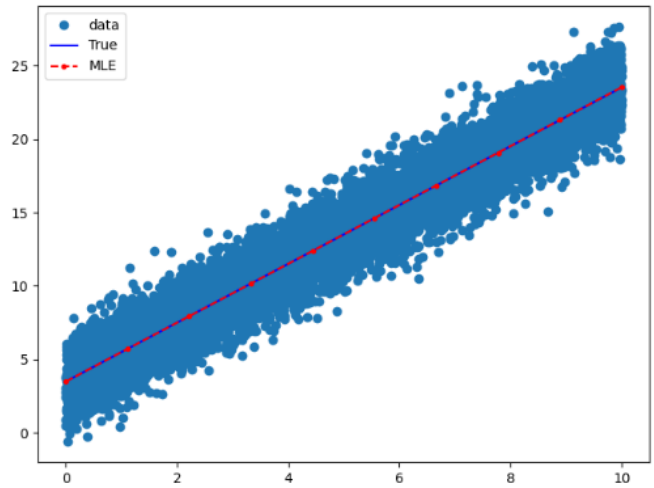
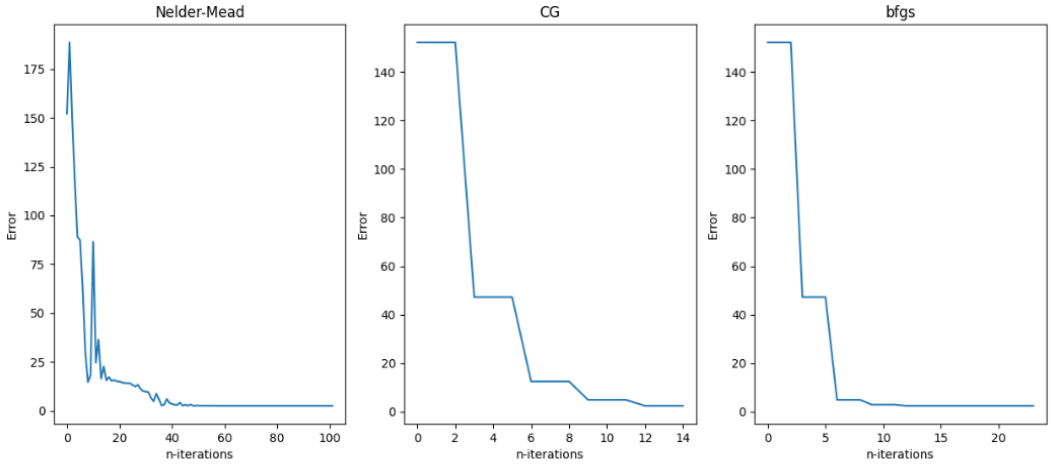
Report on the completion of the second task.

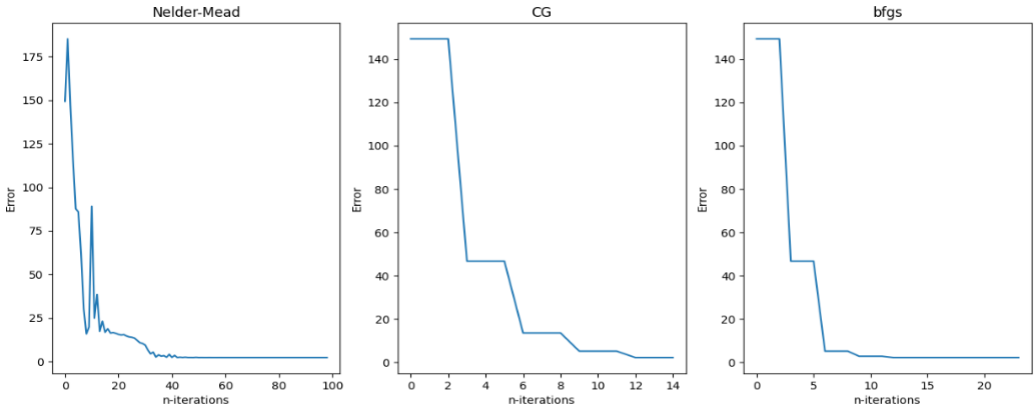
1. **The purpose of the task.**
   The main goal of this task is to investigate how different sizes of sample and minimization algorithms affect the process of minimizing different types of errors.
2. **Plotting graphs for different errors on the linear data.**
   a) **MSE (Mean squared error)**



