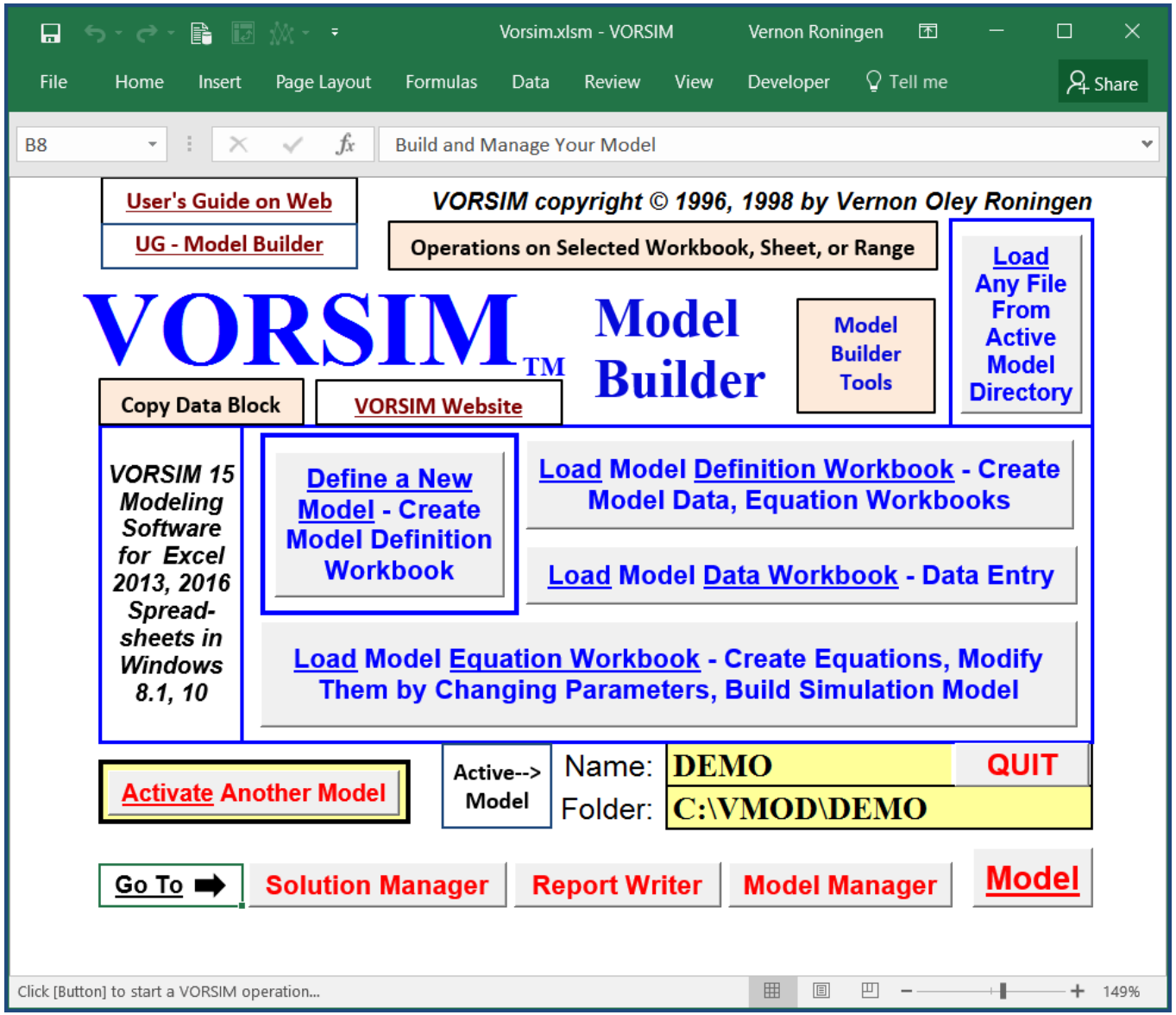
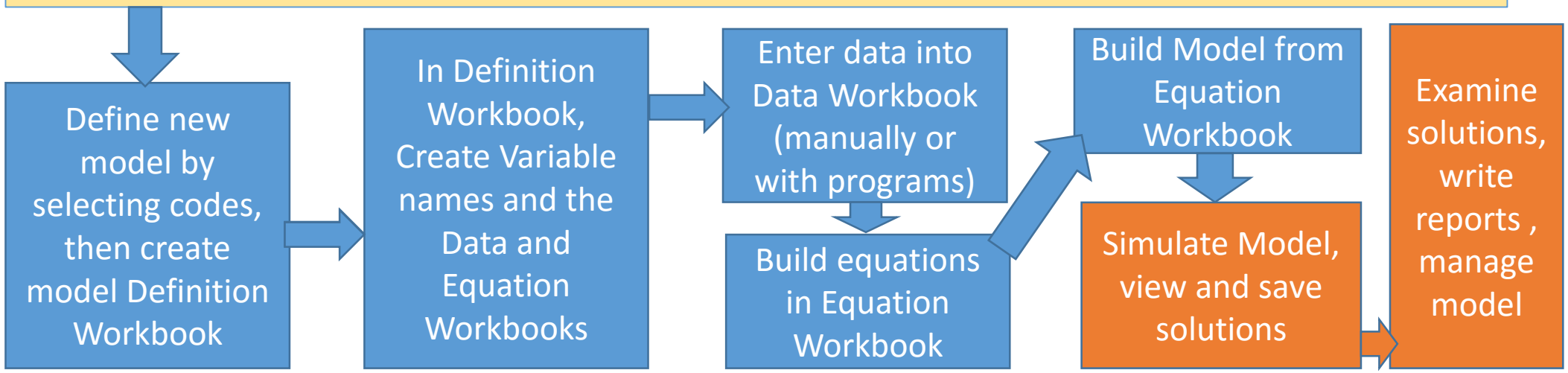
A model is built by VORSIM from this Model Builder control screen that loads when the VORSIM desktop icon is clicked. One starts by defining a new model and creating a model definition workbook. When the latter workbook is complete, then data and equation workbooks are created. Data is entered in the data workbook and equations are created in equation workbook. Then from the first sheet of the equation workbook, the stand-alone model workbook itself is created. When the model workbook is loaded, the model can be configured for solution and solved. Control buttons for various model operations are added as the workbooks are created.



