

**Example 11** — estat framework

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## Description

To demonstrate `estat framework`, which displays results in Bentler–Weeks form, we continue where [\[SEM\] Example 10](#) left off:

```

. use https://www.stata-press.com/data/r17/sem_mimic1
. ssd describe
. notes
. sem (SubjSES -> s_income s_occpres s_socstat)   ///
      (SubjSES <- income occpres)
. estat residuals, normalized
. estimates store mimic1
. sem (SubjSES -> s_income s_occpres s_socstat)   ///
      (SubjSES <- income occpres)               ///
      (s_income <- income)                       ///
      (s_occpres <- occpres)
. lrtest mimic1 .

```

See *Structural models 10: MIMIC models* in [\[SEM\] Intro 5](#) for background.

## Remarks and examples

[stata.com](#)

If you prefer to see SEM results reported in Bentler–Weeks form, type `estat framework` after estimating with `sem`. Many people find Bentler–Weeks form helpful in understanding how the model is fit.

[\[SEM\] Example 10](#) ended by fitting

```

. sem (SubjSES -> s_income s_occpres s_socstat)   ///
      (SubjSES <- income occpres)               ///
      (s_income <- income)                       ///
      (s_occpres <- occpres)

```

In Bentler–Weeks form, the output appears as

```

. estat framework, fitted
Endogenous variables on endogenous variables

```

Beta	Observed	s_income	s_occpres	s_socstat	Latent
					SubjSES
Observed					
s_income	0		0	0	1
s_occpres	0		0	0	.783781
s_socstat	0		0	0	1.195539
Latent					
SubjSES	0		0	0	0

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### Endogenous variables on exogenous variables

Gamma	Observed	
	income	occpres
Observed		
s_income	.0532425	0
s_occpres	0	.0045201
s_socstat	0	0
Latent		
SubjSES	.0538025	.0034324

### Covariances of error variables

Psi	Observed			Latent
	e.s_incr~e	e.s_occ~s	e.s_soc~t	e.SubjSES
Observed				
e.s_income	.2292697			
e.s_occpres	0	.2773786		
e.s_socstat	0	0	.1459009	
Latent				
e.SubjSES	0	0	0	.1480275

### Intercepts of endogenous variables

alpha	Observed			Latent
	s_income	s_occpres	s_socstat	SubjSES
_cons	.8825314	1.06586	1.07922	0

### Covariances of exogenous variables

Phi	Observed	
	income	occpres
Observed		
income	4.820021	
occpres	13.62431	451.6628

### Means of exogenous variables

kappa	Observed	
	income	occpres
mean	5.04	36.698

Fitted covariances of observed and latent variables

	Sigma	Observed s_income	s_occpres	s_socstat	Latent SubjSES	Observed income
Observed s_income		.4478609				
s_occpres		.1614446	.4086519			
s_socstat		.225515	.1738222	.392219		
Latent SubjSES		.1886304	.1453924	.2060311	.1723333	
Observed income		.5627232	.3014937	.3659463	.3060932	4.820021
occpres		3.008694	3.831184	2.729776	2.283302	13.62431
	Sigma	Observed occpres				
Observed occpres		451.6628				

Fitted means of observed and latent variables

	mu	Observed s_income	s_occpres	s_socstat	Latent SubjSES	Observed income
mu		1.548	1.543	1.554	.3971264	5.04
	mu	Observed occpres				
mu		36.698				

Notes:

1. Bentler–Weeks form is a vector and matrix notation for the estimated parameters of the model. The matrices are known as  $\beta$ ,  $\Gamma$ ,  $\Psi$ ,  $\alpha$ ,  $\Phi$ , and  $\kappa$ . Those Greek names are spelled out in the labels, along with a header stating what each contains.
2. We specified `estat framework fitted`. That caused `estat framework` to list one more matrix and one more vector at the end:  $\Sigma$  and  $\mu$ . These two results are especially interesting to those wishing to see the ingredients of the residuals reported by `estat residuals`.
3. One of the more useful results reported by `estat framework`, `fitted` is the  $\Sigma$  matrix, which reports all estimated covariances in a readable format and includes the model-implied covariances that do not appear in `sem`'s ordinary output.
4. `estat framework` also allows the `standardized` option if you want standardized output.

## Also see

[SEM] [Example 10](#) — MIMIC model

[SEM] [estat framework](#) — Display estimation results in modeling framework