Vensim Tutorial

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References:
1. https://www.vensim.com/documentation/index.html
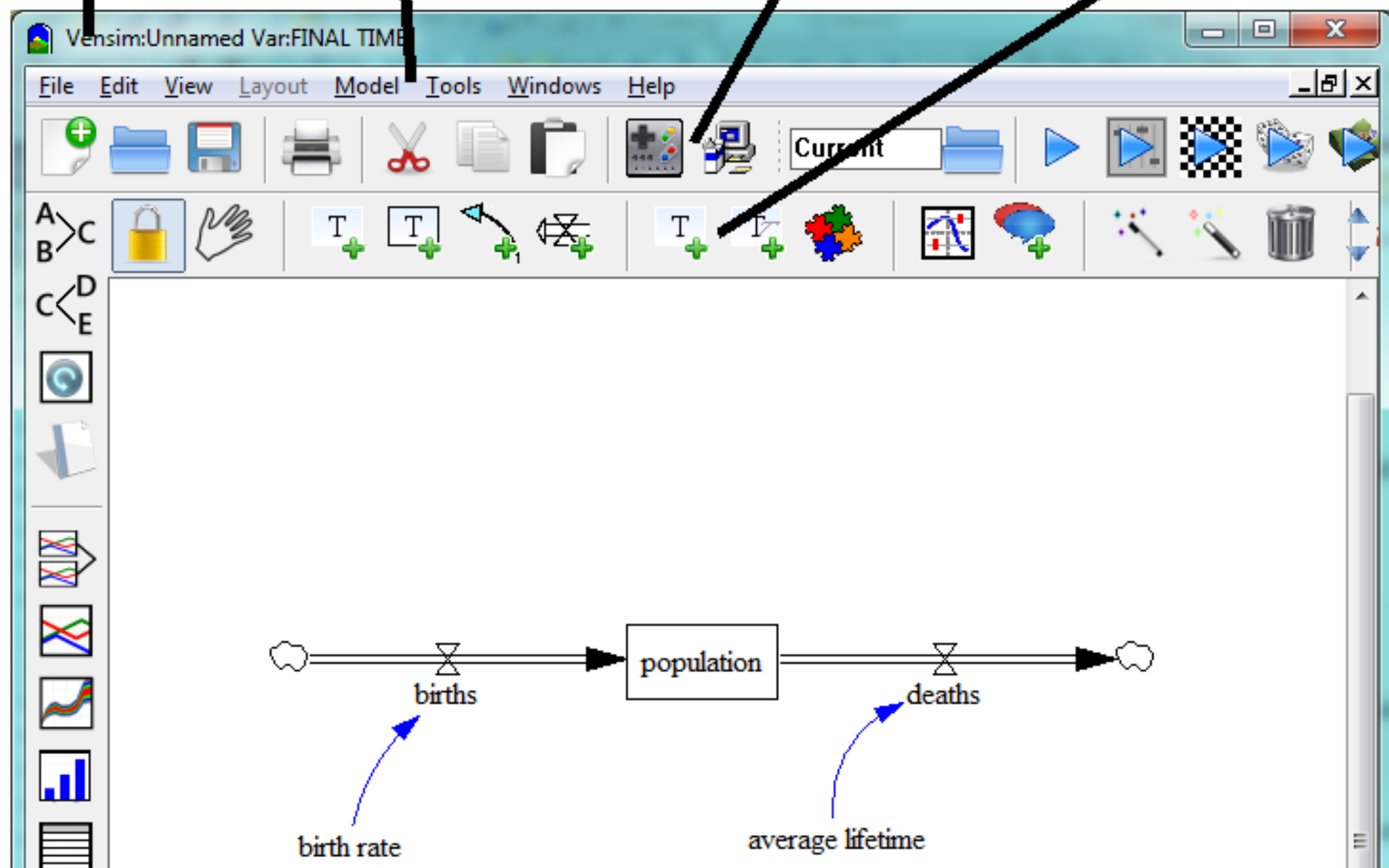
About Vensim

