

Correlated random effects: iidkd

This model is available for dimensions $k = 2$, to 20. We describe in detail the case for $k = 3$ as other ones are similar. This model do the same as models `iid2d`, `iid3d`, `iid4d`, `iid5d`, but uses a different and more efficient parameterisation.

Parametrization

The $(k = 3)$ -dimensional Normal-Wishard model is used if one want to define three vectors of “random effects”, u and v and w , say, for which (u_i, v_i, w_i) are iid bivariate Normals

$$\begin{pmatrix} u_i \\ v_i \\ w_i \end{pmatrix} \sim \mathcal{N}(\mathbf{0}, \mathbf{W}^{-1})$$

where the covariance matrix \mathbf{W}^{-1} is parameterised as $\mathbf{W} = \mathbf{L}\mathbf{L}^T$, where

$$\mathbf{L} = \begin{pmatrix} \exp(\theta_1) & & \\ \theta_4 & \exp(\theta_2) & \\ \theta_5 & \theta_6 & \exp(\theta_3) \end{pmatrix} \quad (1)$$

and $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6$ can take any value. The number of hyperparameters are $k(k+1)/2$, which is 3, 6, 10, 15, 21, 28, 36, 45, 55, ..., for $k = 2, 3, 4, 5, 6, 7, 8, 9, 10, \dots$

For these models the precision matrix \mathbf{W} is Wishart distributed

$$\mathbf{W} \sim \text{Wishart}_k(r, \mathbf{R}^{-1}),$$

with density

$$\pi(\mathbf{W}) = c^{-1} |\mathbf{W}|^{(r-(k+1))/2} \exp \left\{ -\frac{1}{2} \text{Trace}(\mathbf{W}\mathbf{R}) \right\}, \quad r > k+1$$

and

$$c = 2^{(rk)/2} |\mathbf{R}|^{-r/2} \pi^{(k(k-1))/4} \prod_{j=1}^k \Gamma((r+1-j)/2).$$

Then,

$$\text{E}(\mathbf{W}) = r\mathbf{R}^{-1}, \quad \text{and} \quad \text{E}(\mathbf{W}^{-1}) = \mathbf{R}/(r - (k+1)).$$

Hyperparameters

The hyperparameters are $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6$.

The prior-parameters are

$$(r, R_1, R_2, R_3, R_4, R_5, R_6)$$

where

$$\mathbf{R} = \begin{pmatrix} R_1 & R_4 & R_5 \\ R_4 & R_2 & R_6 \\ R_5 & R_6 & R_3 \end{pmatrix}$$

The `inla` function reports posterior distribution for the hyperparameters $\{\theta_i\}$, and the conversion into interpretable quantities can be done using simulation as described below.

The prior for θ is **fixed** to be `wishartkd`, and number of prior parameters required are $1 + k(k+1)/2$. By default the prior-parameters are

$$(r = 100, \underbrace{1, \dots, 1}_{k \text{ times}}, 0, \dots, 0)$$

Specification

The model `iidkd` is specified as

```
y ~ f(i, model="iidkd", order=3, n = <length>) + ...
```

where $\text{order} = k = 3$, and the `iidkd` model is represented internally as one vector of length n ,

$$(u_1, u_2, \dots, u_m, v_1, v_2, \dots, v_m, w_1, w_2, \dots, w_m)$$

where $n = 3m$, and n is the (required) argument in `f()`.

For this model the argument `constr=TRUE` is interpreted as 3 sum-to-zero constraints

$$\sum u_i = 0, \quad \sum v_i = 0 \quad \text{and} \quad \sum w_i = 0.$$

Hyperparameter spesification and default values

(**Note:** The value “1048576” is just a code for “replace this by the default value”. As the default value depends on `order`, the was the easy way out for the moment.)

doc Gaussian random effect in $\text{dim}=k$ with Wishart prior

hyper

theta1

hyperid 29101

name theta1

short.name theta1

initial 1048576

fixed FALSE

prior wishartkd

param 11 1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576 1048576
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to.theta function(x) x

