this time: MCMC

next time: bootstrap

read: JS ch. 17 proper analysis of NB10

AMS 132

9 Mar 17

(1)

$(\mu\sigma^2\gamma|B) \sim p(\mu,\sigma^2,\gamma|B)$

$(Y_i|\mu\sigma^2\gamma B) \overset{IID}{\sim} t_\gamma(\mu,\sigma^2)$

$(i=1,\dots,n)$

$\underset{\sim}{Y} = (y_1,\dots,y_n)$

Q: $p(\mu\sigma^2\gamma|B) = ?$

A: no conjugate prior exists when γ is unknown

$\underset{\sim}{\theta} = (\mu,\sigma^2,\gamma)$

$(p=3)$

joint posterior

want $p(\mu\sigma^2\gamma|\underset{\sim}{y}B) = ?$ and

marginal post. for μ

also want $p(\mu|\underset{\sim}{y}B) = \iint p(\mu\sigma^2\gamma|B)\,d\sigma^2 d\gamma$

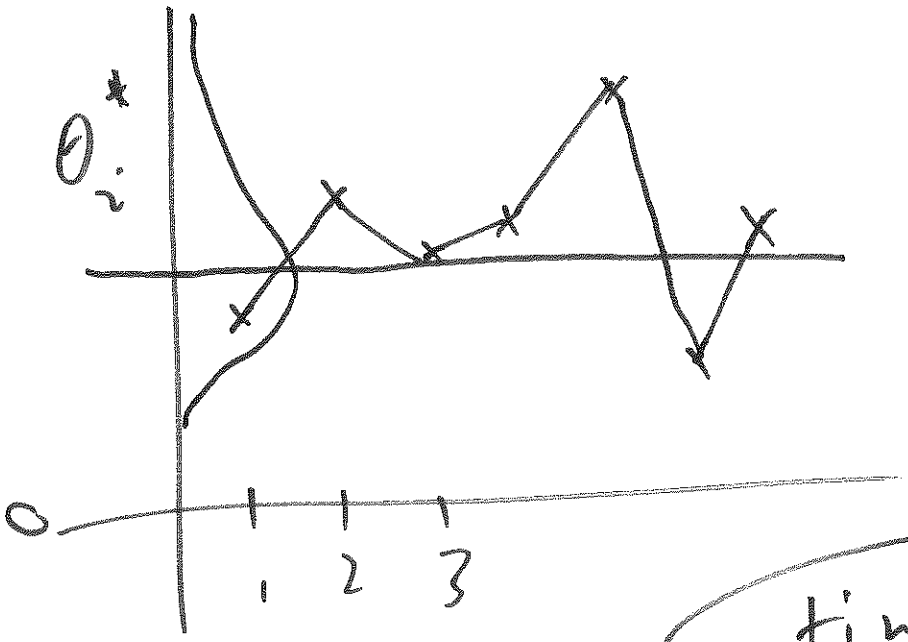
& $p(\sigma^2|\underset{\sim}{y}B)$ & $p(\gamma|\underset{\sim}{y}B)$ each of these requires a $(p-1)$-dimensional integration

iteration #	μ	σ^2	γ	y_{n+1}
0				

starting values

initializing the Markov chain

MCMC data set



(white noise)