- Vensim is a visual modeling tool that allows you to conceptualize, document, simulate, analyze, and optimize models of dynamic systems.
- Vensim provides a simple and flexible way of building simulation models from causal loop or stock and flow diagrams.
- By connecting words with arrows, relationships among system variables are entered and recorded as causal connections.
- This information is used by the Equation Editor to help you form a complete simulation model.
- You can analyze your model throughout the building process, looking at the causes and uses of a variable, and also at the loops involving the variable.
- When you have built a model that can be simulated, Vensim lets you thoroughly explore the behavior of the model.
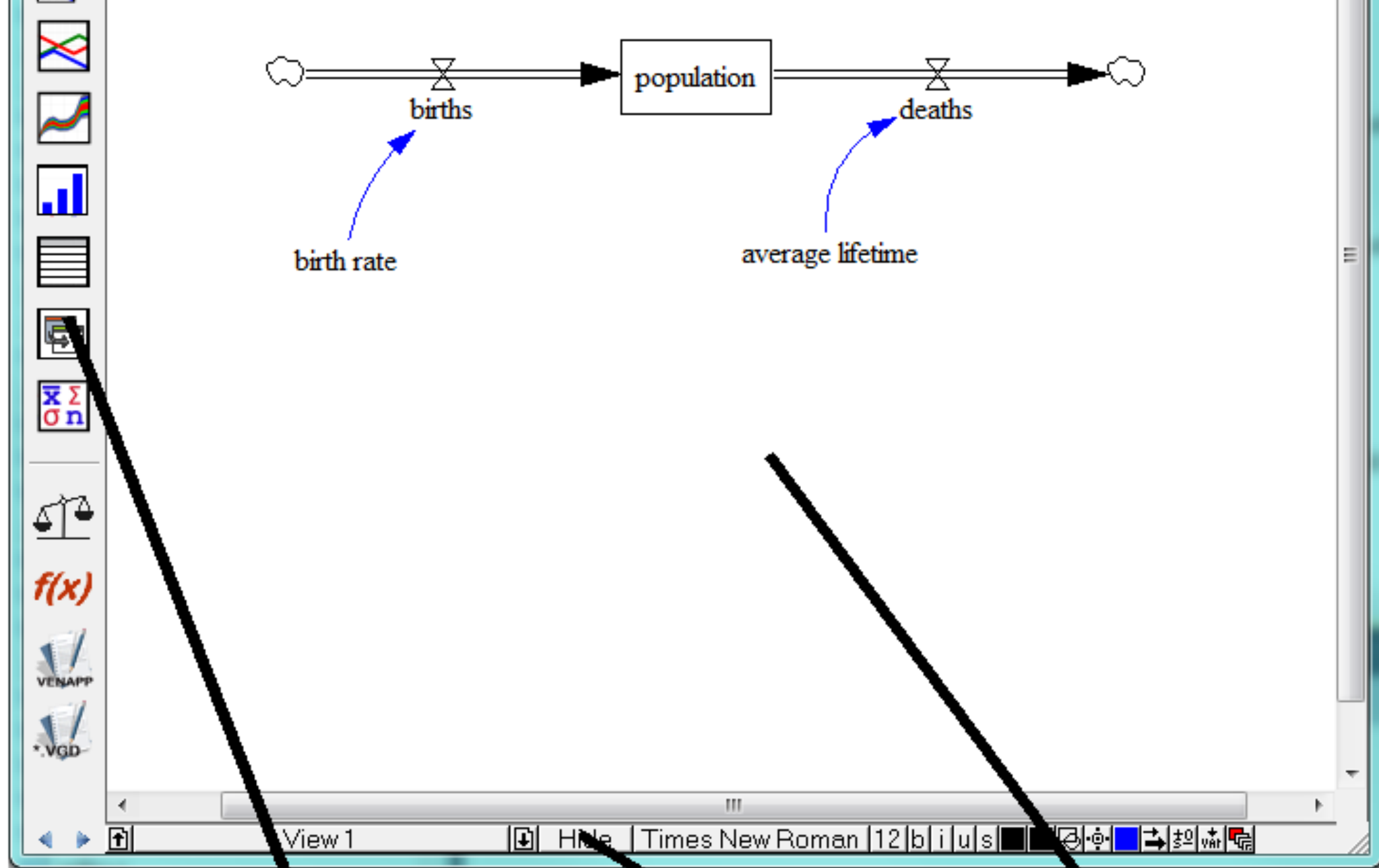
Title bar

Menu

Main toolbar

Sketch tools

Vensim:Unnamed Var:FINAL TIME

File   Edit   View   Layout   Model   Tools   Windows   Help

Current

population

births

deaths

birth rate

average lifetime

population

births

birth rate

deaths

average lifetime

View 1   Hide   Times New Roman   12 b i u s

Analytsis tools

Status bar

Sketch drawing area

Causal Loop Diagramming

- This model describes the competing feedback loops in a project (think of it as a construction project though the concepts are generic to all projects).

- The causal loops show the relationship between the amount of `Work To Do`, `overtime hours required`, and the effect of overtime on both the amount of `work done` and also `fatigue`.

- The first cut at this model assumes a constant size of workforce.

