

# TP 5

## Optimization/Non linearities

As an introduction to optimization issues run the Matlab demo file “Minimization of the banana function” (Optimization Toolbox).

### Fitting a Normal Law

1. Simulate 3 samples of 1000 observations from the normal distribution, keeping the mean constant but with different standard deviations (half the mean, same as the mean, twice the mean). Hint: use *normrnd*.
2. Create programs or an Excel sheet to estimate the parameters of a normal law by maximum likelihood :
  - Matlab (Optimization Toolbox): Write a function which takes as arguments a vector containing the parameters of the normal law and a vector of observations, and which returns the opposite of the log-likelihood for the normal law. Then, depending on your Matlab version, use the *fminsearch* or *fmins* function.
  - Excel: Use the solver.
3. Run your programs on the three samples. Experiment with different initial values and different optimization algorithms (Matlab users).
4. Taking your pencil, derive the estimators of the true values of the parameters from the optimization program. Compare these direct estimators with your previous findings.
5. Compare your results with those provided by the Matlab function *mle* or *normfit*.

### Estimation of a non linear conditional mean

The Excel and the .mat files provided contain the same two sets of data. Using a kernel method, estimate the conditional means  $E[Y_{i,t}|X_{i,t}]$ ,  $i = 1, 2$ . Compare your results with the true generating process indicated in the solution.