GLS and MCMC gain perturbations

Gaussian posteriors for a linear model, with MCMC and GLS fits, and with or without gains in the perturbations. These scripts analyzing the same realizations from the model, for solving for different gain values, i.e. $g \in \{0.01, 0.1, 0.4, 0.6, 0.9, 1.0\}$ Gains are parameterized by a different amount: 0%, 1%, 10% ... 1% and percentage accurate 2.4E-100 (with 1000 realizations) against. The results are plotted.

From the GLS, a single fit is made, running the same solve, for MCMC, a chain starting the sample using 1000 realizations, and then ignoring the first 10% of the samples, and then holding the sample with the highest likelihood.

Here the perturbation is about 5%. GLS, and gain is about by -15% or 20%. The chance of whether to use -20 or 20, is determined randomly, and so that, on average, half the gains are -15 and half are 20.

GLS

Understanding the plots

Where gains are perturbed, the x-axis are changed to compensate. When should be consistent at $g^{true}/(1+\epsilon)$.

```
gt_arr[0]/(1.0+eps_arr[0])/(1.0+g_perturbed_arr[0]) - m_perturbed_arr[0]+b_perturbed_arr[0]
```

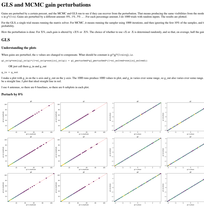
= 1.00 and should be at unity, and

```
b_fit - b_gt
```

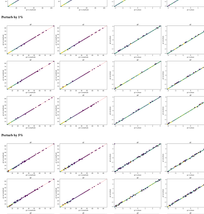
= 0.00 and should be at zero, and so the y-axis for the y-axis. The 1000 realizations 1000 values in plot, and g_arr values over some range, e.g. and also values over some range. If the equality holds, then the plot should be a straight line. And the slope should be equal to 1.

Use 5 realizations, so there are 5 realizations, so there are 6 subplots in each plot.

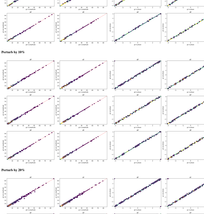
Perturb by 0%



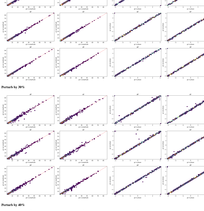
Perturb by 1%



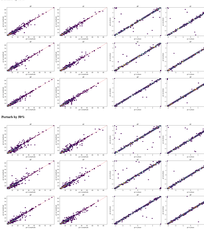
Perturb by 5%



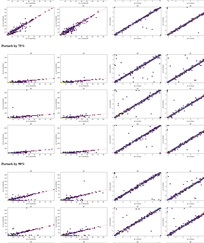
Perturb by 10%



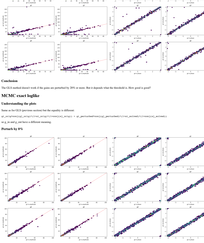
Perturb by 20%



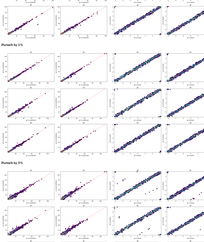
Perturb by 40%



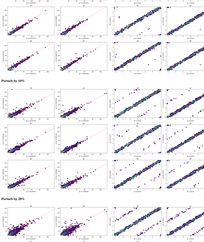
Perturb by 60%



Perturb by 70%



Perturb by 90%



Conclusion

GLS is indeed doesn't work if the gains are perturbed by 20% or more. But is dropout what the threshold is. Most gains is good?

MCMC exact logfits

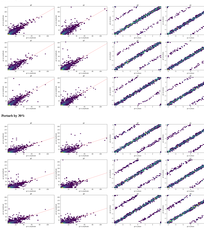
Understanding the plots

Same as the GLS plots, but instead that the equality is different

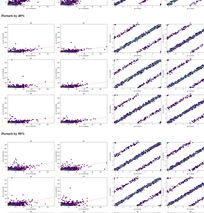
```
gt_arr[0]/(1.0+eps_arr[0])/(1.0+g_perturbed_arr[0]) - m_perturbed_arr[0]+b_perturbed_arr[0]
```

is, e.g. unity, and should be a different meaning.