from.theta function(x) x

theta2

hyperid 29102

name theta2

short.name theta2

initial 1048576

fixed FALSE

prior none

param

to.theta function(x) x

from.theta function(x) x

theta3

hyperid 29103

```

    name theta3
    short.name theta3
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta4
    hyperid 29104
    name theta4
    short.name theta4
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta5
    hyperid 29105
    name theta5
    short.name theta5
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta6
    hyperid 29106
    name theta6
    short.name theta6
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta7
    hyperid 29107
    name theta7
    short.name theta7
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta8
    hyperid 29108
    name theta8
    short.name theta8
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta9
    hyperid 29109
    name theta9
    short.name theta9
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta10
    hyperid 29110
    name theta10
    short.name theta10
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta11
    hyperid 29111
    name theta11
    short.name theta11
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta12
  hyperid 29112
  name theta12
  short.name theta12
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta13
  hyperid 29113
  name theta13
  short.name theta13
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta14
  hyperid 29114
  name theta14
  short.name theta14
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta15
  hyperid 29115
  name theta15
  short.name theta15
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta16
  hyperid 29116
  name theta16
  short.name theta16

```

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta17
    hyperid 29117
    name theta17
    short.name theta17
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta18
    hyperid 29118
    name theta18
    short.name theta18
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta19
    hyperid 29119
    name theta19
    short.name theta19
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta20
    hyperid 29120
    name theta20
    short.name theta20
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta21
  hyperid 29121
  name theta21
  short.name theta21
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta22
  hyperid 29122
  name theta22
  short.name theta22
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta23
  hyperid 29123
  name theta23
  short.name theta23
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta24
  hyperid 29124
  name theta24
  short.name theta24
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta25
  hyperid 29125

```

```

    name theta25
    short.name theta25
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta26
    hyperid 29126
    name theta26
    short.name theta26
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta27
    hyperid 29127
    name theta27
    short.name theta27
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta28
    hyperid 29128
    name theta28
    short.name theta28
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta29
    hyperid 29129
    name theta29
    short.name theta29
    initial 1048576
    fixed FALSE

```



```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta30
    hyperid 29130
    name theta30
    short.name theta30
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta31
    hyperid 29131
    name theta31
    short.name theta31
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta32
    hyperid 29132
    name theta32
    short.name theta32
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta33
    hyperid 29133
    name theta33
    short.name theta33
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

theta34

hyperid 29134
name theta34
short.name theta34
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta35

hyperid 29135
name theta35
short.name theta35
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta36

hyperid 29136
name theta36
short.name theta36
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta37

hyperid 29137
name theta37
short.name theta37
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta38

hyperid 29138
name theta38
short.name theta38

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta39
    hyperid 29139
    name theta39
    short.name theta39
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta40
    hyperid 29140
    name theta40
    short.name theta40
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta41
    hyperid 29141
    name theta41
    short.name theta41
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta42
    hyperid 29142
    name theta42
    short.name theta42
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta43
  hyperid 29143
  name theta43
  short.name theta43
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta44
  hyperid 29144
  name theta44
  short.name theta44
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta45
  hyperid 29145
  name theta45
  short.name theta45
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta46
  hyperid 29146
  name theta46
  short.name theta46
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta47
  hyperid 29147

```

```

    name theta47
    short.name theta47
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta48
    hyperid 29148
    name theta48
    short.name theta48
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta49
    hyperid 29149
    name theta49
    short.name theta49
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta50
    hyperid 29150
    name theta50
    short.name theta50
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta51
    hyperid 29151
    name theta51
    short.name theta51
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta52
    hyperid 29152
    name theta52
    short.name theta52
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta53
    hyperid 29153
    name theta53
    short.name theta53
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta54
    hyperid 29154
    name theta54
    short.name theta54
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta55
    hyperid 29155
    name theta55
    short.name theta55
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

theta56

hyperid 29156
name theta56
short.name theta56
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta57

hyperid 29157
name theta57
short.name theta57
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta58

hyperid 29158
name theta58
short.name theta58
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta59

hyperid 29159
name theta59
short.name theta59
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta60

hyperid 29160
name theta60
short.name theta60

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta61
    hyperid 29161
    name theta61
    short.name theta61
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta62
    hyperid 29162
    name theta62
    short.name theta62
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta63
    hyperid 29163
    name theta63
    short.name theta63
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta64
    hyperid 29164
    name theta64
    short.name theta64
    initial 1048576
    fixed FALSE
    prior none
    param

```



```

    to.theta function(x) x
    from.theta function(x) x
theta65
  hyperid 29165
  name theta65
  short.name theta65
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta66
  hyperid 29166
  name theta66
  short.name theta66
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta67
  hyperid 29167
  name theta67
  short.name theta67
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta68
  hyperid 29168
  name theta68
  short.name theta68
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta69
  hyperid 29169

```