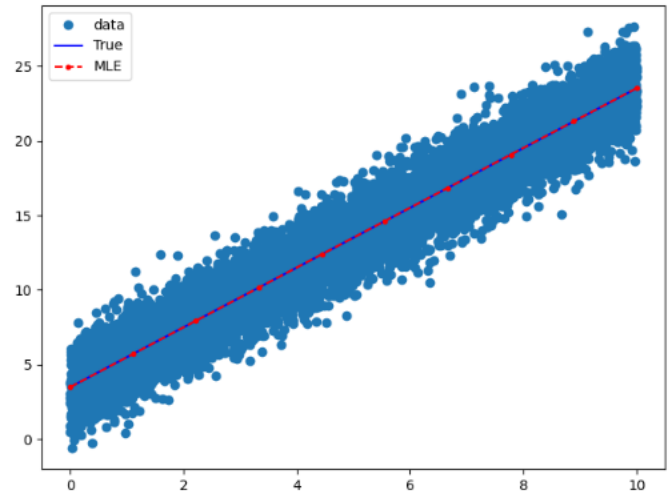
Observations = 50



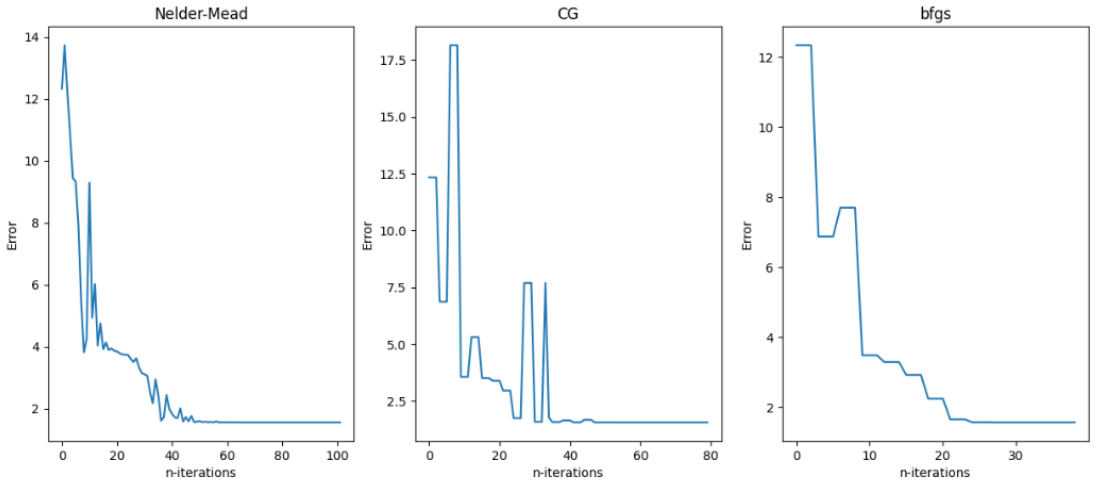
Observations = 10000



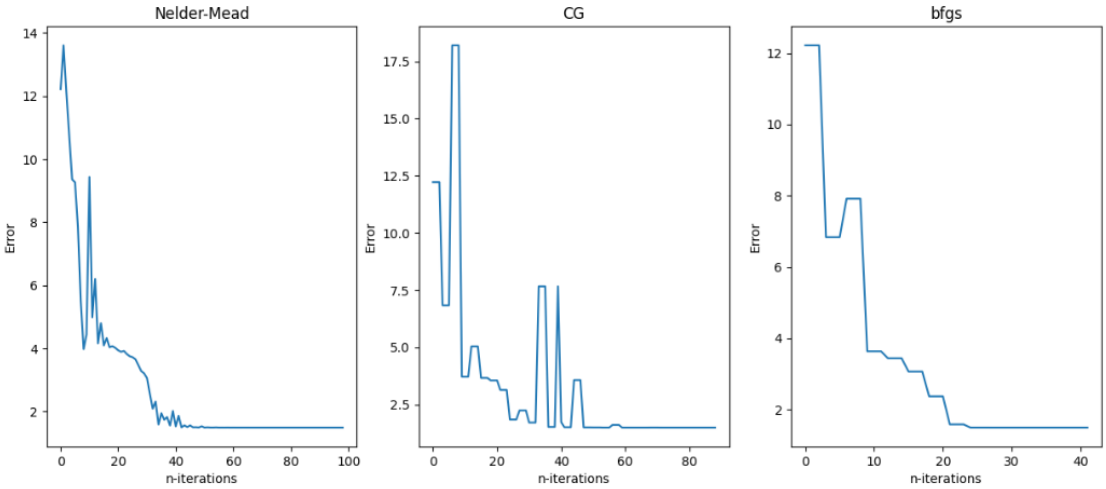
b) RMSE (Root mean squared error)



