highlighted in green to remind the user of manual updates needed. The top section of the FUTA page is set up to revolve around the most recent FUTA estimate on the futarec page in the Import sheet. If the year for that estimate changes, the "hinge" upon which this section revolves shifts over one column to the right. (A more detailed description is available on the page, in cell D2). Additionally, a column must be added at the far right of this block of estimates. Use the same formula as the previous column in the block, but make sure the reference to the quarterly page is lined up to the correct year.

Below the state FUTA estimates, starting in cell C60, is a series of FUTA wage growth rates. They refer to the Output spreadsheet (cells BJ4-BJ15), which determines the annual difference in wages for states with a $7000 state taxable wage base, which is equal to the FUTA taxable wage base. These too are not set up to automatically roll with the rolling forecasts in the other spreadsheets. This section is organized in columns, rather than rows. The last year must be added on the bottom. Columns D and F can be copied from the last cell and pasted in the cell below. In column E, the cell references must be shifted down one cell as explained in the directions for the quarterly page, row 17, with a cut/paste of the entire forecast section. The first forecast year is tricky, because it involves the last historical year's wages (hard-coded in cell BL3). Sometimes the shift from actual to forecast wages leads to an irregular jump or slide for the first forecast year. After discussing with Scott Gibbons and/or Mike Miller, usually a guestimated growth rate

is hard-coded for the first forecast year. Finally, the last historical year should be changed to refer to the corresponding year in row 58.

8. Technical Updates: Exogenous Data: NEWMAN, Extended Benefits (EB), and 10-Pager

For each budget run, there will be technicals from the above three models that are exogenous to the revenue model package. However, for the technical breakout, the inputs from these exogenous models are necessary. The following inputs come from the above models:

1. Input from the Newman and Extended Benefits (EB) models: Benefits and Covered Employment from Newman go in Rows 51, 53 on USHist page of the Import sheet. Make sure you get the calendar year quarter right – NEWMAN is in fiscal years, so enter the first quarter value in the 4th quarter for the previous calendar year. EB goes in column P of the USAnnual page Import.xls. Put all of EB in this column. State share will be broken out later. (EB is a shared state/federal program)

2. Reed Act Distributions iteration. Once all technical updates have been made in the Revenue Model package, the revenue sheet and USLOAN sheet are printed out and given to the person who runs the 10-pager (Mike Miller at the moment).
   a. Reed Act distributions are deposited in the beginning (Oct 1) of a given Fiscal Year. The 10-Pager that calculates these distributions is in Fiscal Years. Therefore, the CY Reed Act Distributions that are displayed in the tax rate model correspond to the following FY Reed Act Distributiions on the 10-pager.
   b. There are 2 possible places to enter the Reed Act Distribution numbers: If it is the final iteration, put them in the appropriate year on the USAnnual sheet in Import.xls. (Column G). If you are doing several iterations (which is likely), put them in the scenario block of the mod page in USCalc.xls.

9. Technical Updates: Structural: Model Revisions

After all of the data updates are complete, an analysis of the state specific models may lead to structural revisions in the ATR equations. Within each state sheet in the Taxrate spreadsheet is the individual ATR and TAXTOT equations which house the coefficients that are used to forecast ATR and TAXTOT. The ATR equation is based on at least one the following explanatory variables: annual reserve ratio, benefit ratio, lagged tax rates, taxable wage proportion, or some interaction or functional form of these variables. The coefficients from the accepted equation are located within this sheet (in cells G5-K5) and stay constant throughout the forecast.

The TAXTOT equations are fairly simple and rarely change structurally. However, if the need arose for a change in TAXTOT this would also fall under the "technicals" category and should be changed at this time.

Each year adjustments can be made to the State ATR equations. The adjustments are based on any significant legislative changes that States have made in their UI tax law. Depending on the change in laws, the specification of the equation may change. The three most common changes in the State ATR equations, to improve their performance, are:

1) A new explanatory variable may be added or an existing one dropped based on the ability of the variable within the equation to model the tax rate. Often a dummy variable for period of the new law may be sufficient to model the new change. The types of dummy are outlined in the "Overview" document, page 6. The "time period" dummies (called DUM) for the forecast period are located in column AP of the Taxrate spreadsheet, rows 50-61. If the equation uses these dummies, they use the absolute cell reference, so a duplicate of the values is not needed in the output block (rows 64-75). If you'd rather have them duplicated in the Output block, for consistency with the other variables, simply have the cells in the output block reference the cells in the formula block above it. The "threshold" dummies are nested in with the rest of the derived variables, and should automatically update using the updating macros. When adding new dummies to improve a state's performance, check the structure of other states that have similar dummies, and model the new dummy after those.

