Title

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estat ic — Display information criteria

Syntax

```
estat ic [ , n(#) ]
```

Menu for estat

Statistics > Postestimation > Reports and statistics

Description

`estat ic` displays Akaike's and Schwarz's Bayesian information criteria.

Option

`n(#)` specifies the N to be used in calculating BIC; see [R] **BIC note**.

Remarks and examples

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`estat ic` calculates two information criteria used to compare models. Unlike likelihood-ratio, Wald, and similar testing procedures, the models need not be nested to compare the information criteria. Because they are based on the log-likelihood function, information criteria are available only after commands that report the log likelihood.

In general, "smaller is better": given two models, the one with the smaller AIC fits the data better than the one with the larger AIC. As with the AIC, a smaller BIC indicates a better-fitting model. For AIC and BIC formulas, see *Methods and formulas*.

▷ Example 1

In [R] **mlogit**, we fit a model explaining the type of insurance a person has on the basis of age, gender, race, and site of study. Here we refit the model with and without the site dummies and compare the models.

```
. use http://www.stata-press.com/data/r13/sysdsn1
(Health insurance data)
. mlogit insure age male nonwhite
  (output omitted)
. estat ic
Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	615	-555.8545	-545.5833	8	1107.167	1142.54

Note: N=Obs used in calculating BIC; see **[R] BIC note**

```
. mlogit insure age male nonwhite i.site
  (output omitted)
. estat ic
Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	615	-555.8545	-534.3616	12	1092.723	1145.783

Note: N=Obs used in calculating BIC; see **[R] BIC note**

The AIC indicates that the model including the site dummies fits the data better, whereas the BIC indicates the opposite. As is often the case, different model-selection criteria have led to conflicting conclusions.

◁

❑ Technical note

`glm` and `binreg, ml` report a slightly different version of AIC and BIC; see [R] **glm** for the formulas used. That version is commonly used within the GLM literature; see, for example, Hardin and Hilbe (2012). The literature on information criteria is vast; see, among others, Akaike (1973), Sawa (1978), and Raftery (1995). Judge et al. (1985) contains a discussion of using information criteria in econometrics. Royston and Sauerbrei (2008, chap. 2) examine the use of information criteria as an alternative to stepwise procedures for selecting model variables.

❑

Stored results

`estat ic` stores the following in `r()`:

Matrices

`r(S)` 1 × 6 matrix of results:
1. sample size
2. log likelihood of null model
3. log likelihood of full model
4. degrees of freedom
5. AIC
6. BIC

Methods and formulas

Akaike's (1974) information criterion is defined as

$$\text{AIC} = -2\ln L + 2k$$

where $\ln L$ is the maximized log-likelihood of the model and k is the number of parameters estimated. Some authors define the AIC as the expression above divided by the sample size.

Schwarz's (1978) Bayesian information criterion is another measure of fit defined as

$$\text{BIC} = -2\ln L + k\ln N$$

where N is the sample size. See [R] **BIC note** for additional information on calculating and interpreting BIC.

Hirotugu Akaike (1927–2009) was born in Fujinomiya City, Shizuoka Prefecture, Japan. He was the son of a silkworm farmer. He gained BA and DSc degrees from the University of Tokyo. Akaike's career from 1952 at the Institute of Statistical Mathematics in Japan culminated in service as Director General; after 1994, he was Professor Emeritus. His best known work in a prolific career is on what is now known as the Akaike information criterion (AIC), which was formulated to help selection of the most appropriate model from a number of candidates.

Gideon E. Schwarz (1933–2007) was a professor of Statistics at the Hebrew University, Jerusalem. He was born in Salzburg, Austria, and obtained an MSc in 1956 from the Hebrew University and a PhD in 1961 from Columbia University. His interests included stochastic processes, sequential analysis, probability, and geometry. He is best known for the Bayesian information criterion (BIC).

References

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Also see

[R] **estat** — Postestimation statistics

[R] **estat summarize** — Summarize estimation sample

[R] **estat vce** — Display covariance matrix estimates