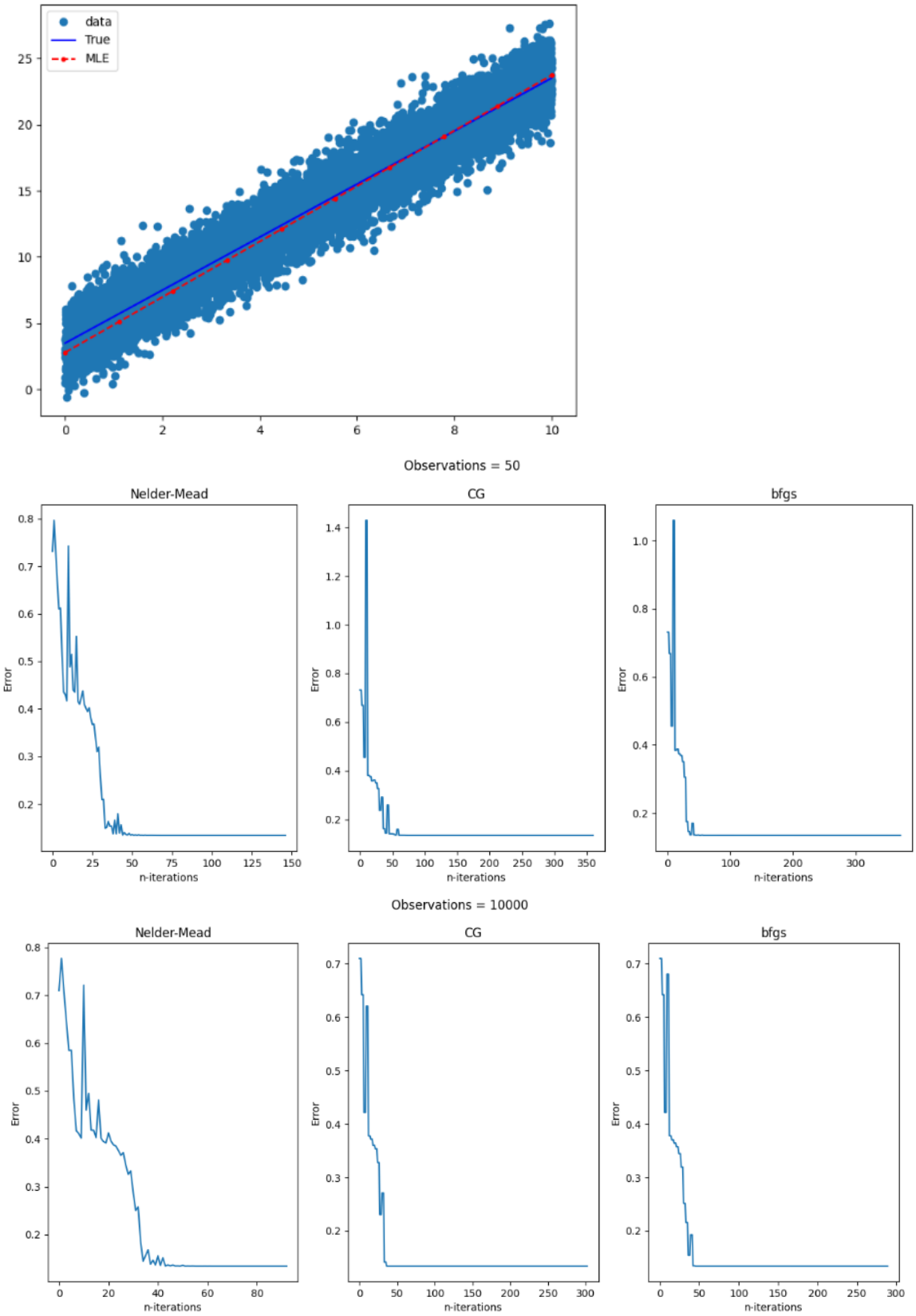
Observations = 50



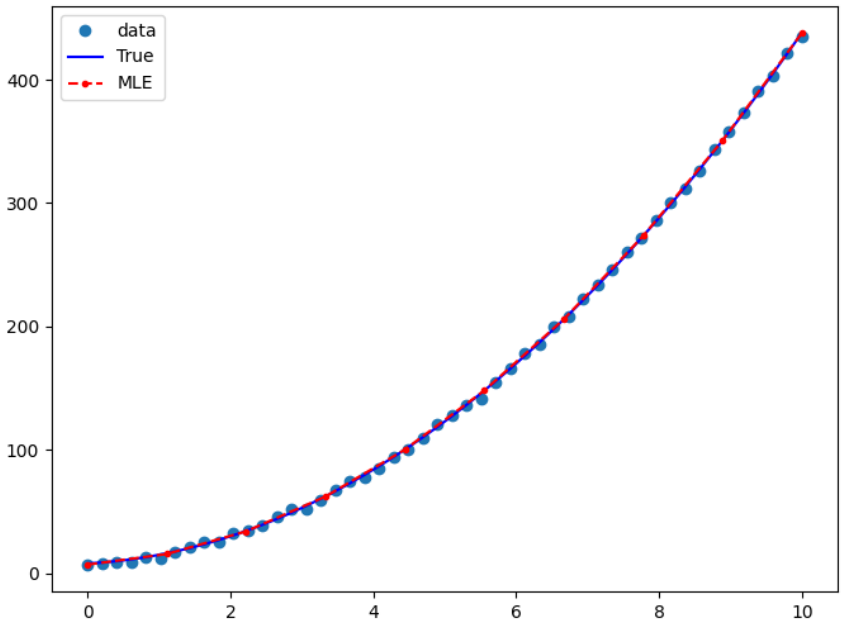