Steps

- Start Vensim
- Select the menu item **File>New Model** or click the **New Model** button on the Toolbar.
    - The Model Settings dialog box opens
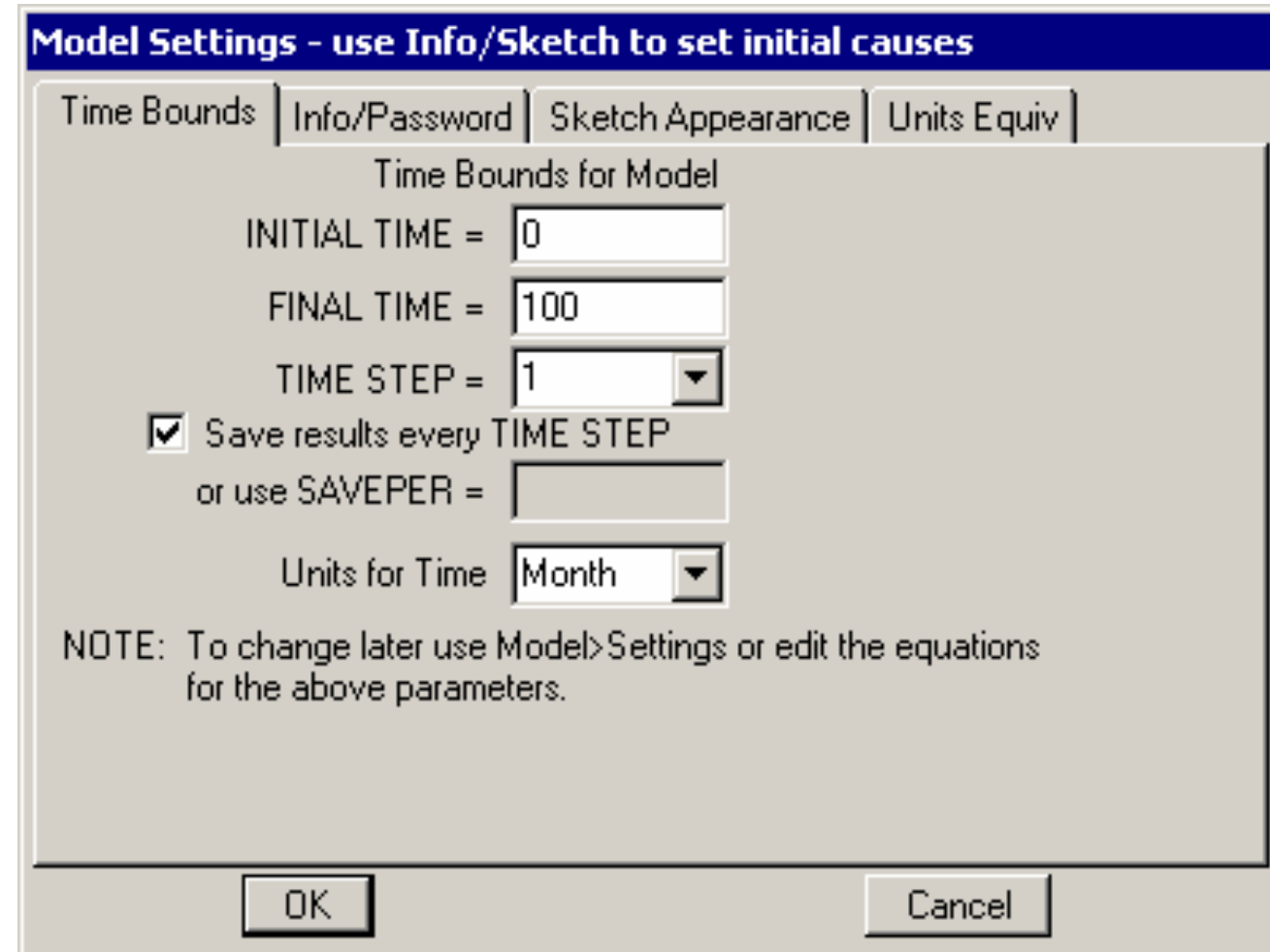
Steps

- Start Vensim
- Select the menu item **File>New Model** or click the **New Model** button on the Toolbar.
  - The Model Settings dialog box opens
- Click OK to accept the default values
- Click the **Save** button on the Toolbar. Select the directory *UserGuide\chap04* then type in the name *project* and click the **Save** button in the dialog box.
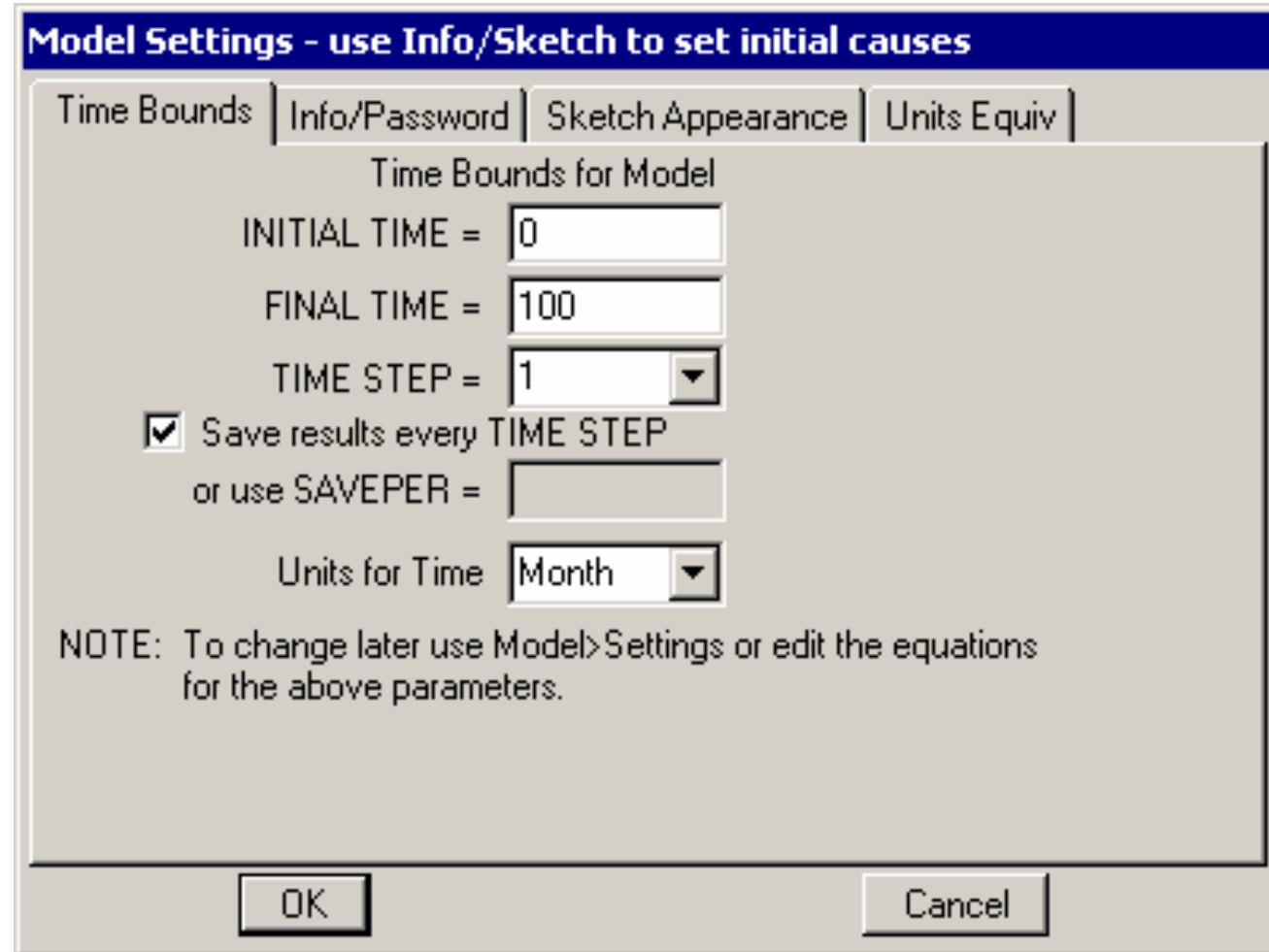
Adding Variables

