Amos User's Guide Part II
Jeannie-Marie Sheppard (2002), edited (2006)

This handout will include discussion of some more useful features. First, if you look at the button bar to the left, you notice that the top stripe is grey. If you click on it, it will turn blue. When that bar is blue, it means that the button bar is selected.   When the button bar is selected, if you let the mouse hang out for a bit over a button, a caption will pop up saying what it is. In referencing the buttons' positions, I will use row-column notation, i.e., TITLE is in the (3,1) position.

Drawing a tidy picture is key.

This guy is cool. So suppose your diagram looks like this:
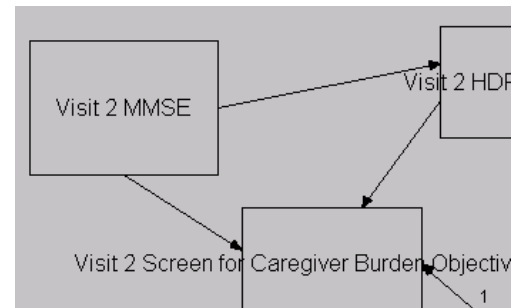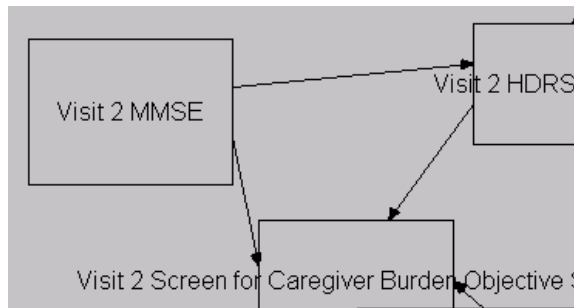
Clicking on the touch up wand and selecting V2 MMSE will tidy things up a bit…
This wasn't an major change but it is quick. It works well on errors.

One way to make your boxes and ovals all the same size is to use the copy machine. Suppose you didn't do that, you could use the following tool: (10,2) Drag Properties

This button will drag properties from one object to another. So if you wanted to make two boxes be the same height and width, click on this box and height and width. Note, don't close the drag Properties option box before you do it, but you may have to move it out of the way.
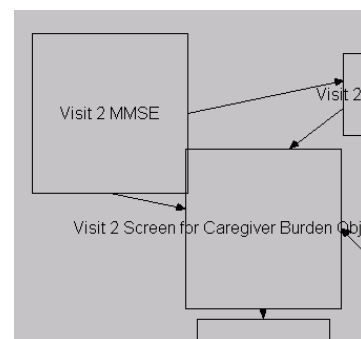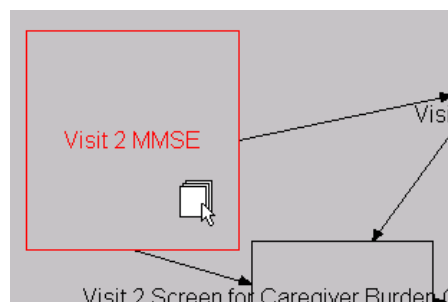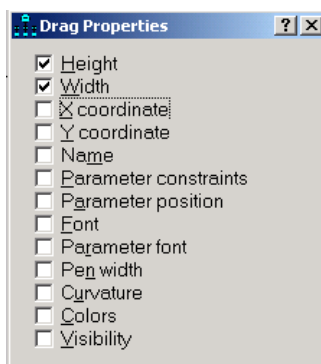
There are probably a tonne of ways to use this, another useful one is to line things up. If you want them to be at the same level, etc, you can drag X and Y coordinates.
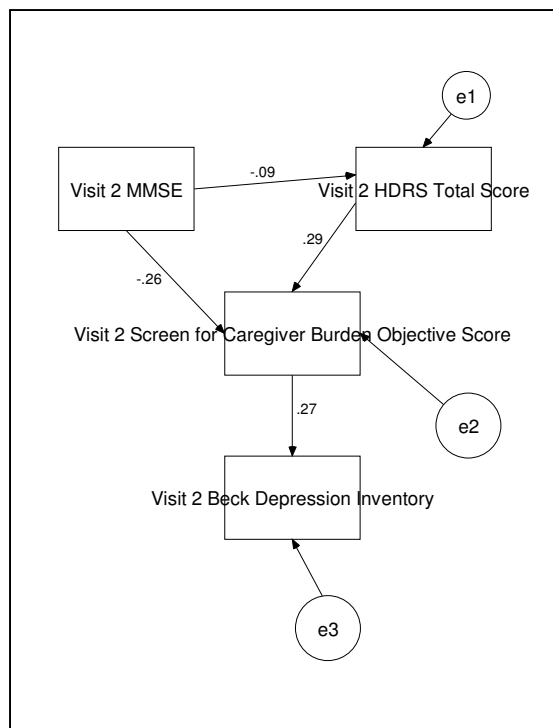
Now, after you run your model, much to your chagrin, you have to tidy it up all over again. Not to worry.