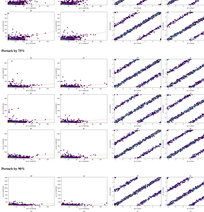
Perturb by 0%



Perturb by 1%



Perturb by 5%



Perturb by 10%

Perturb by 20%

Perturb by 30%

Perturb by 40%

Perturb by 50%

Perturb by 70%

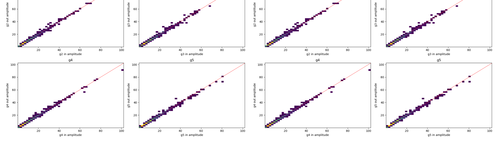
Perturb by 90%

MCMC approximate logfits

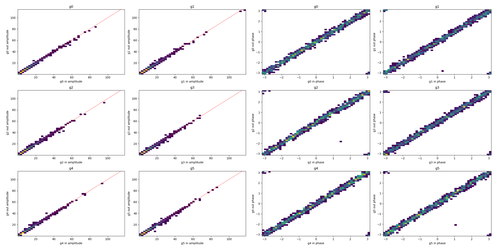
Understanding the plots

All the gains are estimated using the approximate calculation of $\exp(g)^{true}/(1+\epsilon)$ and $\exp(g)$.

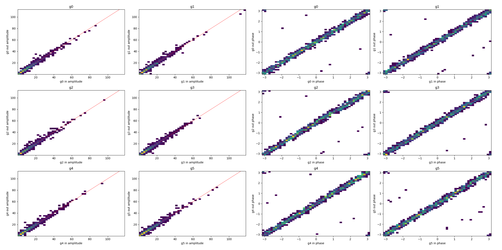
Perturb by 0%



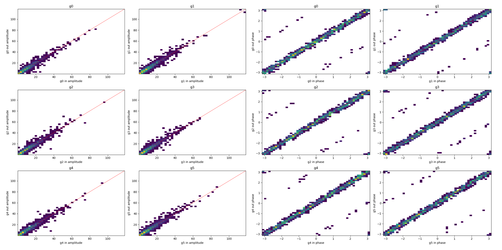
Perturb by 1%



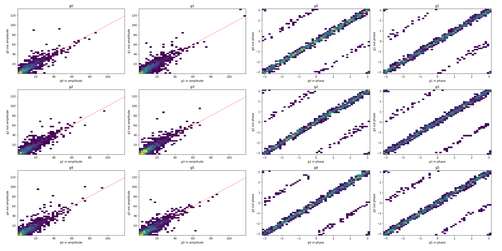
Perturb by 5%



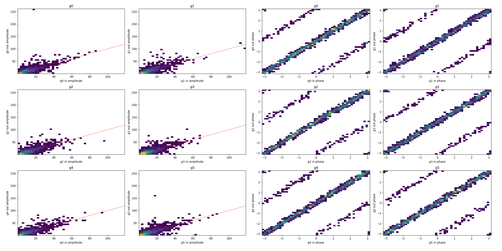
Perturb by 10%



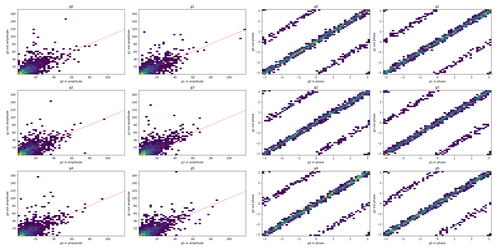
Perturb by 20%



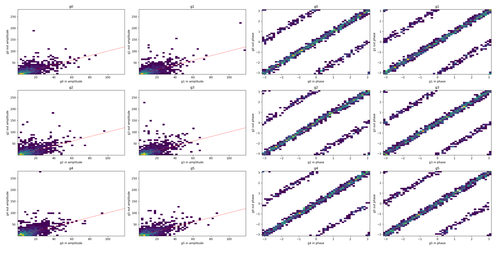
Perturb by 30%



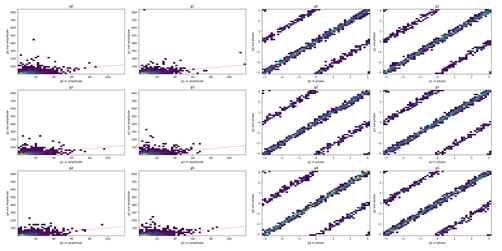
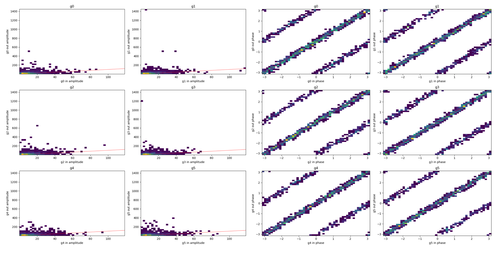
Perturb by 40%



Perturb by 50%



Perturb by 75%



Perturb by 90%