- Click with the mouse button on the **Variable** tool ⊤₊ (or press the keyboard number 3 above the letter keys — not the numerical keypad).

- Click in the middle top of the sketch and type `Work To Do` in the editing box, then press Enter.

- Click again on the sketch and continue filling out the diagram with the variables.

Adding Arrow

- Select the **Arrow** tool by clicking on it   (or press the keyboard number 5). Click once on `Work To Do`. Be sure to let the mouse button up without moving the mouse! Move the cursor to `overtime hours required` and click again. A straight arrow will join the two variables.

- Click once on `overtime hours required` then move the cursor to `work done` and click again. A straight arrow will join the two variables.

- Click the **Save** button or select the menu item **File>Save** or press Ctrl + S. Save the model in the directory *UserGuide\chap04* with a name such as *project.*

Currrent

Work To Do

quality of work

work done

fatigue

overtime hours
required
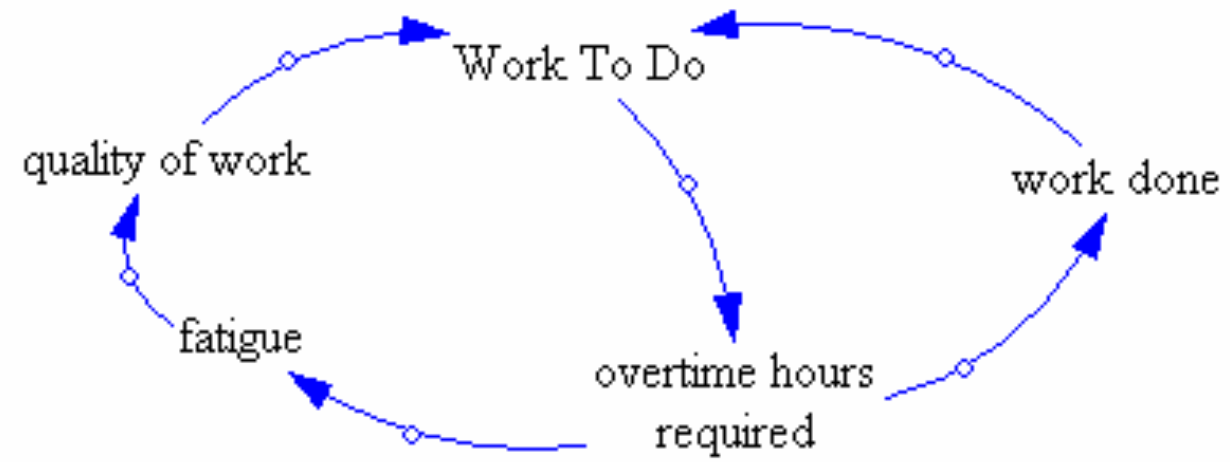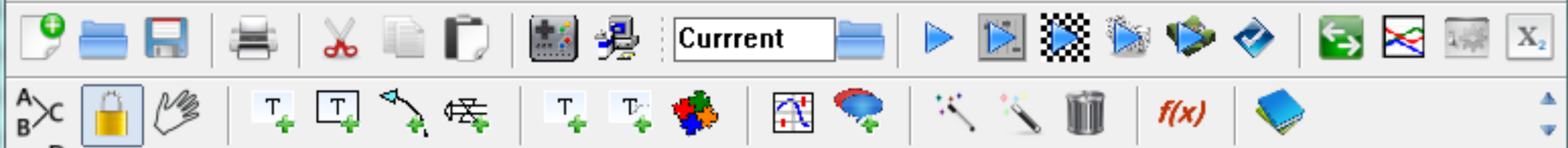
Creating Stock and Flow Diagram

- Start Vensim.
- Click on the **New Model** button (or select menu **File>New Model...**) and click **OK** in the Model Settings dialog box to accept the default values.
- Click the **Save** button on the Toolbar. Select the directory *UserGuide\chap05* then save as *customer* or some other name of your choice.