```

    name theta69
    short.name theta69
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta70
    hyperid 29170
    name theta70
    short.name theta70
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta71
    hyperid 29171
    name theta71
    short.name theta71
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta72
    hyperid 29172
    name theta72
    short.name theta72
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta73
    hyperid 29173
    name theta73
    short.name theta73
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta74
    hyperid 29174
    name theta74
    short.name theta74
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta75
    hyperid 29175
    name theta75
    short.name theta75
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta76
    hyperid 29176
    name theta76
    short.name theta76
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta77
    hyperid 29177
    name theta77
    short.name theta77
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

theta78

hyperid 29178
name theta78
short.name theta78
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta79

hyperid 29179
name theta79
short.name theta79
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta80

hyperid 29180
name theta80
short.name theta80
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta81

hyperid 29181
name theta81
short.name theta81
initial 1048576
fixed FALSE
prior none
param
to.theta function(x) x
from.theta function(x) x

theta82

hyperid 29182
name theta82
short.name theta82

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta83
    hyperid 29183
    name theta83
    short.name theta83
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta84
    hyperid 29184
    name theta84
    short.name theta84
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta85
    hyperid 29185
    name theta85
    short.name theta85
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta86
    hyperid 29186
    name theta86
    short.name theta86
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta87
  hyperid 29187
  name theta87
  short.name theta87
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta88
  hyperid 29188
  name theta88
  short.name theta88
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta89
  hyperid 29189
  name theta89
  short.name theta89
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta90
  hyperid 29190
  name theta90
  short.name theta90
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta91
  hyperid 29191

```

```

    name theta91
    short.name theta91
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta92
    hyperid 29192
    name theta92
    short.name theta92
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta93
    hyperid 29193
    name theta93
    short.name theta93
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta94
    hyperid 29194
    name theta94
    short.name theta94
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta95
    hyperid 29195
    name theta95
    short.name theta95
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta96
    hyperid 29196
    name theta96
    short.name theta96
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta97
    hyperid 29197
    name theta97
    short.name theta97
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta98
    hyperid 29198
    name theta98
    short.name theta98
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta99
    hyperid 29199
    name theta99
    short.name theta99
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```



```

theta100
  hyperid 29200
  name theta100
  short.name theta100
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta101
  hyperid 29201
  name theta101
  short.name theta101
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta102
  hyperid 29202
  name theta102
  short.name theta102
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta103
  hyperid 29203
  name theta103
  short.name theta103
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta104
  hyperid 29204
  name theta104
  short.name theta104

```

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta105
    hyperid 29205
    name theta105
    short.name theta105
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta106
    hyperid 29206
    name theta106
    short.name theta106
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta107
    hyperid 29207
    name theta107
    short.name theta107
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta108
    hyperid 29208
    name theta108
    short.name theta108
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta109
  hyperid 29209
  name theta109
  short.name theta109
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta110
  hyperid 29210
  name theta110
  short.name theta110
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta111
  hyperid 29211
  name theta111
  short.name theta111
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta112
  hyperid 29212
  name theta112
  short.name theta112
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta113
  hyperid 29213

```

```

    name theta113
    short.name theta113
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta114
    hyperid 29214
    name theta114
    short.name theta114
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta115
    hyperid 29215
    name theta115
    short.name theta115
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta116
    hyperid 29216
    name theta116
    short.name theta116
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta117
    hyperid 29217
    name theta117
    short.name theta117
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta118
    hyperid 29218
    name theta118
    short.name theta118
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta119
    hyperid 29219
    name theta119
    short.name theta119
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta120
    hyperid 29220
    name theta120
    short.name theta120
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta121
    hyperid 29221
    name theta121
    short.name theta121
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta122
  hyperid 29222
  name theta122
  short.name theta122
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta123
  hyperid 29223
  name theta123
  short.name theta123
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta124
  hyperid 29224
  name theta124
  short.name theta124
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta125
  hyperid 29225
  name theta125
  short.name theta125
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta126
  hyperid 29226
  name theta126
  short.name theta126

```

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta127
    hyperid 29227
    name theta127
    short.name theta127
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta128
    hyperid 29228
    name theta128
    short.name theta128
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta129
    hyperid 29229
    name theta129
    short.name theta129
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta130
    hyperid 29230
    name theta130
    short.name theta130
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta131
  hyperid 29231
  name theta131
  short.name theta131
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta132
  hyperid 29232
  name theta132
  short.name theta132
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta133
  hyperid 29233
  name theta133
  short.name theta133
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta134
  hyperid 29234
  name theta134
  short.name theta134
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta135
  hyperid 29235