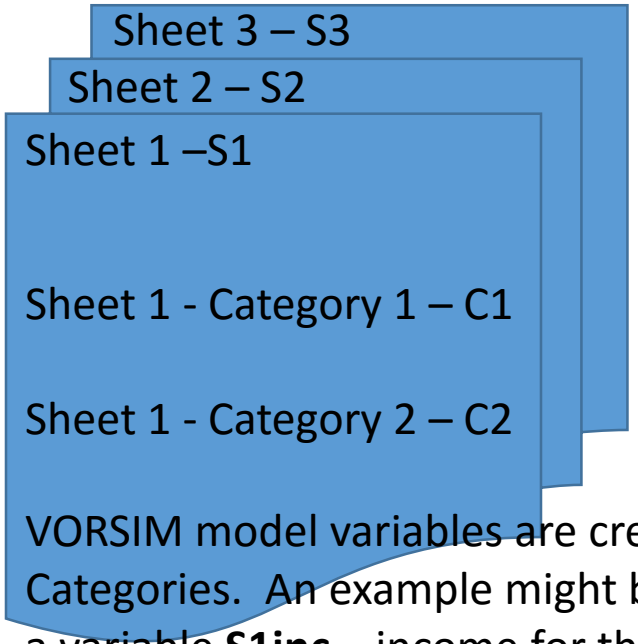
# Steps in building a model in Excel With VORSIM 15 using buttons on the Model Builder control screen

Design model by defining problem to be examined, determining data availability, designing model structure, and selecting a closure method. This paper and pencil exercise is the most important part of the model building effort using VORSIM or any other modeling software. Thinking required!




VORSIM 15 requires Office Excel 2013 or later versions

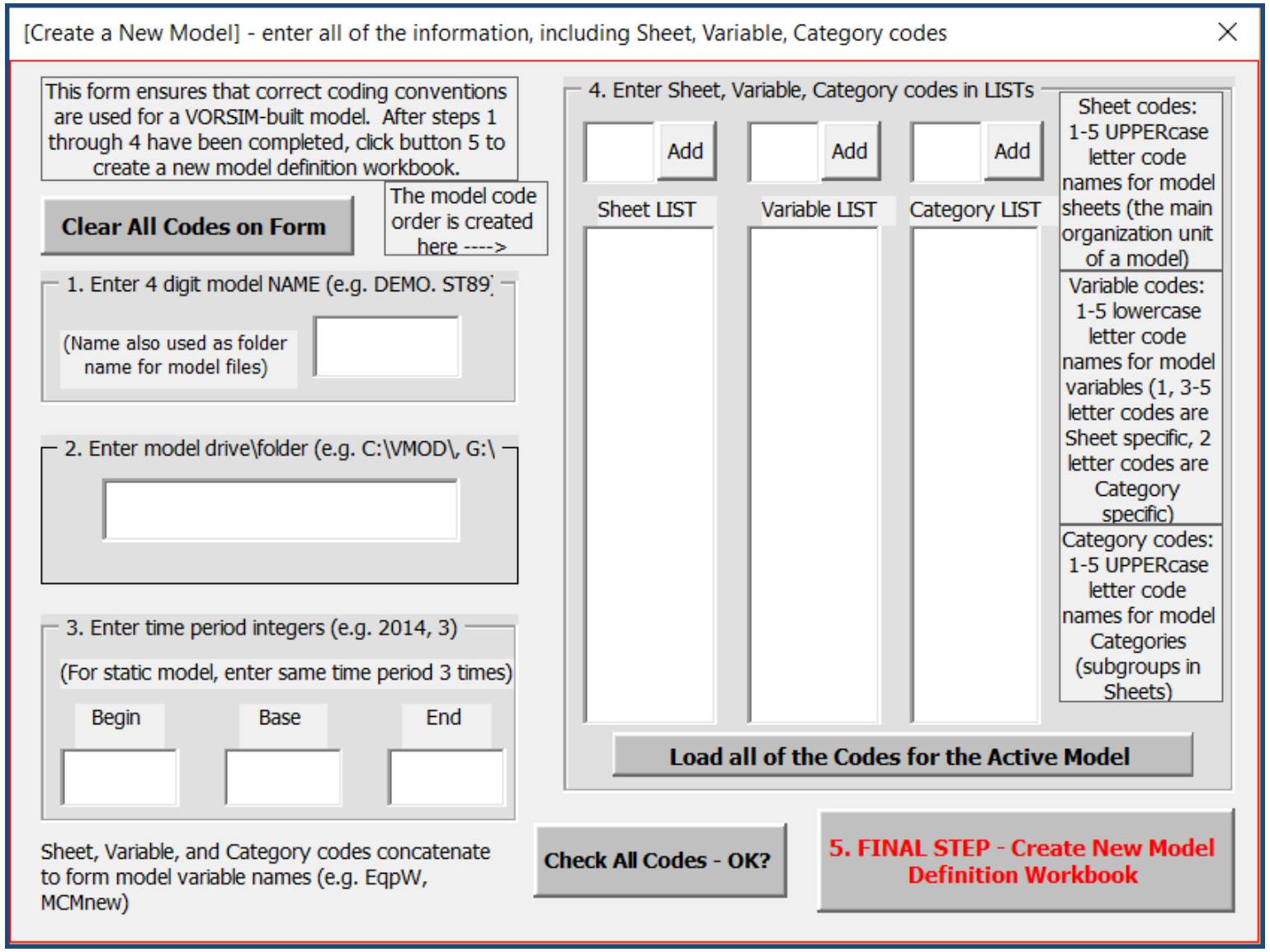
VORSIM uses the structure of the Excel spreadsheet for building a model. Information is kept in Excel Workbooks containing Sheets which in turn, can be subdivided into Categories.