IID sampling

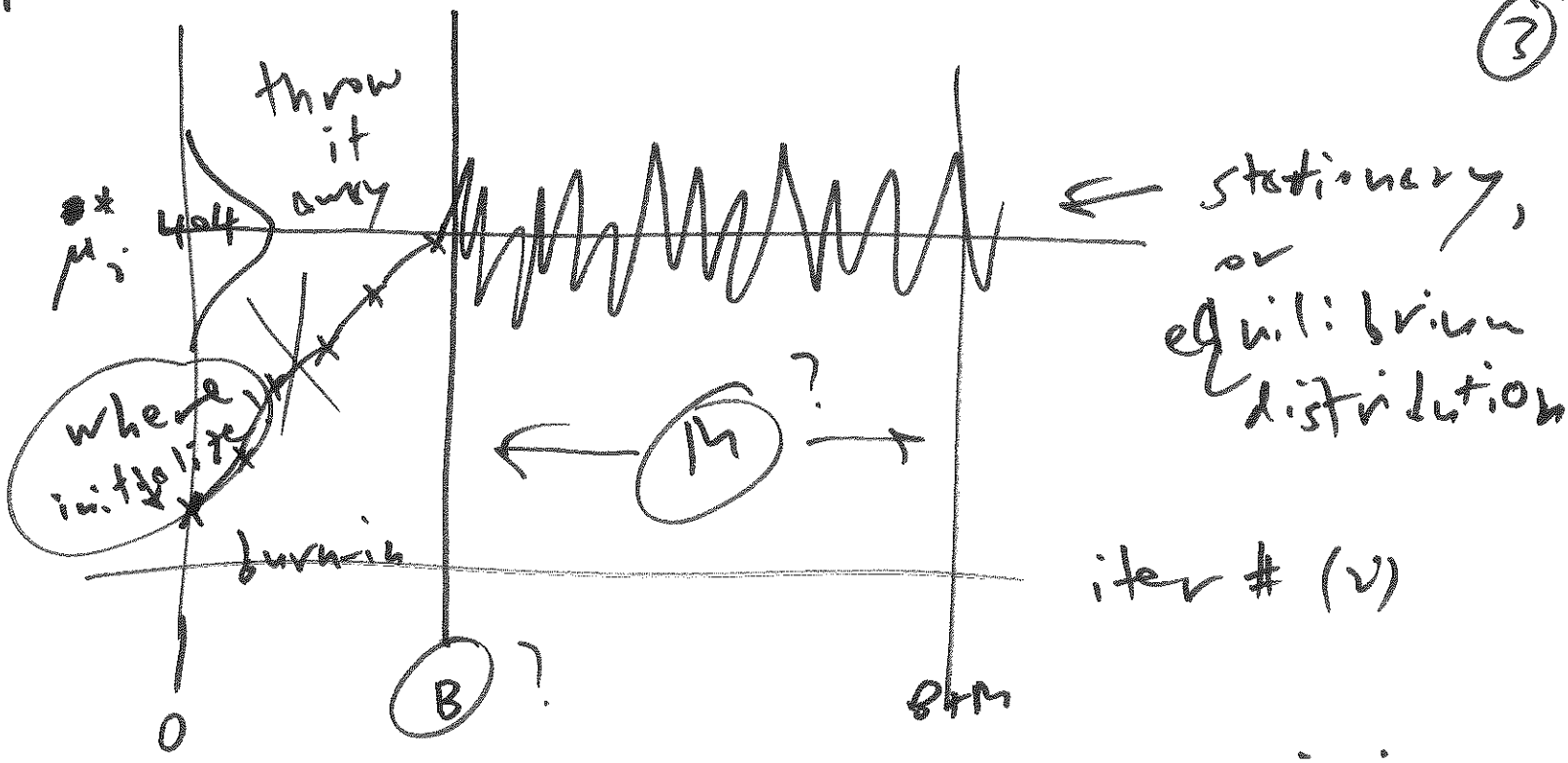
time series plot

1st order Markov chain: to know where to go next, I only need to know where I am now

	μ	σ^2	r	y_{n+1}	$\sqrt{\sigma^2}$
init → 0					
1					
⋮					
1,000 → B					
B+1					
⋮					
M = 100,000					
B+M					

MCMC data set

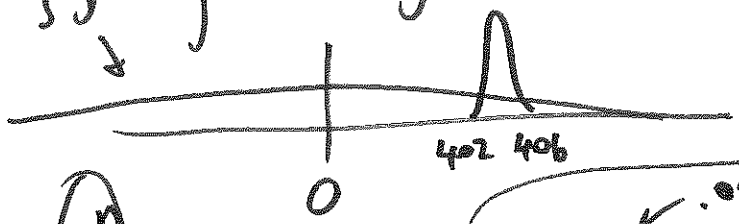
Some Markov chains are <u>nice</u>: they have predictable limiting behavior



1000 huge ⟺ huge variance ⟷ tiny precision

SD huge ⟺ huge variance ⟷ tiny precision

$p(\mu \mid \mathcal{B})$



$1 \cdot 10^{-6}$

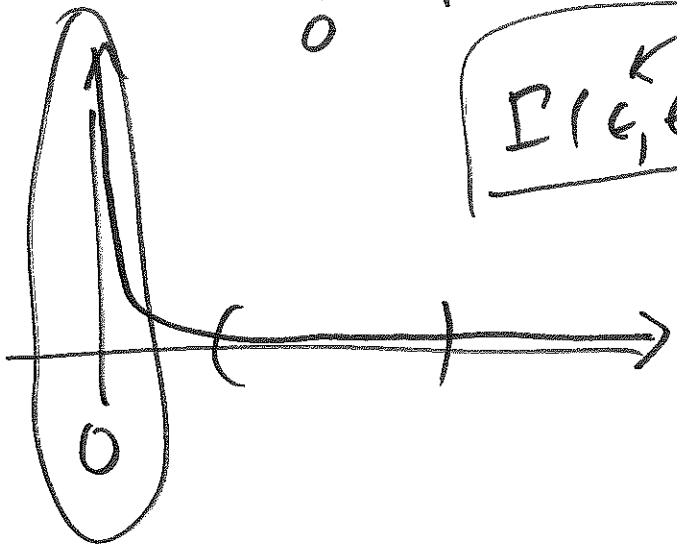
⇕

variance

$1 \cdot 10^{6}$ ⇕

SD 1000

$\boxed{\Gamma(\epsilon, \epsilon)}$ ← .001



$p(\tau \mid \mathcal{B})$