A command for estimating regression parameters for the maximum agreement predictor

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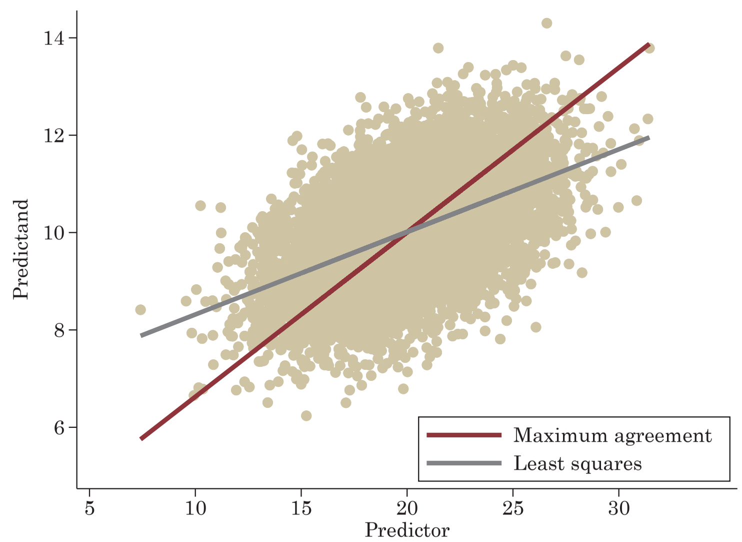
Reference

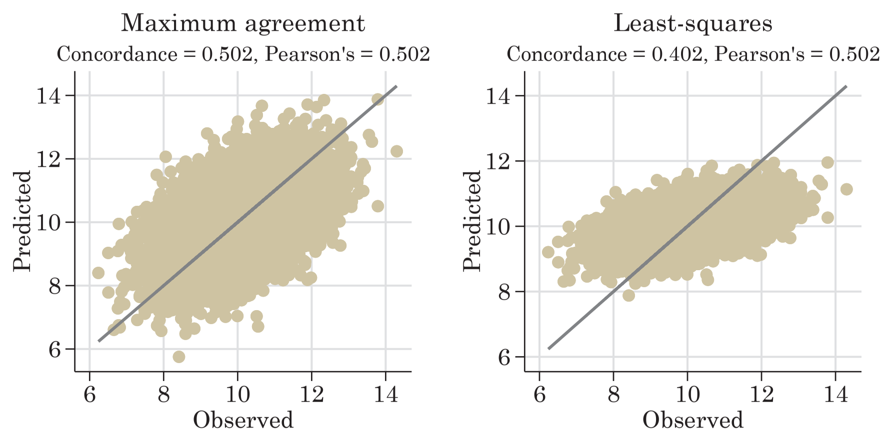
The details of the underlying theory are published in

Bottai M, Kim T, Lieberman B, Luta G, Peña E
On Optimal Correlation-Based Prediction
The American Statistician, 76:4, 313-321, 2022

Maximum agreement and least squares predictors



Predicted values



The do-file

```
. mareg y x
Maximum agreement regression                  Number of obs          =     10000
                                              R-squared              =    0.2518
                                              Concordance corr. coef. =   0.5018

------------------------------------------------------------------------------
             |  Observed   Bootstrap                         Normal-based
           y |     Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |  .3379582    .0027289   123.84   0.000     .3326096    .3433068
       _cons |  3.248312    .0562403    57.76   0.000     3.138083    3.358541
------------------------------------------------------------------------------

. regress y x, noheader
------------------------------------------------------------------------------
           y |     Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |  .1695945    .0029235    58.01   0.000     .1638638    .1753252
       _cons |  6.621815    .0592277   111.80   0.000     6.505717    6.737913
------------------------------------------------------------------------------
```


Syntax

`mareg` [*varlist*] [*if*] [*in*] [*weight*] [, `bsopts`(*string*) *options*]

varlist is the same as that of `regress`.
`bsopts` are the options of the `bootstrap` command.
options are the options of the `regress` command.

Some theory

Bottai et al. considered estimating Y with a predictor $h(X)$.
They assumed $E(Y^2) < \infty$ and defined

$$\mathfrak{H} = \{h : (\mathbb{R}^p, \mathbb{B}^p) \to (\mathbb{R}, \mathbb{B}) \mid E[h(X)^2] < \infty\}$$

with $\mathbb{B}$ and $\mathbb{B}^p$ denoting Borel σ-fields.

Some theory

Bottai et al. defined

$$\tilde{h} = \arg\max_{h \in \mathfrak{H}} \kappa(Y, h(X))$$

with κ denoting a bivariate correlation function.

They showed that

– For Pearson's correlation, the class $\tilde{h}$ is uncountably infinite.
– The MA and LS predictors belong to it.
– The MA predictor is the unique concordance maximizer.

Some theory

Bottai et al. show

$$E(h_{\mathrm{MA}}(X)) = E(Y)$$
$$E(h_{\mathrm{LS}}(X)) = E(Y)$$

$$Var(h_{\mathrm{MA}}(X)) = Var(Y)$$
$$Var(h_{\mathrm{LS}}(X)) \leq Var(Y)$$

$$Cor(Y, h_{\mathrm{MA}}(X)) = Cor^{\mathrm{C}}(Y, h_{\mathrm{MA}}(X))$$
$$Cor(Y, h_{\mathrm{LS}}(X)) \geq Cor^{\mathrm{C}}(Y, h_{\mathrm{LS}}(X))$$

The inequalities are equalities if and only if $Cor(Y, h_{\mathrm{LS}}(X)) = 1$.

Conclusions

The `mareg` command

– estimates maximum agreement regression
– is optimal when the inferential objective is concordance
– shares the syntax of `regress` and `bootstrap`
– is computationally fast
– is available through `ssc` and

```
net from http://www.imm.ki.se/biostatistics/stata
```