```



```

    name theta135
    short.name theta135
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta136
    hyperid 29236
    name theta136
    short.name theta136
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta137
    hyperid 29237
    name theta137
    short.name theta137
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta138
    hyperid 29238
    name theta138
    short.name theta138
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta139
    hyperid 29239
    name theta139
    short.name theta139
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta140
    hyperid 29240
    name theta140
    short.name theta140
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta141
    hyperid 29241
    name theta141
    short.name theta141
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta142
    hyperid 29242
    name theta142
    short.name theta142
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta143
    hyperid 29243
    name theta143
    short.name theta143
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta144
  hyperid 29244
  name theta144
  short.name theta144
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta145
  hyperid 29245
  name theta145
  short.name theta145
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta146
  hyperid 29246
  name theta146
  short.name theta146
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta147
  hyperid 29247
  name theta147
  short.name theta147
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta148
  hyperid 29248
  name theta148
  short.name theta148

```

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta149
    hyperid 29249
    name theta149
    short.name theta149
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta150
    hyperid 29250
    name theta150
    short.name theta150
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta151
    hyperid 29251
    name theta151
    short.name theta151
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta152
    hyperid 29252
    name theta152
    short.name theta152
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta153
  hyperid 29253
  name theta153
  short.name theta153
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta154
  hyperid 29254
  name theta154
  short.name theta154
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta155
  hyperid 29255
  name theta155
  short.name theta155
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta156
  hyperid 29256
  name theta156
  short.name theta156
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta157
  hyperid 29257

```

```

    name theta157
    short.name theta157
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta158
    hyperid 29258
    name theta158
    short.name theta158
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta159
    hyperid 29259
    name theta159
    short.name theta159
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta160
    hyperid 29260
    name theta160
    short.name theta160
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta161
    hyperid 29261
    name theta161
    short.name theta161
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta162
    hyperid 29262
    name theta162
    short.name theta162
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta163
    hyperid 29263
    name theta163
    short.name theta163
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta164
    hyperid 29264
    name theta164
    short.name theta164
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta165
    hyperid 29265
    name theta165
    short.name theta165
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta166
  hyperid 29266
  name theta166
  short.name theta166
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta167
  hyperid 29267
  name theta167
  short.name theta167
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta168
  hyperid 29268
  name theta168
  short.name theta168
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta169
  hyperid 29269
  name theta169
  short.name theta169
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta170
  hyperid 29270
  name theta170
  short.name theta170

```



```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta171
    hyperid 29271
    name theta171
    short.name theta171
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta172
    hyperid 29272
    name theta172
    short.name theta172
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta173
    hyperid 29273
    name theta173
    short.name theta173
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta174
    hyperid 29274
    name theta174
    short.name theta174
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta175
  hyperid 29275
  name theta175
  short.name theta175
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta176
  hyperid 29276
  name theta176
  short.name theta176
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta177
  hyperid 29277
  name theta177
  short.name theta177
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta178
  hyperid 29278
  name theta178
  short.name theta178
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta179
  hyperid 29279

```

```

    name theta179
    short.name theta179
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta180
    hyperid 29280
    name theta180
    short.name theta180
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta181
    hyperid 29281
    name theta181
    short.name theta181
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta182
    hyperid 29282
    name theta182
    short.name theta182
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta183
    hyperid 29283
    name theta183
    short.name theta183
    initial 1048576
    fixed FALSE

```

```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta184
    hyperid 29284
    name theta184
    short.name theta184
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta185
    hyperid 29285
    name theta185
    short.name theta185
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta186
    hyperid 29286
    name theta186
    short.name theta186
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta187
    hyperid 29287
    name theta187
    short.name theta187
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta188
  hyperid 29288
  name theta188
  short.name theta188
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta189
  hyperid 29289
  name theta189
  short.name theta189
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta190
  hyperid 29290
  name theta190
  short.name theta190
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta191
  hyperid 29291
  name theta191
  short.name theta191
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta192
  hyperid 29292
  name theta192
  short.name theta192

```