Entering Levels/Stocks

- Select the **Level** tool and click once on the diagram. Type in `Potential Customers` and press Enter.

- With the **Level** tool still selected, click on the diagram approximately 3 inches (7 cm) to the right of `Potential Customers`, type in `Customers`, and press Enter.

Creating Rates

- Select the **Rate** tool ⚗ . Click once (click and release the mouse button) on top of *Potential Customers*, then move the cursor on top of *Customers* and click once again. Type the name *new customers* and press Enter.

- Select the **Move/Siz**e tool.

  - When you do this you will see that the pipes have small circles in the middle of them.
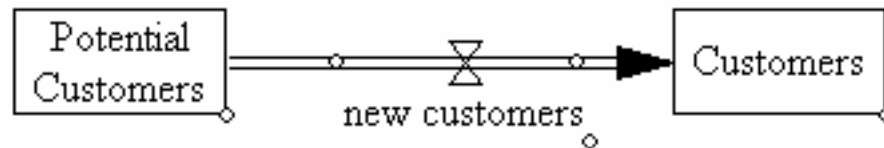
Bending Rate Pipes

- Click once on *Customers*, then press and hold the Shift key down and move the cursor about half an inch (1 cm) to the right of *Customers* and click once.

- Continue holding down the Shift key for all further clicks. Move directly down about an inch and a half (3.5 cm) (below and right of *Customers*) then click once.

- Move directly left to 1 inch below and left of *Potential Customers* and click once. Move directly up just left of *Potential Customers* and click once.

- Move on to *Potential Customers* and click once. Release the shift key. Type the Rate name *exiting customers* and press Enter.
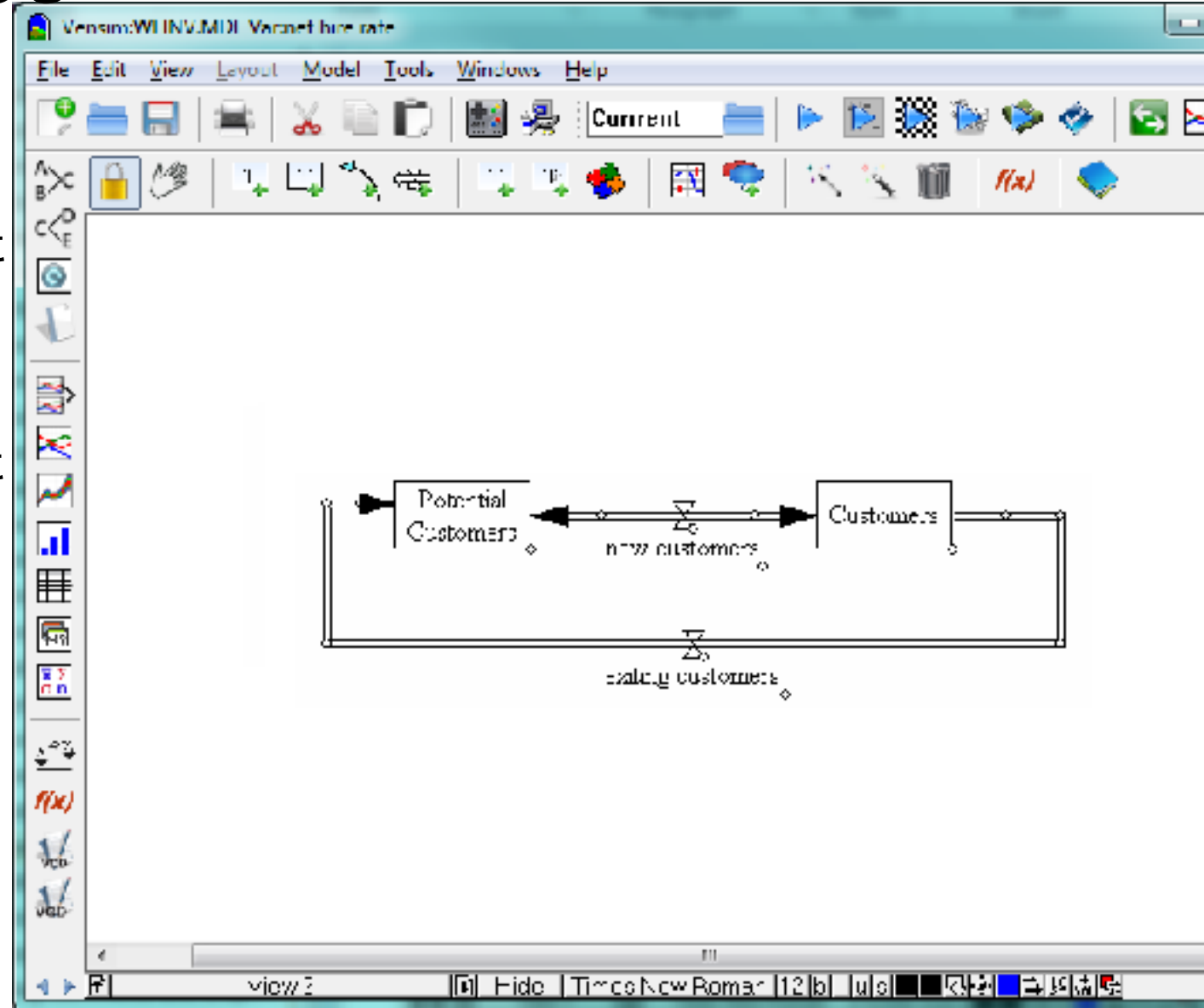
Adding Auxiliaries and Arrows