Observations = 10000



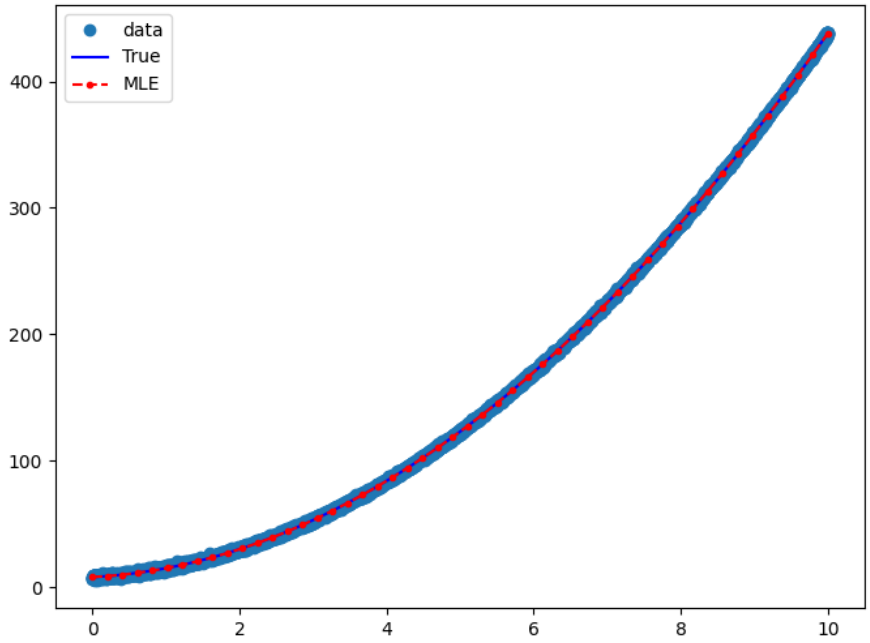
c) MAPE (Mean absolute percentage error)