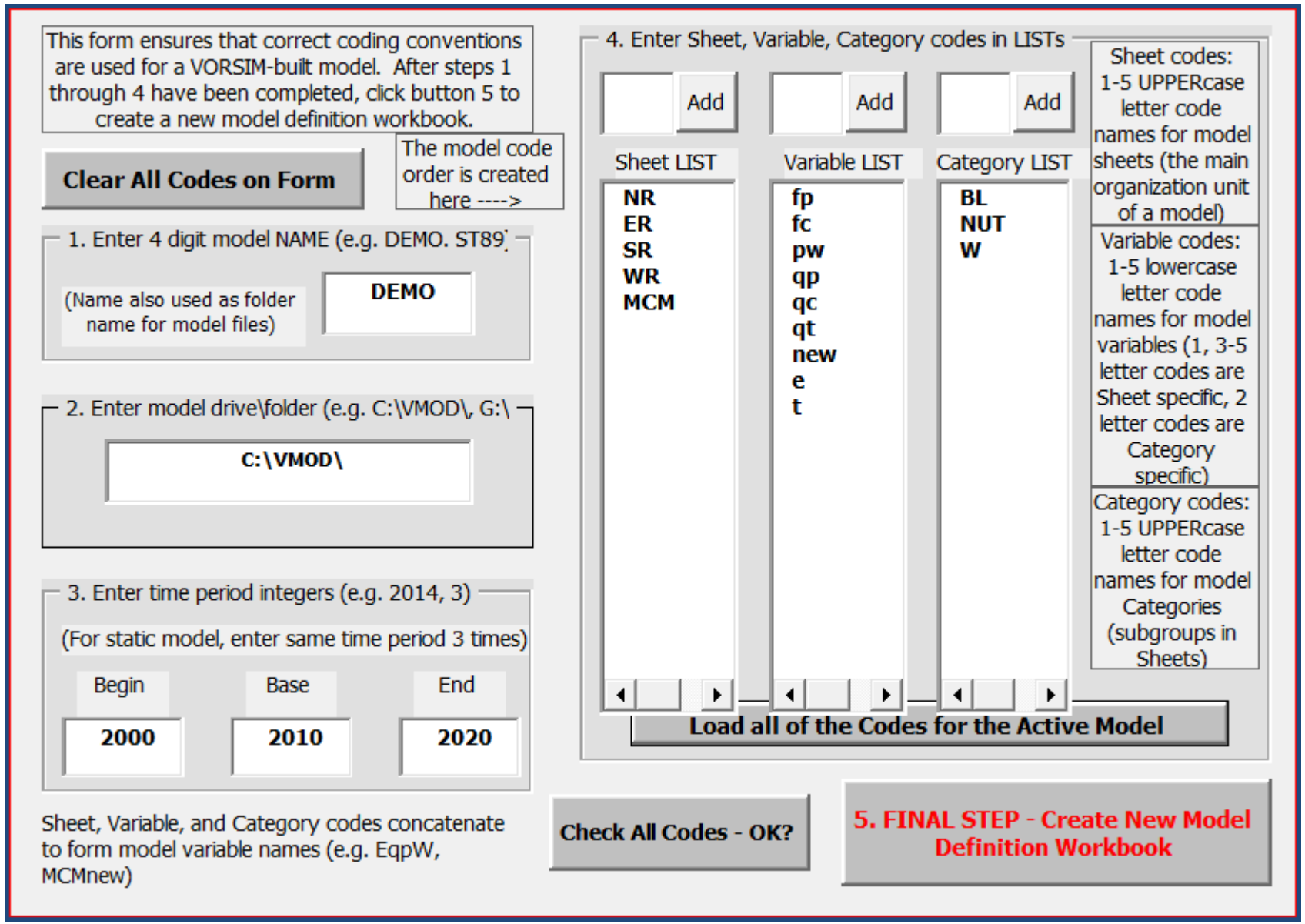

An Excel model consists of equations made of variables using Excel math notation. In Excel, numbers and equation variables are located in Sheet cells referenced by row and column – e.g. B3 or AX241. Because a model with many variables and numbers can be spread out in a workbook, VORSIM provides a way of naming variables consistent with Workbook structure and a way of setting the cell location of each and every variable in a model. With VORSIM, when a model is built so you know where variables and equations are located.