2) The time period of the equation may change. The historical data used in the regression maybe shortened in order to increase the significance of the most recent data or increased to capture periods of a similar nature. Note: to change the historical data used in the regression, change the beginning or ending date specified in the "query block", explained in section 3 of the above section called Technical Updates: Taxrate Spreadsheet.

3) A different functional form of an existing variable may be used to improve the relationship between the explanatory variable and the average tax rate.

4) Addition of a dummy variable. For example, if a state has added a new tax rate schedule it may be necessary to add a dummy variable for the period it will be in effect. The change in specification should be tested against historical data and the regression diagnostics used to accept or reject the new variable.

Another type of model revision that may arise would be a change to the general structure of the model. For example, the Trust Fund Balance forecast used for the Reserve Ratio in this model has undergone a series of changes in its calculation. When the model was first developed, it was calculated in the Taxrate spreadsheet. Later it was deemed more efficient and more accurate for the Taxrate spreadsheet to simply link to the balances calculated in the Loan model. This type of structural change would be considered a "technical" and thus should be done at this time.

10. Technical Updates: Structural: Fixing Errors

The "technical" updates also include any changes based on previous errors in the model. Past errors have been both theoretical and practical, including but not limited to incorrect cell references, inaccurate interpretation of the liabilities/collections distinction, timing errors, and incorrect formulas. Because of the nature of the government's budgetary set-up, these errors can only be fixed during the semi-annual budget runs. For this reason, I've found it helpful in between the budget runs to keep a running list of (usually small) errors that need to be fixed or adjusted in the following run.

Updating Directions: "Economics"

There are 3 basic parts to the Economics updates – all stem from the assumptions provided by OMB. These assumptions are provided as quarterly forecasts. They go in the USHist page of Import.xls.

1) Assumptions used directly from OMB: Rows 8-20 on the USHist page. The section is identified as "Budget Assumptions"
   a) Wages and Salaries: Personal Income (Pers_Inc_Qtr) Page from the budget.
   b) Civilian Employment: Labor Force (Labor_Qtr) Page from the budget. Under Heading "Civilian Labor Force"; Subheading "Employed"
   c) Unemployment Rate Civilian: Labor Force (Labor_Qtr) Page from the budget
   d) Interest Rate: Interest Rates for New Purchases of Securities (Trust_Rates) Page from the budget. Under heading "Unemployment Trust Fund". Enter June 30 rate for each forecasted year. This row may be a little confusing because the interest rates are entered under the June 30 (2nd Quarter) columns for each year, but the 4th quarter columns are formulas, so they shouldn't be changed. The model uses an average of the last 4 June 30th interest rates for its interest earned calculation, and will automatically update if you just enter the June 30th rates.
   e) Covered Employment from the NEWMAN model. Just enter the covered employment in this layer. The benefits from the NEWMAN model get entered in the second layer.
   f) FFY wage adjustment factor: This is a manually set trigger for the first forecast year, used to adjust the wages in order for the model to hit the known revenues for the first forecast year. This

adjustment is housed and explained in Output.xls, cell BG4. If it is set to 1, there is essentially no adjustment. The adjustment can also be turned "off" by setting cell BF4 = 0.

g) FFY FUTA adjustment factor: Just like the wage adjustment factor, this adjusts the FUTA forecast to hit the actual deposits received for the first FY shown in the output. It is also manually adjusted. The cells for this adjustment are in the Revenue.xls spreadsheet, page "revloan", cells A9 and A10.

2) Benefit Changes: ~~Get State benefits from the~~ NEWMAN model, and EB from the EB model, in same format as for technicals, but the models now incorporate the new economic assumptions.

3) REED ACT changes: Get REED ACT distributions in same format as for technicals, but they now incorporate the new economic assumptions. Note. This is an iteration that requires the results of all technicals and economics up until this point to be entered into the 10-pager.