- Select the **Variable** tool ⊤ . Click once just to the left of and below `new customers` then type the name `time to become customer` and press Enter.
- Click once just right and below `exiting customers` and type the name `product life` and press Enter.
- Select the **Arrow** tool. Click once on `Potential Customers`, then once on a blank part of the sketch above and between `Potential Customers` and `new customers`, then once on the valve attached to `new customers`.
    - A curved arrow will join the Level and the Rate valve. Vensim allows you to connect arrows to either the Rate name or the Rate valve. The Rate name and valve are structurally the same.
- Click once on `time to become customer` then once on the Rate name `new customers`.
- Click once on `Customers` then once on the valve attached to the Rate `exiting customers`.
- Click once on `product life` then once on the Rate name `exiting customers`.

Currrent

Potential
Customers

new customers

Customers

time to become
customer

exiting customers ◄○— product life
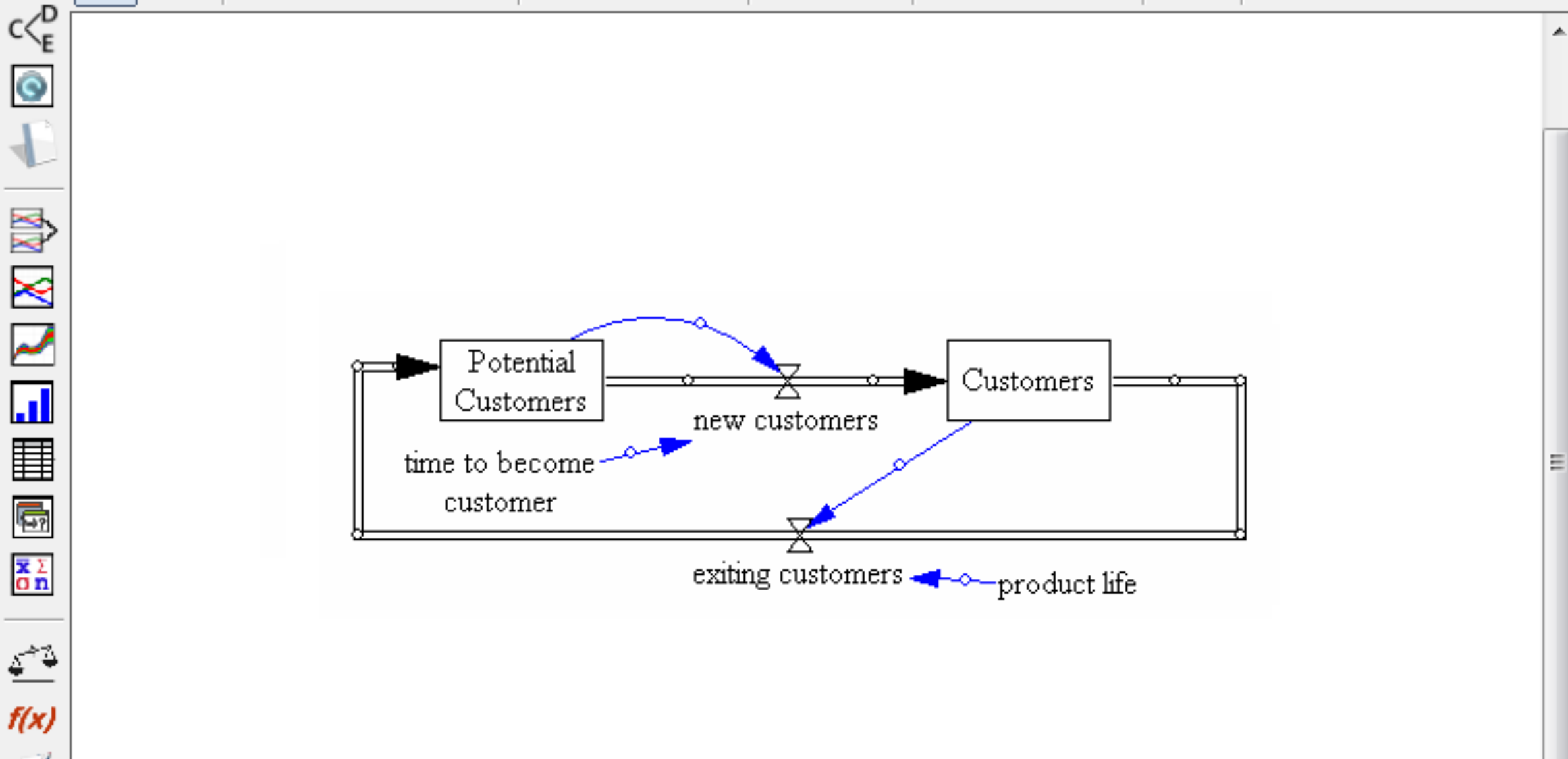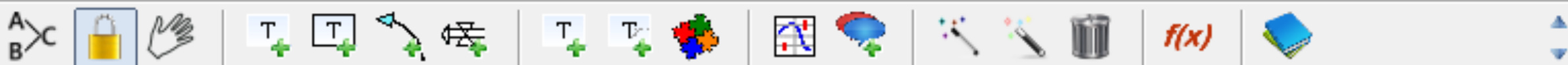
Simulating the Model (2 of 2)