VORSIM model variables are created by concatenating variable codes with codes for Sheets and Categories. An example might be a variable code **inc** for income joined with a Sheet code to form a variable **S1inc** – income for the part of the model residing on Sheet 1. A two digit variable code **qs** for quantity **C1** sold would be used in the variable name **S2qsC1** – the quantity sold in Sheet 2 of the Category 1 product. A simple but flexible set of rules is enforced which creates readable variable names , sets locations for all variables, and maintains a model which follows the structure of an Excel Workbook. Procedures in VORSIM make sure the rules are followed in code entry forms using your designated codes and model structure.

When planning a model, information for this form must be selected. When creating a model, this form must be filled out. As code information for a model is entered on this form, VORSIM rules are enforced so that everything in later model building steps will work. As us true with all VORSIM forms, explanations appear on the forms and numbers often specify the order of tasks on the forms. The final step creates the model definition workbook and closes this form. Documentation of codes and the final selection of model variables takes place in the model definition workbook.



Here, information needed to create the model DEMO has been added to the model creation form. Model workbooks are usually stored in a folder with the model name on the VMOD directory. So, for example, the location of the DEMO files would be C:\VMOD\DEMO in this example. The sheet, variable, and category codes follow the selected structure and type of equations for the model. Two digit variable codes allow similar equations to be written for categories.



Here is the Definition sheet of the model definition workbook that was created. Descriptions have been manually added to the codes. Excel format codes are added to variable codes. For example, any cell with variable using the pw code will appear numerically with 2 places after the decimal point, e.g. 45.00. Also, the maximum number of lags for a variable in equations is set. The documentation shown is minimal but adequate. As long as key model cells (here in column A-C) are not disturbed, documentation can be entered anywhere in workbooks. Workbooks can be backed up as needed so that information is not lost if a workbook is damaged. The second sheet of this workbook contains a "map" of all the model variables.

Mdesc | simple dynamic DEMOnstration net trade model

| DEMO | <--Model | C:\VMOD\ | Begin: | 2000 | Base: | 2010 | End: | 2020 |
|---|---|---|---|---|---|---|---|---|
| simple dyn | Name | Drive:\Directory\--------- | ----------Time Periods for Data and Model--------- | | | | | |

| Sheet | | Sheet Description..... |
|---|---|---|
| NR | - | Northern Region |
| ER | - | Eastern Region |
| SR | - | Southern Region |
| WR | - | Western Region |
| MCM | - | Market Clearing Mechanism |

| Category | | Category Description..... |
|---|---|---|
| BL | - | Bolts |
| NUT | - | Nuts |
| W | - | Washers |

| Variable | Format | Lag | Variable Description..... |
|---|---|---|---|
| fp | 0.0 | 0 | shift variable - unexpected production change (normal value = 1) |
| fc | 0.0 | 0 | shift variable - unexpected consumption change (normal value = 1) |
| pw | 0.00 | 1 | market clearing price |
| qp | 0 | 2 | quantity produced |
| qc | 0 | 0 | quantity consumed |
| qt | 0 | 0 | quantity net trade = qp - qc |
| new | 0.0 | 0 | new construction index impacting consumption |
| e | 0 | 0 | target equilibrium variable ( = 0 when markets cleared) |
| t | 0 | 0 | time |

