Re: Bayesian estimation of structured correlation/covariance

Source: http://sci.tech−archive.net/Archive/sci.stat.math/2005−11/msg00383.html

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* *From*: "Ben Lee" <benjamin.n.lee@xxxxxxxxx>
* *Date*: 28 Nov 2005 12:03:00 −0800

Thanks for the detailed reply,
I will definitely look into Gibbs Sampling more. The other
alternative I was considering was just making Naive assumptions about
conditional independence − for instance, I have the framework for
estimating the unknown correlation variables given an observed
correlation between a pair of paths. Empirically, it seems the
estimation results are pretty good if I assume that I can simply
multiply the likelihoods from different pairs of paths to obtain the
overall likelihood.

Ben Lee
David Jones wrote:
> Ben Lee wrote:
> >> Of course, I can measure several paths, so from what I've read, I
> > should formulate this as covariance matrix estimation with the
> Wishart
> > distribution.
> >
> > I'd prefer correlation estimation which I understand from a
> bivariate
> > angle with the Fisher transform − but from what I've read from
> > discussion in this group, the multivariate case gets quite nasty.
> >
>
> For your situation you might need to avoid something which make the
> large step of using the Wishart/ inverse Wishart distribution for the
> covariance matrix. This is because of the structured nature of the
> correlation/covariance you want to impose. An alternative is to become
> invested (more fully invested) in the modern computational approaches
> to Bayesian statistics based on MCMC (Monte Carlo Markov Chains).
>
> For example, in one approach based on "Gibbs sampling" you can arrive
> a situation where your compuations for the covariance matrix are
> converted to a case where the elements of the sample covariance matrix
> can be treated as regression coefficents in a simplified problem that
> allows their joint distribution to be described as multivariate
> Normal. (The simplified problem arises because certain of the model
> parameters are being temporarily treated as known). Your constraints

> are then converted into information about the mean values for certain
> of the marginal distributions or for certain linear combinations of
> the marginal variables (the regression coefficients). The known
> information is then implemented in the computations essentially by
> using the theory for going from a joint multivariate Normal
> distribution for (X,Y) to the conditional distribution (X|Y), where
> here for example Y might be the set of sample regression coefficients
> for pairs of variables where the true covariance (and regression
> coefficent) is known to be zero. This works for the "known zero
> correlation case" and possibly for the "known equal correlation case",
> but you would need to look into rthe theory in more detail.
>
> The above is very much a from−first−principles approach that would
> need substantial effort to work out in detail. You may find that
> literature already exists for the general problem of structured
> correlation matrices, particularly for cases where some correlations
> are assumed to be zero.
>
> If you don't find an MCMC approach appealing you may still be best to
> switch from viewing your problem as one of estimating the covarince
> matrix, to one where you are estimating a set of regression
> relationships.
>
> David Jones

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- ***References***:
  - ***Bayesian estimation of structured correlation/covariance***
    - *From:* Ben Lee
  - ***Re: Bayesian estimation of structured correlation/covariance***
    - *From:* David Jones

- Prev by Date: ***Confidence Intervals***
- Next by Date: ***2 peculiar problems of data analysis***
- Previous by thread: ***Re: Bayesian estimation of structured correlation/covariance***
- Next by thread: ***Integration question***
- Index(es):
  - ***Date***
  - ***Thread***