Numerical Methods- Homework 3

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1 A truncated observation of wages

1. Model setting $w = \beta t + \epsilon$, where ϵ $N(\mu_w, \sigma_w^2)$.
2. If the $w < r(t) = \gamma t + \epsilon$,the wage is not observable, which means that the wage for home production is zero.
3. The working age, t, is between 16 to 65.
4. The parameter value I use for (β, μ, w , σ_w , γ, ϕ) is (30, 0, 300, 20, 5).
5. The sample size is 200 for true parameter value, and then I used 20,000 times simulation to estimate the parameters.

Table1: If the guess values are close to the true values

Variable	True value	Guess	SMM	SMM without truncation
β	30	25	30.2438	27.6418
μ_w	0	1	0.9845	161.6658
σ_w	300	250	287.4248	347.9201
γ	20	15	20.1523	-27.8950
ϕ	5	3	2.0045	-480.0015

Table2 : If the guess values are far away from the true values

Variable	True value	Guess	SMM	SMM without truncation
β	30	20	29.6487	27.5495
μ_w	0	5	52.8550	164.9050
σ_w	300	100	-384.6743	-819.1266
γ	20	10	9.3055	-449.8016
ϕ	5	1	0.6518	16.5086

From the above tables, it seems that SMM can recover the true value well, but it is not stable. If the guess values are far away from the true values like the numbers in Table 2, the SMM estimates for σ_w, μ_w, and ϕ are also far away from their true values.

In addition, if we estimate the parameters without selection/truncation, the only estimate close to true value is β.

2 A model of finding and separation

Now, the same workers face labor search friction. They can find a job every week with probability $f(t) = \phi t + \lambda$.

In order to put search friction into the code, I assume that agent finds her job at her 31 and retire at her 40, which means $t \in [31, 40]$. In other words, the match will automatically terminate after 10 periods.

First, I construct 200 samples. One the agent's productivity is lower than lower bound of productivity , labeled as $\underline{z}$, she would get fired and will never get hired again.

However, in the following table, we can see the increase of times of simulations do not help the preciseness in this case.

Variable	True value	SMM with 20,000 simulations	SMM with 200,000 simulations
μ_w	10	8.6295	8.5884
σ_w	5	4.2067	4.2336
$\underline{z}$	50	46.6309	46.7344

Table3: With search frictions