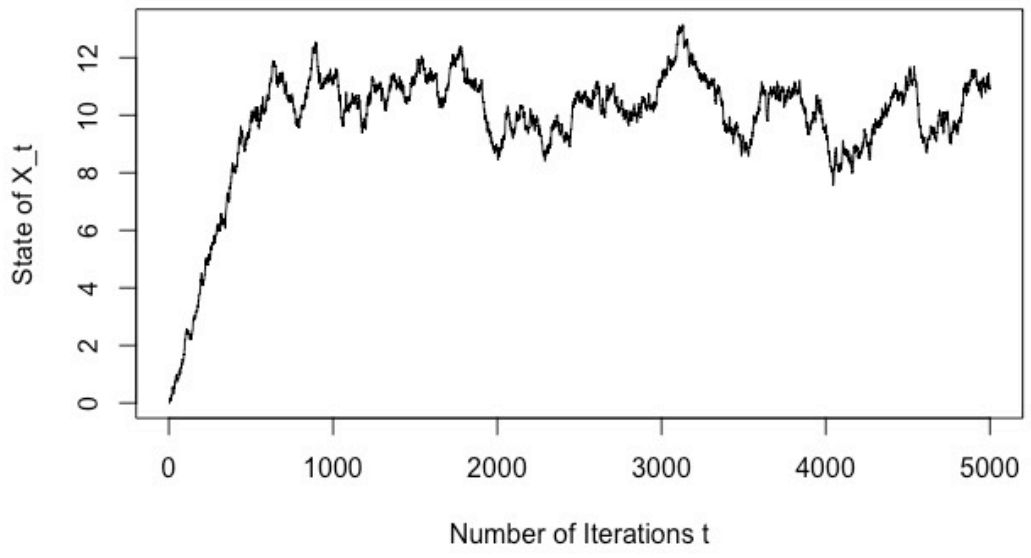
Joseph High
9E1FDC

# 550.633 Homework #11 R Code and Plot

## Problem 6.2

```
> set.seed(2)
> N = 5000;
> mu = 10;
> sigma = 0.1;
>
> X = matrix(NA, N, 1);  #storage for the X_t for all 5000
iterations
> X[1] = 0;              #Initial value
> for(i in 1:N) {
+   z <- rnorm(1, mean = 0, sd = sigma)
+   Y <- X[i] + z
+   u <- runif(1)
+   f.y <-dnorm(Y, mean = mu, sd = 1)
+   f.x <-dnorm(X[i], mean = mu, sd = 1)
+   alpha = min(f.y/f.x, 1)
+   if(u <= alpha) {
+     X[i+1] = Y
+   }
+   else{
+     X[i+1] = X[i]
+   }
+ }
> plot(1:N, X[1:N], type ="l", xlab = "Number of Iterations
t", ylab = "State of X_t")
> abline(v = 1000, col = "red", lty = "dashed")
```



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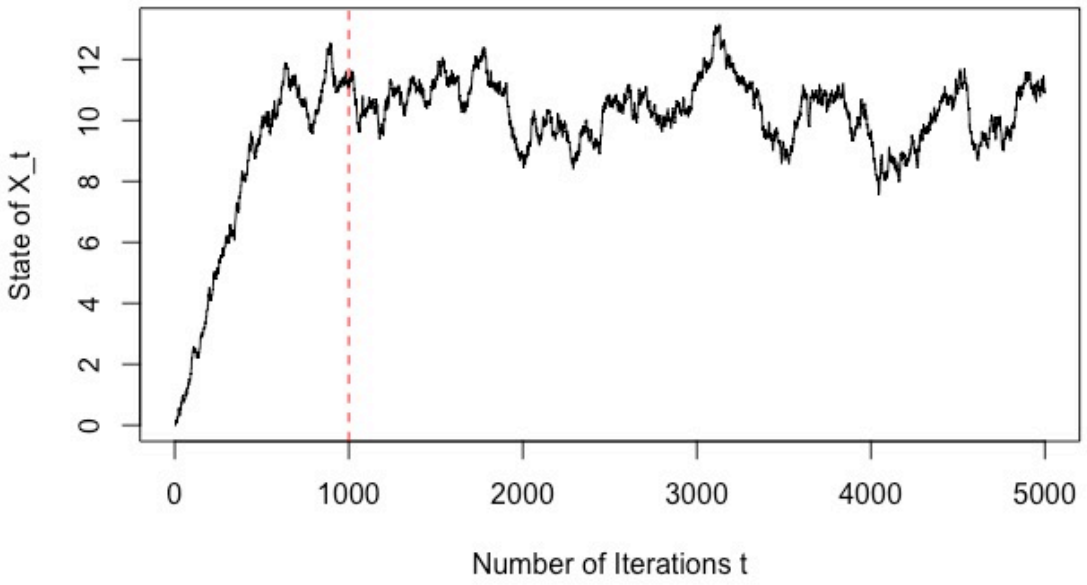


At approximately 1000 iterations, the process appears to reach stationarity (just as the solutions manual for the textbook suggests). Observe that for all t < 1000 (roughly), there is noticeable correlation amongst the X_t. Indeed, for any t<1000, when X_t increases, X_{t+1} tends to increase as well. Similarly, for t < 1000, when X_t decreases, X_{t+1} tends to decrease as well. However, for t > 1000 (roughly), the X_t become less and less correlated. That is, there is more randomness in the state of X_t for each t > 1000 (roughly).