Definition | Variables

Click [Button] to start a VORSIM operation... 100%

1. Create -- Variables | 2. Create Data Workbook | 3. Create Equation Workbook

| DEMO | NR | ER | SR | WR | MCM |
|---|---|---|---|---|---|
| fpBL | NRfpBL | ERfpBL | SRfpBL | WRfpBL | |
| fpNUT | NRfpNUT | ERfpNUT | SRfpNUT | WRfpNUT | |
| fpW | NRfpW | ERfpW | SRfpW | WRfpW | |
| fcBL | NRfcBL | ERfcBL | SRfcBL | WRfcBL | |
| fcNUT | NRfcNUT | ERfcNUT | SRfcNUT | WRfcNUT | |
| fcW | NRfcW | ERfcW | SRfcW | WRfcW | |
| pwBL | NRpwBL | ERpwBL | SRpwBL | WRpwBL | MCMpwBL |
| pwNUT | NRpwNUT | ERpwNUT | SRpwNUT | WRpwNUT | MCMpwNUT |
| pwW | NRpwW | ERpwW | SRpwW | WRpwW | MCMpwW |
| qpBL | NRqpBL | ERqpBL | SRqpBL | WRqpBL | |
| qpNUT | NRqpNUT | ERqpNUT | SRqpNUT | WRqpNUT | |
| qpW | NRqpW | ERqpW | SRqpW | WRqpW | |
| qcBL | NRqcBL | ERqcBL | SRqcBL | WRqcBL | |
| qcNUT | NRqcNUT | ERqcNUT | SRqcNUT | WRqcNUT | |
| qcW | NRqcW | ERqcW | SRqcW | WRqcW | |
| qtBL | NRqtBL | ERqtBL | SRqtBL | WRqtBL | MCMqtBL |
| qtNUT | NRqtNUT | ERqtNUT | SRqtNUT | WRqtNUT | MCMqtNUT |
| qtW | NRqtW | ERqtW | SRqtW | WRqtW | MCMqtW |
| new | NRnew | ERnew | SRnew | WRnew | |
| e | | | | | MCMe |
| t | | | | | MCMt |
| pw:1BL | NRpw:1BL | ERpw:1BL | SRpw:1BL | WRpw:1BL | MCMpw:1BL |
| pw:1NUT | NRpw:1NUT | ERpw:1NUT | SRpw:1NUT | WRpw:1NUT | MCMpw:1NUT |
| pw:1W | NRpw:1W | ERpw:1W | SRpw:1W | WRpw:1W | MCMpw:1W |
| qp:1BL | NRqp:1BL | ERqp:1BL | SRqp:1BL | WRqp:1BL | |
| qp:2BL | NRqp:2BL | ERqp:2BL | SRqp:2BL | WRqp:2BL | |
| qp:1NUT | NRqp:1NUT | ERqp:1NUT | SRqp:1NUT | WRqp:1NUT | |
| qp:2NUT | NRqp:2NUT | ERqp:2NUT | SRqp:2NUT | WRqp:2NUT | |
| qp:1W | NRqp:1W | ERqp:1W | SRqp:1W | WRqp:1W | |
| qp:2W | NRqp:2W | ERqp:2W | SRqp:2W | WRqp:2W | |

Definition | Variables

Click [Button] to start a VORSIM operation... 100%

This is the master variable "map" for the model DEMO. Sheet codes are at the top and a concatenation of variable and category codes are in the left column. The combination yields the variable name in the white cells. Where variables are not needed, cells are left blank. For example, cell B3 contains the variable **NRfpBL**. Two digit variable codes create allow the creation of variables for each category while other variable codes create one variable for each sheet (e.g. **NRnew**). This map sets the location of variables (formulas or data) in the model workbook. Lagged variable names are created where they are needed. Button 1 at the top of the sheet creates the variable names from cells initially containing the number 1 (but not for blank cells). So decisions are made here about which variables to include in the model DEMO. Once variables have been selected, buttons 2and 3 create the model Data and Equation Workbooks.

| WR variable | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WRfpBL | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRfpNUT | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRfpW | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRfcBL | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRfcNUT | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRfcW | | | | | | | | | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| WRpwBL | 1.00 | 1.05 | 1.10 | 1.16 | 1.22 | 1.28 | 1.34 | 1.41 | 1.48 | 1.55 | 1.63 | 1.71 | 1.80 | 1.89 | 1.98 | 2.08 | 2.18 | 2.29 | 2.41 | 2.53 | 2.65 |
| WRpwNUT | 1.00 | 1.06 | 1.12 | 1.19 | 1.26 | 1.34 | 1.42 | 1.50 | 1.59 | 1.69 | 1.79 | 1.90 | 2.01 | 2.13 | 2.26 | 2.40 | 2.54 | 2.69 | 2.85 | 3.03 | 3.21 |
| WRpwW | 1.00 | 1.04 | 1.08 | 1.12 | 1.17 | 1.22 | 1.27 | 1.32 | 1.37 | 1.42 | 1.48 | 1.54 | 1.60 | 1.67 | 1.73 | 1.80 | 1.87 | 1.95 | 2.03 | 2.11 | 2.19 |
| WRqpBL | 1000 | 1006 | 1006 | 1008 | 1012 | 1015 | 1016 | 1022 | 1026 | 1027 | 1032 | 1033 | 1036 | 1039 | 1042 | 1045 | 1048 | 1051 | 1054 | 1057 | 1060 |
| WRqpNUT | 900 | 906 | 910 | 910 | 914 | 920 | 922 | 923 | 923 | 923 | 928 | 932 | 935 | 937 | 940 | 943 | 945 | 948 | 951 | 953 | 956 |
| WRqpW | 1400 | 1406 | 1413 | 1417 | 1416 | 1417 | 1421 | 1422 | 1428 | 1430 | 1431 | 1436 | 1439 | 1442 | 1445 | 1448 | 1451 | 1454 | 1456 | 1459 | 1462 |
| WRqcBL | 1300 | 1304 | 1309 | 1310 | 1323 | 1322 | 1335 | 1354 | 1362 | 1366 | 1377 | 1380 | 1388 | 1395 | 1403 | 1411 | 1419 | 1427 | 1435 | 1443 | 1451 |
| WRqcNUT | 1250 | 1256 | 1259 | 1252 | 1257 | 1259 | 1248 | 1250 | 1250 | 1252 | 1261 | 1250 | 1250 | 1249 | 1249 | 1248 | 1248 | 1247 | 1247 | 1246 | 1246 |
| WRqcW | 200 | 215 | 219 | 206 | 212 | 207 | 210 | 211 | 212 | 204 | 208 | 209 | 209 | 209 | 209 | 208 | 208 | 208 | 208 | 208 | 208 |
| WRqtBL | -300 | -298 | -303 | -302 | -311 | -307 | -319 | -332 | -336 | -339 | -345 | | | | | | | | | | |
| WRqtNUT | -350 | -350 | -349 | -342 | -343 | -339 | -326 | -327 | -327 | -329 | -333 | | | | | | | | | | |
| WRqtW | 1200 | 1191 | 1194 | 1211 | 1204 | 1210 | 1211 | 1211 | 1216 | 1226 | 1223 | | | | | | | | | | |
| WRnew | 104.0 | 110.0 | 116.0 | 122.0 | 128.0 | 134.0 | 140.0 | 146.0 | 152.0 | 158.0 | 164.0 | 170.0 | 176.0 | 182.0 | 188.0 | 194.0 | 200.0 | 206.0 | 212.0 | 218.0 | 224.0 |

