**Title**

**gmmhart— HAR Test for linear hypotheses in a two-step efficient gmm framework after performing gmmhar estimation**

Syntax Menu Description Options Remarks and example Stored results Methods and formula References Also see

**Syntax**

Basic syntax

gmmhart coeflist

gmmhart exp=exp[=…]

options Description

Model

accumulate test the hypothesis jointly with previously tested hypotheses

time-series operators are allowed.

Syntax 1 tests that coefficients are 0.

Syntax 2 tests that linear expressions are equal.

**Menu**

statistics>Postestimation>Tests> GMM HAR test

**Description**

The Stata command gmmhart performs the Wald tests of simple and composite linear hypotheses about the parameters in the most recently estimated gmmhar model. See Hwang and Sun (2017) for details.

**Options**

Model

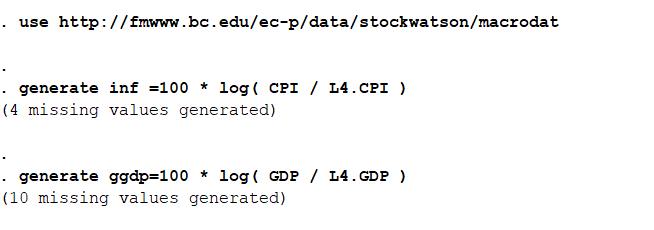
accumulate allows a hypothesis to be tested jointly with the previously tested hypotheses.

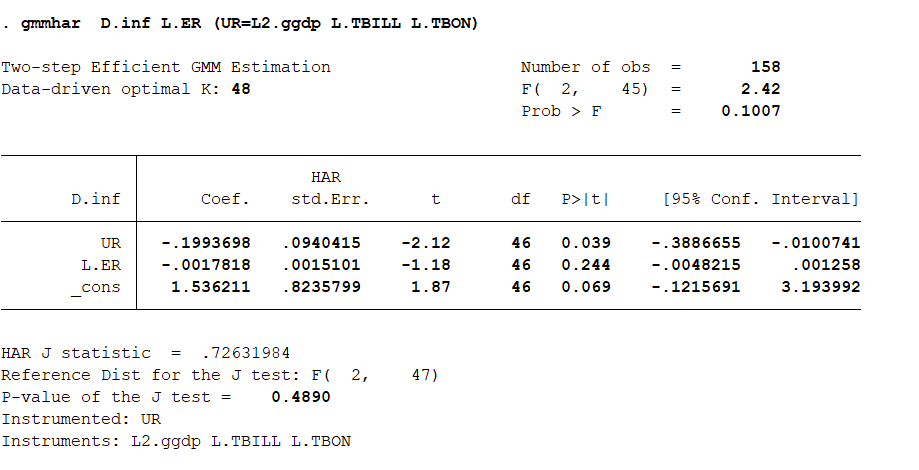
**Remarks and examples**

Hwang and Sun (2017) considers the more accurate fixed-smoothing asymptotics in the two-step efficient GMM framework where the weighting matrix and the asymptotic variance matrix are based on the orthonormal series long run variance estimator. Hwang and Sun (2017) propose some modifications to the usual Wald statistic and show that the modified test statistic is asymptotically standard F distributed under the fixed-smoothing asymptotics. The modified statistic is a rescaled version of the original test statistic with the rescaling factor depending on the J statistic (Sun and Kim, 2012) for testing over-identifying restrictions. The data-driven K, the number of orthonormal bases used in the long run variance estimator, is selected to minimize the AMSE of the estimator of the long run variance of the moment process.

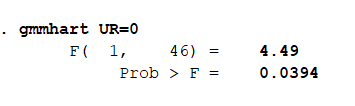
**ΔExample 1: Test for a single coefficient against zero**

We estimate the following regression:





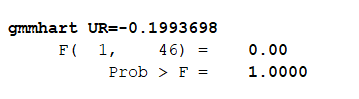
We can test the hypothesis that the coefficient on UR is zero by typing:



The F statistic is 4.49. The approximating F distribution has degrees of freedom 1 and 46. The p-value of the test is 3.94%. We fail to reject the null hypothesis at the 1% level.