The move parameter values button will help you move the numbers around. Unfortunately, there doesn't seem to be a way to move the estimate on top of the object, but you can rearrange things.

When you're in the output window, you can click on either the estimate itself, or the box or arrow to which it is related (they'll both turn red) and you can move things around, (just like the moving truck)

The change the shape of objects (6,1) does just that, and works intuitively.

Check out the other buttons, some of them are real time savers.

Diagram:

Visit 2 MMSE

e1

-.09 → Visit 2 HDRS Total Score

.29

-.26

Visit 2 Screen for Caregiver Burden Objective Score

e2

.27

Visit 2 Beck Depression Inventory

e3

This is a toy example using a bit of data from the DIADS study concerning Alzheimer patient and caregiver depression. First I want to give this project a title (look at part 1 for this) If you use the title button on the button bar (3,1) this titles the picture, not the analysis. Use the title tab in the analysis properties

I run the model now. Part of the point of this example is to help you decide which elements of the output you should include in your homework. Including all the input a) kills trees b)doesn't give you the opportunity to show that you understand which parts of the output are relevant to a particular question.

```
                                             diad1
                        Wednesday, November 13, 2002 06:01:38




                                 Amos

                          by James L. Arbuckle


                           Version 4.01




                 Copyright 1994-1999 SmallWaters Corporation
                        1507 E. 53rd Street - #452
                            Chicago, IL 60615 USA
                              773-667-8635
                            Fax: 773-955-6252
                         http://www.smallwaters.com



                 ***********************************************
```

Obviously trash. Don't include this.

Looking here will help you make sure that you put the right variables in, and that they are doing the things that you thought they were doing (i.e., observed, exogenous, whatever)

```
Title

    MMSE, HDRS thru SCB to Beck

Your model contains the following variables

            V2HDRST             observed    endogenous
            V2SCBOB             observed    endogenous
            V2BECK              observed    endogenous

            V2MMSE              observed    exogenous

            e1                  unobserved  exogenous
            e2                  unobserved  exogenous
            e3                  unobserved  exogenous

            Number of variables in your model:      7
            Number of observed variables:           4
            Number of unobserved variables:         3
            Number of exogenous variables:          4
            Number of endogenous variables:         3


Summary of Parameters

            Weights  Covariances Variances  Means  Intercepts  Total
            -------  ----------- ---------  -----  ----------  -----
    Fixed:      3         0          0        0        0         3
    Labeled:    0         0          0        0        0         0
    Unlabeled:  4         0          4        0        0         8
            -------  ----------- ---------  -----  ----------  -----
    Total:      7         0          4        0        0         11

NOTE:
    The model is recursive.


Sample size:    41
```

This says how many parameters you have and what they are. First there are 3 fixed weights (these are the ones between the errors and your endogenous weights)
There are 4 unlabeled weights (each arrow between observed variables)
There are 4 variances (for each of your observed variables)
If you asked it to estimate means and intercepts, (you would have to do this if you have any missing data) then there would be:
1 mean (1 for each exogenous variable)
3 intercepts (1 for predicting each endogenous variable)

```
Degrees of freedom                      ? X

Parameters: 11
Free parameters: 8
Sample moments: 10
DF: 2

  Symbol              Frequency
  <No Symbol>             8
  1                       3
```

