Finding the Ratio estimate of the population total

Here is some R code that finds the point and the 95% interval estimates for ratio estimator of the population total. Given a sample, the next bit of code uses the labels of a sample from the population to compute the ratio estimate of the population total and its absolute error. It also finds the usual 95% confidence interval, and returns its lower bound, length and checks to see if the interval contains the true population total.

First we write the code for the function that will calculate the estimates.

```
> ratiotot<-function(smp,popy,popx)
+ {
+         n <- length(smp)
+         N<-length(popx)
+         ff<-n/N
+         ysamp<-popy[smp]
+         xsamp<-popx[smp]
+         tx<-sum(popx)
+         trtot<-sum(popy)
+         rhat <- sum(ysamp)/sum(xsamp)
+         esttot <- rhat * tx
+         err<-abs(esttot - trtot)
+         dum1<-(N*N*(1-ff))/(n*(n-1))
+         vartot <- dum1*sum((ysamp-rhat*xsamp)^2)
+         dum<-1.96*sqrt(vartot)
+         lwbd<-esttot - dum
+         upbd<-esttot + dum
+         if(lwbd <= trtot & trtot <= upbd) { cov<-1}
+         else {cov<-0}
+         ans<-c(esttot,err,lwbd,upbd - lwbd,cov)
+         return(ans)
+ }
```

Next we generate a set x values and y values for the population. The command set.seed lets you set the seed of the random number generator in R so that you can generate the same population again. Then we take a simple random sample and compute the estimates.

```
> set.seed(1999)
> popx<-rgamma(500,5) + 50
> popy<-rnorm(500,2*popx,24)
> cor(popx,popy)

[1] 0.2679044

> smp<-sample(1:500,25,prob=popx)
> ratiotot(smp,popy,popx)

[1] 58211.079  2304.836 53636.731  9148.695     1.000
```