- Start Vensim.
- Click the **New Model** button, or select the menu item **File>New Model…**
- In the Model Settings dialog (Time Bounds tab) type 30 for FINAL TIME, type (or select from the drop down box) 0.125 for TIME STEP. Click on the dropdown box for **Units for Time**, and select **Year**. Click on **OK** (or press Enter).
- Select the **Level** tool and click somewhere in the middle of the sketch. Type the name *Population*, and press the Enter key.
- Select the **Rate** tool. Click once (single click and release of the mouse button) about 2 inches (5 cm) to the left of the Level *Population*, then move the cursor on top of *Population* and click once again. Type the name *births*, and press Enter.
- Click once on the Level *Population* then move the cursor about 2 inches (5 cm) right and click again. Type the name *deaths*, and press Enter.

Simulating the Model (1 of 2)

- Select the **Variable** tool. Click on the sketch below `births`, type `birth rate` and press Enter. Click on the sketch below `deaths`, type `average lifetime` and press Enter.

- Select the **Arrow** tool, click once on `birth rate` then once on `births`. Click once on `average lifetime`, then once on `deaths`.

- Click once on `Population`, then once on the sketch a little below and left of `Population`, then once on `births`.

- Click once on `Population`, then once on the sketch a little below and right of `Population`, then once on `deaths`.

- Click the **Save** button and save your model in the directory *UserGuide\chap06*. Name your model (we call it *pop.mdl*).
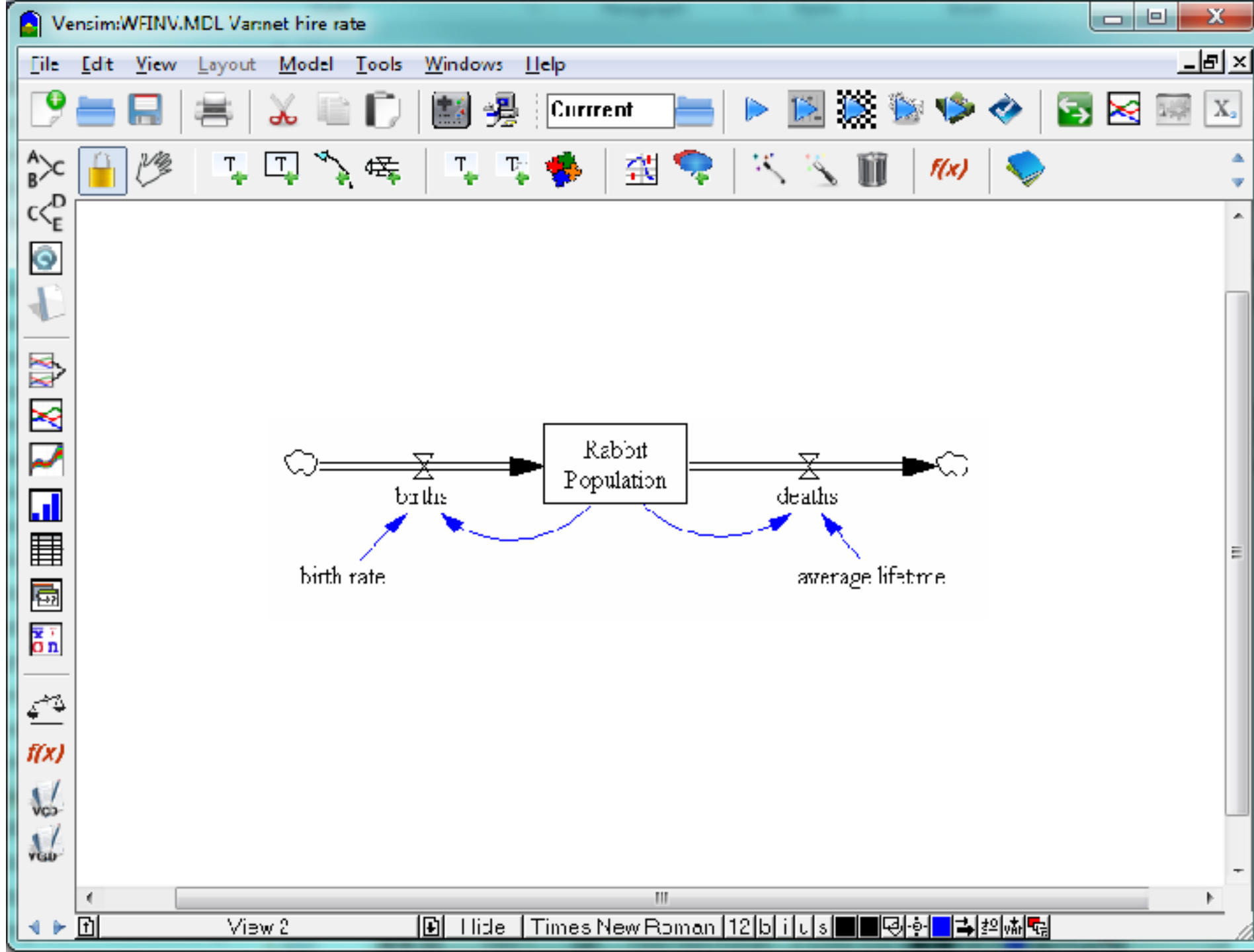
Writing Equation