At this point you may recall having clicked the DF (13,1) button and gotten the following information, which doesn't seem to match with the above.
Sample moments are correlations between observed variables, and their variances. n(n+1)/2 = 10

Total parameters is equal to variances for every box, and each arrow.
Now, you have 7 arrows, however, 3 (these are for the errors) are fixed so you are estimated 4 direct effects, and 4 correlations. This means there are 8 parameters that are free to be estimated.

```
Sample Covariances

            V2MMSE   V2HDRST  V2SCBOB  V2BECK
            -------- -------- -------- --------
V2MMSE       41.684
V2HDRST      -4.124   35.640
V2SCBOB      -9.430    9.534   25.378
V2BECK        3.766    7.435    6.996   27.079


Eigenvalues of Sample Covariances

   1.542e+001   2.273e+001   4.019e+001   5.144e+001

Condition number of Sample Covariances = 3.335068e+000


Sample Correlations

            V2MMSE   V2HDRST  V2SCBOB  V2BECK
            -------- -------- -------- --------
V2MMSE        1.000
V2HDRST      -0.107    1.000
V2SCBOB      -0.290    0.317    1.000
V2BECK        0.112    0.239    0.267    1.000


Eigenvalues of Sample Correlations

   5.435e-001   7.201e-001   1.127e+000   1.609e+000

Condition number of Sample Correlations = 2.961101e+000

Determinant of sample covariance matrix = 7.2472e+005


Model: MMSE, HDRS thru SCB to BECK


Computation of degrees of freedom

            Number of distinct sample moments:     10
            Number of distinct parameters to be estimated:    8
            ---------------------------
            Degrees of freedom:     2
```

So, if in analysis properties you selected "sample moments" it will show you the covariance and correlation matrices of your observed variables.

Now for the eigenvalues: If you haven't studied linear algebra, just ignore them. Basically, this is making sure you really did give the computer 10 *different* pieces of information, and not any duplicates. If two rows of the variance-covariance matrix are equal, the determinant will be 0, and you won't be able to invert the matrix, which will make it impossible to calculate standard errors. The condition number is the largest eigenvalue divided by the smallest eigenvalue. The closer it is to 1, the better. You don't need to include this in your homework.

We already talked about computing degrees of freedom.

```
Maximum Likelihood Estimates
----------------------------


Regression Weights:                  Estimate    S.E.    C.R.    Label
-------------------                  --------  -------  -------  -------

        V2HDRST <----- V2MMSE         -0.099    0.145   -0.681   par-4
        V2SCB0B <---- V2HDRST          0.244    0.122    1.993   par-1
        V2SCB0B <----- V2MMSE         -0.202    0.113   -1.784   par-3
        V2BECK <----- V2SCB0B          0.276    0.157    1.751   par-2


Standardized Regression Weights:     Estimate
--------------------------------     --------

        V2HDRST <----- V2MMSE         -0.107
        V2SCB0B <---- V2HDRST          0.289
        V2SCB0B <----- V2MMSE         -0.259
        V2BECK <----- V2SCB0B          0.267


Variances:                           Estimate    S.E.    C.R.    Label
----------                           --------  -------  -------  -------

              V2MMSE                  41.684    9.321    4.472   par-5
                  e1                  35.232    7.878    4.472   par-6
                  e2                  21.144    4.728    4.472   par-7
                  e3                  25.150    5.624    4.472   par-8
```

Here's the real meat of the output. CR (Critical Ratio) is like a z-value. The arrows are the same as the arrows on your picture.