```

    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta193
    hyperid 29293
    name theta193
    short.name theta193
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta194
    hyperid 29294
    name theta194
    short.name theta194
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta195
    hyperid 29295
    name theta195
    short.name theta195
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta196
    hyperid 29296
    name theta196
    short.name theta196
    initial 1048576
    fixed FALSE
    prior none
    param

```

```

    to.theta function(x) x
    from.theta function(x) x
theta197
  hyperid 29297
  name theta197
  short.name theta197
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta198
  hyperid 29298
  name theta198
  short.name theta198
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta199
  hyperid 29299
  name theta199
  short.name theta199
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta200
  hyperid 29300
  name theta200
  short.name theta200
  initial 1048576
  fixed FALSE
  prior none
  param
  to.theta function(x) x
  from.theta function(x) x
theta201
  hyperid 29301

```

```

    name theta201
    short.name theta201
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta202
    hyperid 29302
    name theta202
    short.name theta202
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta203
    hyperid 29303
    name theta203
    short.name theta203
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta204
    hyperid 29304
    name theta204
    short.name theta204
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta205
    hyperid 29305
    name theta205
    short.name theta205
    initial 1048576
    fixed FALSE

```



```

    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta206
    hyperid 29306
    name theta206
    short.name theta206
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta207
    hyperid 29307
    name theta207
    short.name theta207
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta208
    hyperid 29308
    name theta208
    short.name theta208
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x
theta209
    hyperid 29309
    name theta209
    short.name theta209
    initial 1048576
    fixed FALSE
    prior none
    param
    to.theta function(x) x
    from.theta function(x) x

```

```

theta210
  hyperid 29310
  name theta210
  short.name theta210
  initial 1048576
  fixed FALSE
  prior none
  param
    to.theta function(x) x
    from.theta function(x) x

constr FALSE

nrow.ncol FALSE

augmented TRUE

aug.factor 1

aug.constr 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

n.div.by -1

n.required TRUE

set.default.values TRUE

status experimental

pdf iidkd

```

Example

Just simulate some data and estimate the parameters back. This is for **order=4**.

```

library(mvtnorm)

n <- 300
m <- 4
N <- m*n
rho <- 0.8

Sigma <- matrix(NA, m, m)
diag(Sigma) <- (1/(1:m))^2
for(i in 1:m) {
  for (j in 1:m) {
    if (i != j) {
      Sigma[i, j] <- rho^abs(i-j) * sqrt(Sigma[i, i] * Sigma[j, j])
    }
  }
}

y <- c()
yy <- rmvnorm(n, sigma = Sigma)
for(i in 1:m) {
  y <- c(y, yy[, i])
}

```

```

}

r <- inla(y ~ f(i, model = "iidkd", order = m, n=N,
  ## set parameters using 'theta1'.
  ## these are the default parameters.
  hyper = list(theta1 = list(
    param = c(100, rep(1, m), rep(0, m*(m-1)/2))))),
data = data.frame(i = 1:N, y),
## fix precision as we have exact observations
control.family = list(hyper = list(
  prec = list(initial = 15, fixed = TRUE))),
verbose = FALSE)

## this is how the internal parameters are defined
L <- t(chol(solve(Sigma)))
diag(L) <- log(diag(L))
LL <- t(chol(solve(cov(yy))))
diag(LL) <- log(diag(LL))

## compare the estimated (internal) parameters with MLE and the truth
round(dig = 3, cbind(true = c(diag(L), L[lower.tri(L)]),
  mle = c(diag(LL), LL[lower.tri(LL)]),
  inla = r$mode$theta))

## this gives a list of sampled matrices (stdev's and correlations)
xx <- inla.iidkd.sample(10^4, r, "i")
## compute the mean
qq <- matrix(rowMeans(matrix(unlist(xx), nrow = m^2)), m, m)

iSigma <- 1/sqrt(diag(Sigma))
Cor <- diag(iSigma) %*% Sigma %*% diag(iSigma)
round(dig = 3, cbind(inla = c(diag(qq), qq[lower.tri(qq)]),
  true = c(sqrt(diag(Sigma)), Cor[lower.tri(Cor)])))

```