- Click on the **Equations** tool.
- Click on the variable `births`.
- Complete the equation for births as below (in the editing box)
  `Population * birth rate`
  - Click on the variable `Population` in the **Variables** list (in the middle of the Equation Editor), then type the * symbol (or click on it in the Equation Editor keypad), then click on `birth rate` in the **Variables** list.
- Type in the units of measurement `rabbit/Year` in the **Units:** box. This indicates that we measure the rate of `births` in rabbit per Year. Click on **OK** or press Enter.
- As you complete the equations for each of the variables, the highlights will disappear. The menu item **Model>Check** (Ctrl + T) or the **Check Model** button in the Equation Editor also checks and displays what remains to be done.

Checking for Model Syntax and Units Errors

- Before we simulate the model, we should check it for errors in equations and units.
  - Select **Model>Check Model** from the menu (or press Ctrl + T); you should get an information box saying "Model is OK."
- If the model has errors, the Equation Editor will open with the variable containing the error. Check that the equation uses all the inputs and looks the same as in the listing above. Check that the structure of your model is the same as in the diagram above.
  - Select **Model>Units Check** from the menu (or press Ctrl + U); you should get an information box saying "Units are AOK."
- If a units error is generated, read the Output window to see which variables are failing the check. Open the **Equation Editor** on each variable and check the units against the list above. Units that do not check out often indicate poor or incorrect equation formulation.

Simulating the Model

- Double click on the **Runname** editing box on the Toolbar and type *equilib* for the first run name.
- Click on the **Simulate** button (or just press Enter when the cursor is in the **Runname** box).
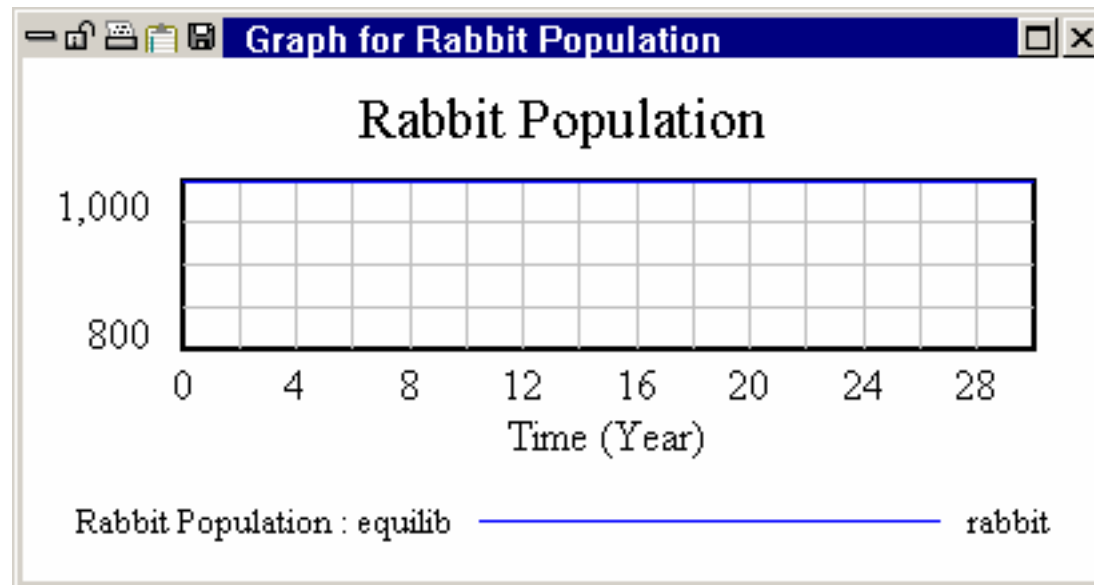
End Slides.

- Download Vensim software at www.vensim.com
- Create your model
- Read more tutorials at https://www.vensim.com/documentation/index.html