This is stuff you would want to include.

```
Total Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    -0.099    0.000    0.000
V2SCB0B    -0.226    0.244    0.000
V2BECK     -0.062    0.067    0.276


Standardized Total Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    -0.107    0.000    0.000
V2SCB0B    -0.290    0.289    0.000
V2BECK     -0.077    0.077    0.267


Direct Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    -0.099    0.000    0.000
V2SCB0B    -0.202    0.244    0.000
V2BECK      0.000    0.000    0.276


Standardized Direct Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    -0.107    0.000    0.000
V2SCB0B    -0.259    0.289    0.000
V2BECK      0.000    0.000    0.267
```

```
Indirect Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    0.0000   0.0000   0.0000
V2SCB0B   -0.0242   0.0000   0.0000
V2BECK    -0.0624   0.0673   0.0000


Standardized Indirect Effects

          V2MMSE   V2HDRST  V2SCB0B
          -------- -------- --------
V2HDRST    0.0000   0.0000   0.0000
V2SCB0B   -0.0310   0.0000   0.0000
V2BECK    -0.0774   0.0772   0.0000
```

You'll get these if you select "indirect, direct, and total effects in analysis properties. In your homework though, you must calculate them by hand to show you understand the path rules.

```
Summary of models
-----------------

            Model    NPAR      CMIN     DF         P   CMIN/DF
    ----------------  ----  --------    --  --------- ---------
MMSE, HDRS thru SCB      8     2.990     2     0.224     1.495
   Saturated model      10     0.000     0
Independence model       4    13.706     6     0.033     2.284


            Model     RMR       GFI      AGFI       PGFI
    ---------------- --------- --------- --------- ---------
MMSE, HDRS thru SCB    2.522     0.965     0.826     0.193
   Saturated model     0.000     1.000
Independence model     5.615     0.856     0.760     0.513
```

Here's some more meat. I named my model, but if you didn't you would want to look at "Default Model". The saturated model is when you estimate all possible parameters (i.e., draw arrows between everything) It will always have perfect fit, because you have tailored the model perfectly to the data. The independence model assumes all your variables are uncorrelated.

Now, the CMIN, look in appendix B of AMOS help if you want the formula.

Depending on your method of estimation it will take on a different value, it compares your model to the saturated model, if it is significant, than your model has significantly worse fit that the saturated (perfect) model.

Model	RMR	GFI	AGFI	PGFI
MMSE, HDRS thru SCB	2.522	0.965	0.826	0.193
Saturated model	0.000	1.000		
Independence model	5.615	0.856	0.760	0.513

You could also include these:
RMR -root mean square residual. Compares estimated variances and covariances to observed variances and covariances. Smaller is better.

GFI ranges from 0-1, 1 is good.

You could include these as well.

| Model	AIC	BCC	BIC	CAIC
MMSE, HDRS thru SCB	18.990	21.276	43.789	40.699
Saturated model	20.000	22.857	50.999	47.136
Independence model	21.706	22.849	34.105	32.560

Everything else is trash.

Dr.. David Garson is a full professor at NCSU and teaches a class using AMOS at NCSU http://www2.chass.ncsu.edu/garson/pa765/semAMOS1.htm He goes into detail about the other fit measures if you are interested. His website is awesome, it's where I go with all my questions, and other parts of the website will be included as weblinks for some of the lectures.
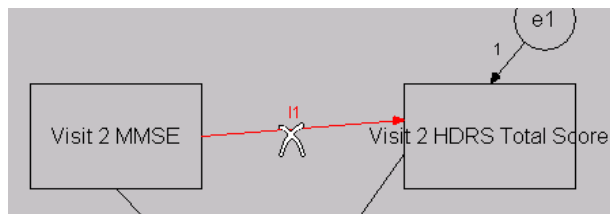