NR | ER | SR | WR | MCM

Click [Button] to start a VORSIM operation...

This is the data sheet for WR (western region) in the Data Workbook. There is a workbook sheet for each sheet code. Historical data is on the left, base period (2010) data in the middle yellow cells, and exogenous (white cells) or projected (blue cells) are on the right. DEMO is a time series model starting in the base period 2010 and simulating out to 2020. Data is entered manually or programmatically and the data workbook can be backed up at any time so that data entry efforts do not have to be repeated if the data workbook is corrupted. Data for the base period is used to initialize the model's constant terms making the model reproduce the base period data. Exogenous data from this workbook is used to simulate the model into the future. Note that if the model were static (one time period), the data workbook would only contain one column of base period data per sheet.

NR | Add Equation Parameter Matrix | Write NR Equations | Put NR Equations in Model | Calculate 1 Intercept

NR - Equation Parameter Matrices and Equations | Edit Equation | Equation Bank | Symmetry

| product price | market clearing price |
|---|---|
| pw | MCMpwl |
| BL | - |
| NUT | - |
| W | - |

| | ---current price elasticities- | | | ---lagged price elasticities-- | | | -lagged production elasticities- | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| quantity produc. | shift | bolts | nuts | washers | bolts | nuts | washers | bolt prod. -1 | nut prod. -1 | washer prod. -1 | growth rate | sum of current qp elast. | sum of lagged qp elast |
| qp | *!fpl | !pwBL^# | wNUT^# | *!pwW^# | pw:1BL^# | p:1NUT^# | pw:1W^# | qp:1BL^# | p:1NUT^# | qp:1W^# | MCMt)^# | | |
| BL | - | 0.50 | -0.05 | -0.02 | 0.10 | -0.02 | -0.01 | 0.10 | 0.02 | 0.02 | 0.00 | 0.43 | 0.07 |
| NUT | - | -0.04 | 0.41 | -0.06 | -0.02 | 0.17 | -0.02 | 0.02 | 0.10 | 0.02 | 0.00 | 0.31 | 0.13 |
| W | - | -0.03 | -0.10 | 0.36 | -0.01 | -0.03 | 0.15 | 0.02 | 0.02 | 0.10 | 0.00 | 0.23 | 0.10 |

| | ---current price elasticities--- | | | | | |
|---|---|---|---|---|---|---|
| quantity sold | shift | bolts | nuts | washers | new constr. | sum of qs elast. |
| qc | *!fcl | !pwBL^# | wNUT^# | *!pwW^# | *!new^# | |
| BL | - | -0.89 | 0.02 | 0.01 | 1.20 | -0.86 |
| NUT | - | 0.02 | -1.05 | 0.13 | 1.30 | -0.90 |
| W | - | 0.01 | 0.12 | -1.30 | 1.40 | -1.17 |

| new constr. | growth rate |
|---|---|
| new | MCMt)^# |
| new | 0.20 |

| northern region net | + prod. | - cons. |
|---|---|---|
| qt | +!qpl | -!qcl |
| BL | - | - |
| NUT | - | - |
| W | - | - |

Equations actually used in the model replace variable names with their cell location (for efficiency purposes) and they can be seen below.

| | Equations |
|---|---|
| NRpwBL | 1*MCMpwBL |
| NRpwNL | 1*MCMpwNUT |
| NRpwW | 1*MCMpwW |
| NRqpBL | 300.3394*NRfpBL*NRpwBL^.5*NRpwNUT^-.05*NRpwW^-.02*NRpw:1BL^.1*NRpw:1NUT^-.02*NRpw:1W^-.01*NRqp:1BL^.1*NRqp:1NUT^.02*NRqp:1W^.02 |
| NRqpNU | 300.2235*NRfpNUT*NRpwBL^-.04*NRpwNUT^.41*NRpwW^-.06*NRpw:1BL^-.02*NRpw:1NUT^.17*NRpw:1W^-.02*NRqp:1BL^.02*NRqp:1NUT^.1*NRqp:1W^.02 |
| NRqpW | 256.7072*NRfpW*NRpwBL^-.03*NRpwNUT^-.1*NRpwW^.36*NRpw:1BL^-.01*NRpw:1NUT^-.03*NRpw:1W^.15*NRqp:1BL^.02*NRqp:1NUT^.02*NRqp:1W^.1 |
| NRqcBL | 3.953792*NRfcBL*NRpwBL^-.89*NRpwNUT^.02*NRpwW^.01*NRnew^1.2 |
| NRqcNU | 2.23042*NRfcNUT*NRpwBL^.02*NRpwNUT^-1.05*NRpwW^.13*NRnew^1.3 |
| NRqcW | 1.618891*NRfcW*NRpwBL^.01*NRpwNUT^.12*NRpwW^-1.3*NRnew^1.4 |
| NRnew | 88.8212*(1+MCMt)^.2 |
| NRqtBL | 0+NRqpBL-NRqcBL |
| NRqtNU | 0+NRqpNUT-NRqcNUT |
| NRqtW | 0+NRqpW-NRqcW |