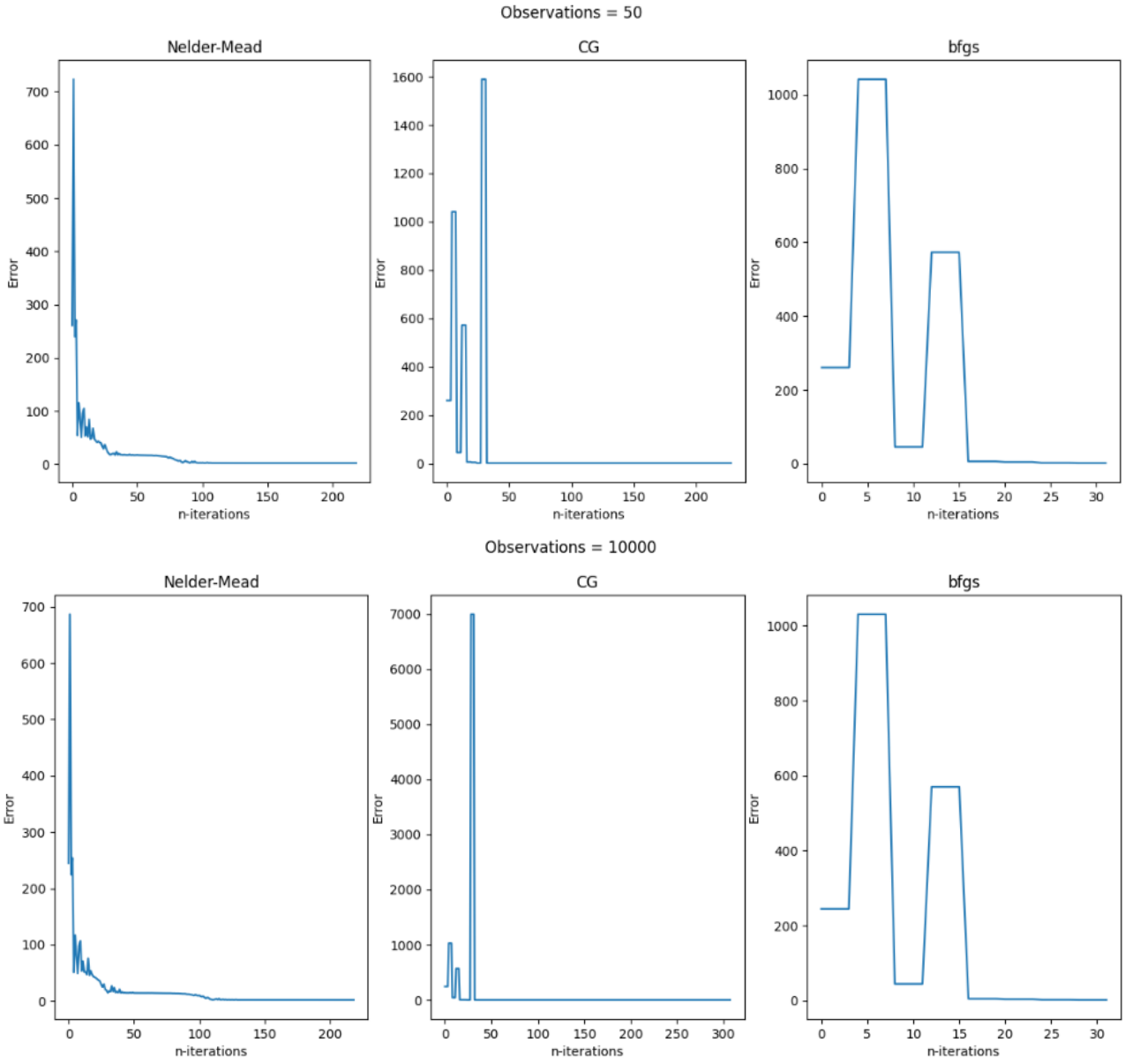
3. **Experiments with non-linear data.**
   samples = 50:



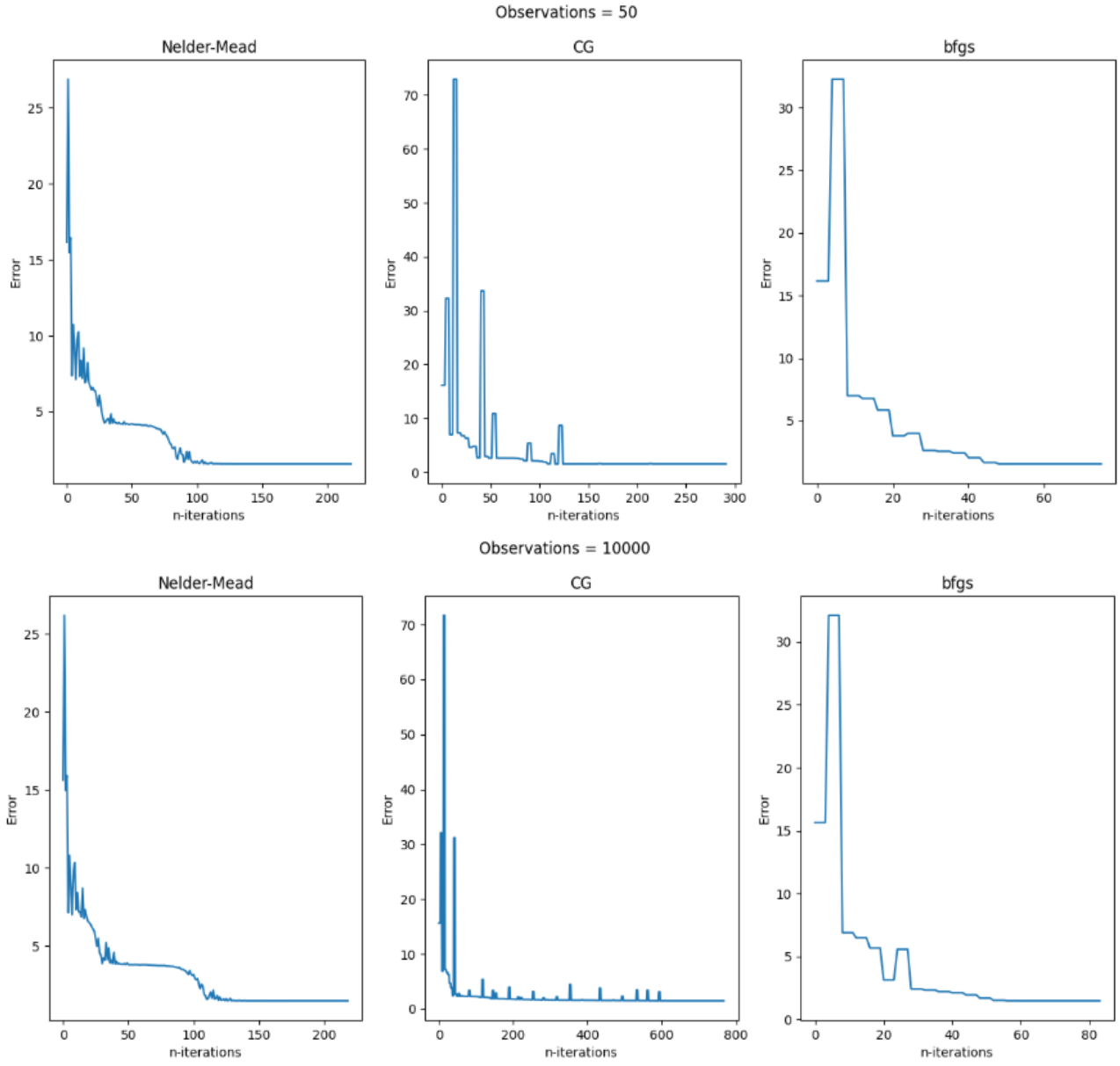
samples = 10000:



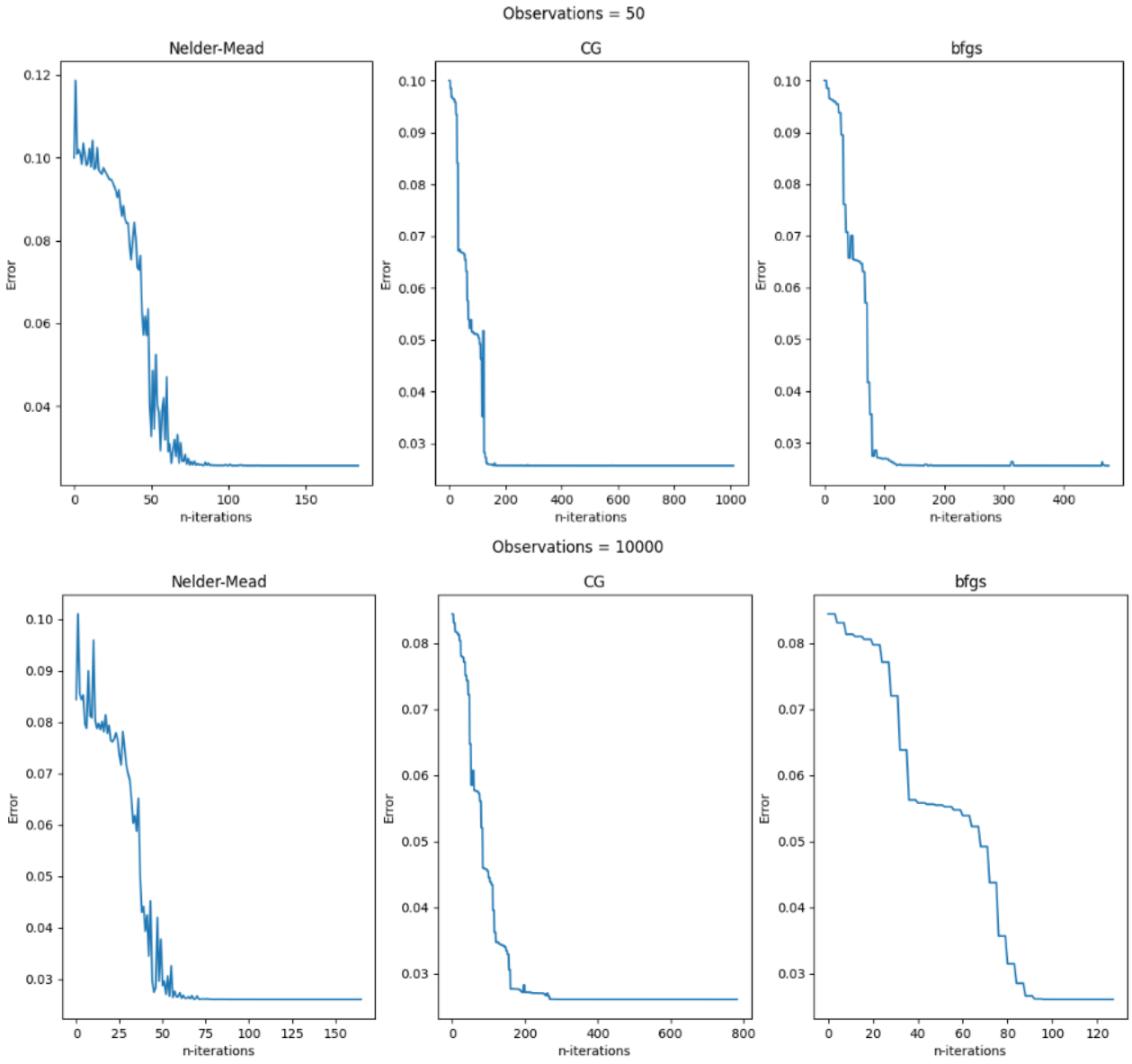
a) MSE


Observations = 50
Nelder-Mead
CG
bfgs
Error
n-iterations
Observations = 10000
Nelder-Mead
CG
bfgs
Error
n-iterations

b) RMSE


Observations = 50
Nelder-Mead
CG
bfgs
Error
n-iterations
Observations = 10000
Nelder-Mead
CG
bfgs
Error
n-iterations

c) MAPE



4. Conclusion.

- From the graphs above we can clearly see that the sample size usually doesn't affect the number of needed iterations for finding optimal coefficients for the 'bfgs' minimization algorithm. There is only one place where it does on the non-linear data trying to minimize MAPE. 'Nelder-Mead' is not particularly susceptible to the sample size and 'CG' sometimes is, but only on the non-linear data.
- As for minimization methods, the 'Nelder-Mead' is basically the best in most cases, because it has a pretty good error graph, but sometimes 'bfgs' and 'cg' beat it on linear data, minimizing MSE and RMSE and on the non-linear data 'bfgs' surpass it on the same metrics by the count of iterations.

-As for metrics, RMSE and MSE perform a little better than MAPE on the linear data, but there is no significant difference between them all on the non-linear data.