Now suppose I want to fit another model, you decide that you want to take out the link between MMSE and HDRS. I could just fit to separate models and compare the output, but I wanted to set it up so that it ran them both in one go, so that the estimates would be right next to each other, to make comparison easier.
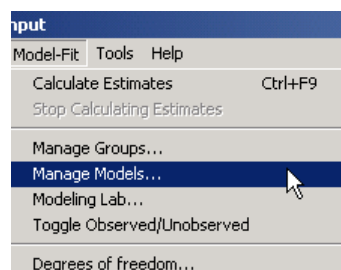
If you already see Model Number 2 in the window, just rename the new model and click close, otherwise, click new, rename model number 2, then close.
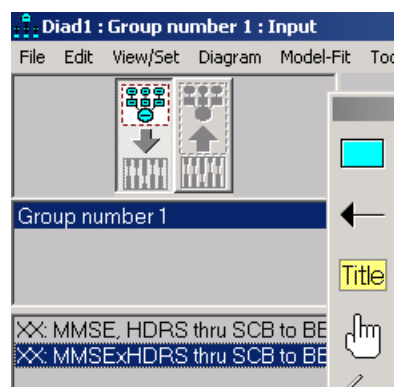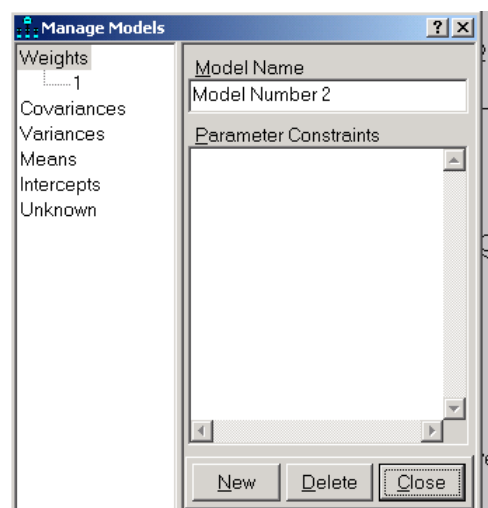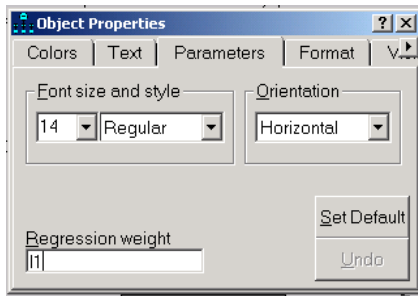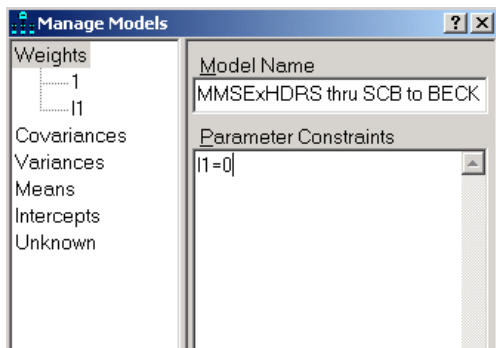
Notice you now have two model in the window on the left. Go to the second one, and opposite click on the arrow between mmse and hdrs.
Select object properties, then parameters, then type a name in the regression weight space.

Now, go back to manage models

Note, in manage models you will get sent to the model you were in on the outside. So, I set that covariance (arrow) to equal 0 in the second model (thus erasing the arrow)

I was a little concerned if this would work right or not, i.e., is setting l1 to 0 the same thing as erasing the arrow. It seems that it is. When you look at degrees of freedom for the constrained model by pressing the DF key (1,13), it still says I have the same degrees of freedom as the unconstrained, however, when I run the two models, in the output I have the proper degrees of freedom for each model, and the same estimates as if I deleted the arrow.

Now, run the two models…

```
Summary of models
-----------------

            Model  NPAR        CMIN   DF            P    CMIN/DF
    ----------------  ----   ---------   --    ---------   ---------
MMSE, HDRS thru SCB     8       2.990    2        0.224       1.495
MMSExHDRS thru SCB t    7       3.450    3        0.327       1.150
     Saturated model   10       0.000    0
  Independence model    4      13.706    6        0.033       2.284


            Model   RMR         GFI         AGFI        PGFI
    ----------------  ----------   ----------   ----------   ----------
MMSE, HDRS thru SCB   2.522        0.965        0.826        0.193
MMSExHDRS thru SCB t  2.852        0.963        0.878        0.289
     Saturated model  0.000        1.000
  Independence model  5.615        0.856        0.760        0.513
```