Variables | NR | ER | SR | WR | MCM | Basec ...

Buttons for model operations are placed at the top of each model equation sheet.

Equations are built and stored in matrix form where rows represent variables for categories and columns represent equation terms. Term coefficients in the matrix cells replace the # symbol when the equation is written (using the button at the top). Re-writing the equation when coefficients are changed is a simple matter of using the button at the top again. Equation terms with no numerical coefficients have –'s in the cells if the term is to be included.

The equations written for model variables are shown at the bottom of the sheet. They begin with constant terms calculated so the equation reproduces variable base data. They include model variable names related by Excel math notation. These are the documentation of model equations.

Write Sheets of Equations | 1. Create Model Workbooks | 2. Put ALL Equations in Model | 2 | Create An Alternative Model | 2020 | <-Enter D for double precision constant terms

| DEMO | NR | ER | SR | WR | MCM |
|---|---|---|---|---|---|
| fpBL | NRfpBL | ERfpBL | SRfpBL | WRfpBL | |
| fpNUT | NRfpNUT | ERfpNUT | SRfpNUT | WRfpNUT | |
| fpW | NRfpW | ERfpW | SRfpW | WRfpW | |
| fcBL | NRfcBL | ERfcBL | SRfcBL | WRfcBL | |
| fcNUT | NRfcNUT | ERfcNUT | SRfcNUT | WRfcNUT | |
| fcW | NRfcW | ERfcW | SRfcW | WRfcW | |
| pwBL | NRpwBL | ERpwBL | SRpwBL | WRpwBL | MCMpwBL |
| pwNUT | NRpwNUT | ERpwNUT | SRpwNUT | WRpwNUT | MCMpwNUT |
| pwW | NRpwW | ERpwW | SRpwW | WRpwW | MCMpwW |
| qpBL | NRqpBL | ERqpBL | SRqpBL | WRqpBL | |
| qpNUT | NRqpNUT | ERqpNUT | SRqpNUT | WRqpNUT | |
| qpW | NRqpW | ERqpW | SRqpW | WRqpW | |
| qcBL | NRqcBL | ERqcBL | SRqcBL | WRqcBL | |
| qcNUT | NRqcNUT | ERqcNUT | SRqcNUT | WRqcNUT | |
| qcW | NRqcW | ERqcW | SRqcW | WRqcW | |
| qtBL | NRqtBL | ERqtBL | SRqtBL | WRqtBL | MCMqtBL |
| qtNUT | NRqtNUT | ERqtNUT | SRqtNUT | WRqtNUT | MCMqtNUT |
| qtW | NRqtW | ERqtW | SRqtW | WRqtW | MCMqtW |
| new | NRnew | ERnew | SRnew | WRnew | |
| e | | | | | MCMe |
| t | | | | | MCMt |
| pw:1BL | NRpw:1BL | ERpw:1BL | SRpw:1BL | WRpw:1BL | MCMpw:1BL |
| pw:1NUT | NRpw:1NUT | ERpw:1NUT | SRpw:1NUT | WRpw:1NUT | MCMpw:1NUT |
| pw:1W | NRpw:1W | ERpw:1W | SRpw:1W | WRpw:1W | MCMpw:1W |
| qp:1BL | NRqp:1BL | ERqp:1BL | SRqp:1BL | WRqp:1BL | |
| qp:2BL | NRqp:2BL | ERqp:2BL | SRqp:2BL | WRqp:2BL | |
| qp:1NUT | NRqp:1NUT | ERqp:1NUT | SRqp:1NUT | WRqp:1NUT | |
| qp:2NUT | NRqp:2NUT | ERqp:2NUT | SRqp:2NUT | WRqp:2NUT | |
| qp:1W | NRqp:1W | ERqp:1W | SRqp:1W | WRqp:1W | |
| qp:2W | NRqp:2W | ERqp:2W | SRqp:2W | WRqp:2W | |

Funcs: ABS, AVERAGE, MAX, MIN, SUM, EXP, LN, IF, INT, AND, OR, SMALL, COUNT, ISERROR, SUMPRODUCT

Refer to VBA help for the proper use of these functions in an equation.