**ΔExample 2:** **Testing that a coefficient is equal to a given value**

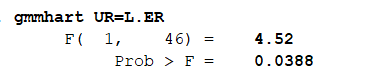
We can test the hypothesis that the coefficient on UR is -0.1993698 by typing:



We find that we fail to reject that hypothesis.

**ΔExample 3: Testing the equality of two coefficients**

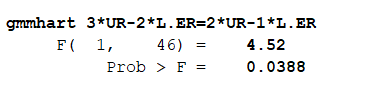
Now let’s test something a bit more difficult: whether the coefficient on UR is the same as the coefficient on L.ER:



We fail to reject the equality hypothesis at the 1% level, but we find evidence to reject it at the 5% level.

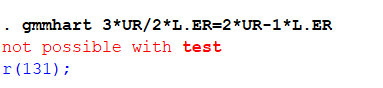
**ΔExample 4:**

When we test the equality of the UR and L.ER coefficients, the command gmmhart rearranges and simplifies the equality and test whether the coefficient on UR minus the coefficient on L.ER is zero or not. The arrangement is innocuous. In fact, gmmhart can test the null of more complicated forms. For example,



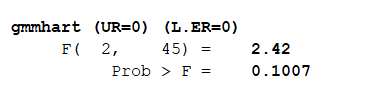
Although we request what appears to be a lengthy hypothesis, once gmmhart simplifies the expression, it realizes that all we want to do is to test whether the coefficient on UR is the same as the coefficient on L.ER.

The gmmhart’s ability to simplify and test complex hypotheses is limited to linear hypotheses. If one attempts to test a nonlinear hypothesis, an error message will be displayed. This is not a problem specific to the command gmmhart. Stata’s command “test” exhibits the same behavior. In fact, gmmhart uses Stata’s command “test” to parse the null hypothesis.



**ΔExample 5: Testing joint hypotheses**

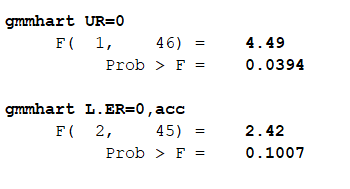
We wish to test whether UR and L.ER, taken as a whole, are jointly significant by testing whether the coefficients on UR and L.ER are simultaneously zero. The command gmmhart allows us to specify multiple restrictions to be tested, each embedded within parentheses.



gmmhart displays the set of restrictions and reports an F statistic of 2.42. gmmhart also reports the key information on the approximating F distribution: its degrees of freedom are (2, 45). The p-value of the test is close to 10.7%.

**□Technical note**

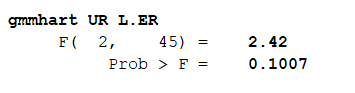
An alternative method to test simultaneous hypotheses is to specify a test for each constraint and accumulate it with the previous constraints:



We test the hypothesis that the coefficient on UR is zero by typing gmmhart UR=0. We then test whether the coefficient on L.ER is also zero by typing gmmhart L.ER=0, accumulate. The accumulate option tells gmmhart that this is not the start of a new test but a continuation of the previous one. gmmhart responds by showing us the two equations and reporting an F statistic of 2.42. The p-value of the test is 10.7%.

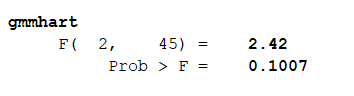
**ΔExample 6: Testing whether coefficients are zero**

Testing whether the coefficients are zero are very common in applied statistics. The gmmhart command has a more convenient syntax to accommodate this common case:



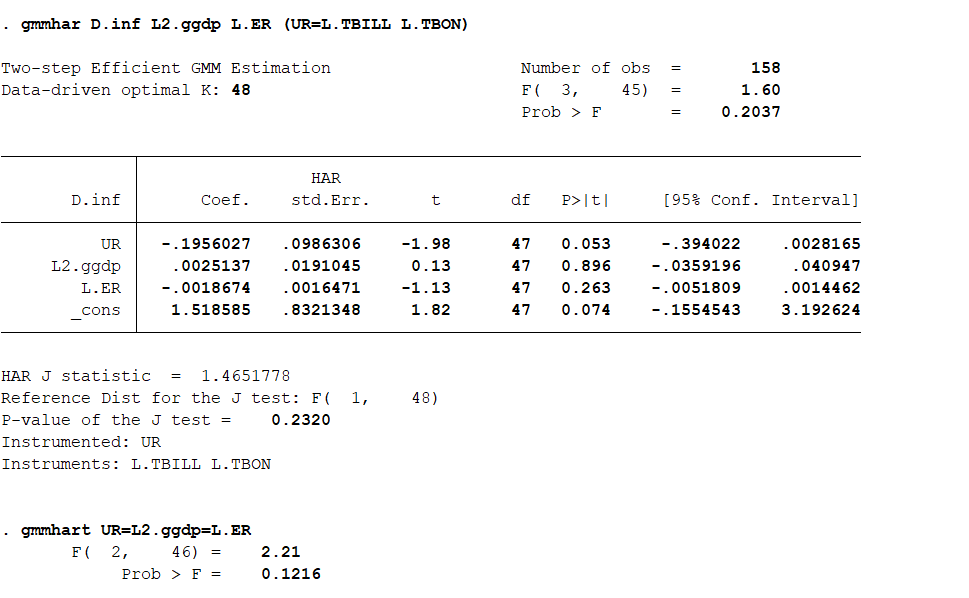
**ΔExample 7: Replaying the previous test**

We just used gmmhart to test the hypothesis that the coefficients on UR and L.ER are jointly zero. We can review our last test by typing gmmhart without any argument.



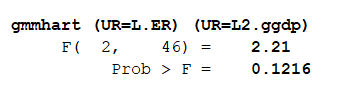
**ΔExample 8: Testing the equality of multiple coefficients**

Let’s test the hypothesis that UR, L.ER, and L2.ggdp have the same coefficient

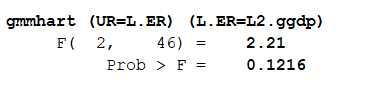


The syntax UR=L.ER=L2.ggdp with multiple = operators is just a convenient shorthand for typing that the first expression equals the second expression and that the first expression equals the third expression.

We can obtain the same test by typing



Equivalently, we can type



**Stored results**

gmmhart stores the following results in r()：

Scalars

r(firdf) the first degrees of freedom

r(secdf) the second degrees of freedom

r(kopt) the data-driven optimal K

r(F) the adjusted F statistic

Matrices

r(thetagmm) the two-step gmm coefficient vector

**Methods and formulas**

Consider the regression model:

where is a zero-mean process that may be correlated with the covariate process

There are instruments such that the moment conditions:

hold if and only if . We allow the process to have the autocorrelation of unknown forms. The model may be over-identified with the degree of over identification . Define： , ,

Then the IV estimator of is

,

where .

Hwang and Sun (2017) consider two-step efficient GMM estimation and inference where the weighting matrix and asymptotic variance matrix are based on the orthonormal series long run variance estimator. In its general form, the two-step GMM estimator is given by

where

，，and . Note that is a quadratic estimator of the long run variance of moment process . is a symmetric weighting function that depends on the smoothing parameter . Hwang and Sun (2017) focus on the orthonormal series LRV estimation with , where are orthonormal basis functions on satisfying for .

We are interested in testing the null against the alternative , where and is a matrix of full row rank. Nonlinear restrictions can be converted into linear ones via the delta method. The Wald statistic is given by

where . Under the assumptions in Hwang and Sun (2017), the following result holds:

,

where

is the modified Wald statistic and

the J statistics for testing overidentifying restrictions. Sun and Kim (2012) show that converges in distribution to . Following Sun and Kim (2012) and Hwang and Sun (2017), we select based on the AMSE criterion implemented using the VAR(1) plug-in procedure.

**References**

Huang, J. and Y. Sun, 2017.Asymptotic F and t Tests in an Efficient GMM Setting. Journal of Econometrics, 198(2): 277-295.

Sun, Y. and M. S. Kim, 2012. [Simple and Powerful GMM Over-identification Tests with Accurate Size](http://econweb.ucsd.edu/~yisun/J_test.pdf). Journal of Econometrics, 166(2): 267-281.

**Also see**

[TS]tsset—Declare data to be time series data.