Variables | NR | ER | SR | WR | MCM | Basedata

The first sheet of the equation workbook repeats the variable map from the definition workbook. Buttons 1 and 2 at the top are used to create model workbooks (the model workbook, exogenous data workbook) and to put the equations from this workbook into the model. Also, an alternative model can be created, (normally leaving out selected equations). The last sheet in this workbook (Basedata) contains the base data that is needed to initialize equations. The func list at the bottom lists all of the Excel math functions that can be used in VORSIM built Excel equations.

VORSIM is set up so that complex operations can be easily repeated. For example, if equation parameters are changed on sheets in this workbook, equations can be quickly re-written on the equation sheets and the model re-created from this sheet.

4. Install Solver | Solve Base | Solve DEMO model | Save Solution | QUIT | Change Exogenous Variable | View Solution Variable | View Eq. | a. Load time series exogenous data workbook

2010

| DEMO | NR | ER | SR | WR | MCM |
|---|---|---|---|---|---|
| fpBL | 1.0 | 1.0 | 1.0 | 1.0 | |
| fpNUT | 1.0 | 1.0 | 1.0 | 1.0 | |
| fpW | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcBL | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcNUT | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcW | 1.0 | 1.0 | 1.0 | 1.0 | |
| pwBL | 1.63 | 1.63 | 1.63 | 1.63 | 1.63 |
| pwNUT | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 |
| pwW | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| qpBL | 994 | 1143 | 1241 | 1032 | |
| qpNUT | 1029 | 1134 | 984 | 928 | |
| qpW | 723 | 720 | 1075 | 1431 | |
| qcBL | 1029 | 823 | 1181 | 1377 | |
| qcNUT | 837 | 1088 | 889 | 1261 | |
| qcW | 1123 | 1333 | 1285 | 208 | |
| qtBL | -35 | 320 | 60 | -345 | 0 |
| qtNUT | 192 | 46 | 95 | -333 | 0 |
| qtW | -400 | -613 | -210 | 1223 | 0 |
| new | 146.0 | 150.0 | 154.0 | 164.0 | |
| e | | | | | 0 |
| t | | | | | 11 |

The model workbook contains sheets for lagged data, the model equations and exogenous data for the base period, parameters for the model solver, and a sheet showing the status of a current solution. Buttons 1-4 initiate programs to set up the model for solution while an alternative option allows the use of a previous configuration. Other buttons at the top of the sheet initiate the solution programs to solve the model, save the current solution, and change exogenous data to simulate alternative solutions. Once a model is configured for solution, the configuration buttons are removed and the model can be simulated and solutions saved repeatedly .

1. Select numbers (white cells) to change for model solution (drive (yellow) target cells to zero) | Option: USE A PREVIOUS CONFIGURATION

2. Select target formulas (yellow) to drive to zero | 3. Option: Select (yellow) aggregate target cell (formula = 0 when model solved)

2 | 1 | Model | Solver parameters | Current solution status

This is the model sheet after the model DEMO has been created. Yellow cells contain equations; white cells data.

Solve Base | Solve DEMO model | Save Solution | QUIT | Change Exogenous Variable | View Solution Variable

2010

| DEMO | NR | ER | SR | WR | MCM |
|---|---|---|---|---|---|
| fpBL | 1.0 | 1.0 | 1.0 | 1.0 | |
| fpNUT | 1.0 | 1.0 | 1.0 | 1.0 | |
| fpW | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcBL | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcNUT | 1.0 | 1.0 | 1.0 | 1.0 | |
| fcW | 1.0 | 1.0 | 1.0 | 1.0 | |
| pwBL | 1.63 | 1.63 | 1.63 | 1.63 | 1.63 |
| pwNUT | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 |
| pwW | 1.48 | 1.48 | 1.48 | 1.48 | 1.48 |
| qpBL | 994 | 1143 | 1241 | 1032 | |
| qpNUT | 1029 | 1134 | 984 | 928 | |
| qpW | 723 | 720 | 1075 | 1431 | |
| qcBL | 1029 | 823 | 1181 | 1377 | |
| qcNUT | 837 | 1088 | 889 | 1261 | |
| qcW | 1123 | 1333 | 1285 | 208 | |
| qtBL | -35 | 320 | 60 | -345 | 0 |
| qtNUT | 192 | 46 | 95 | -333 | 0 |
| qtW | -400 | -613 | -210 | 1223 | 0 |
| new | 146.0 | 150.0 | 154.0 | 164.0 | |
| e | | | | | 0 |
| t | | | | | 11 |

Once a solution has been saved, the model is reset to original conditions and exogenous variables can be changed to generate more scenarios.

Once solutions have been saved, there are many ways to examine them visually using programs available in the Solution Manager and Report Writer screens.

Naming conventions for solutions are simple. VORSIM generally tries to keep everything simple for fast computing.

Green Cells - variables changed by the Solver to solve model (drive values in red cells to zero)

$F$9:$F$11

Red cells - equation values driven to zero

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$F$18 2010

$F$19

$F$20

VORSIM provides helpful diagnostics for equation syntax problems and model solution problems as well as routines to help understand and explain solution results.

2 | 1 | Model | Current solution status

This is the model sheet after configuration. The configuration buttons have been removed. The green cells contain the variables changed by the solver to target the red variables and the blue target variable. The cell location of these cells appear below the model cells. At this point, the model can be simulated with the [Solve DEMO model] button at the top. A VORSIM-built model is created as a stand-alone workbook.