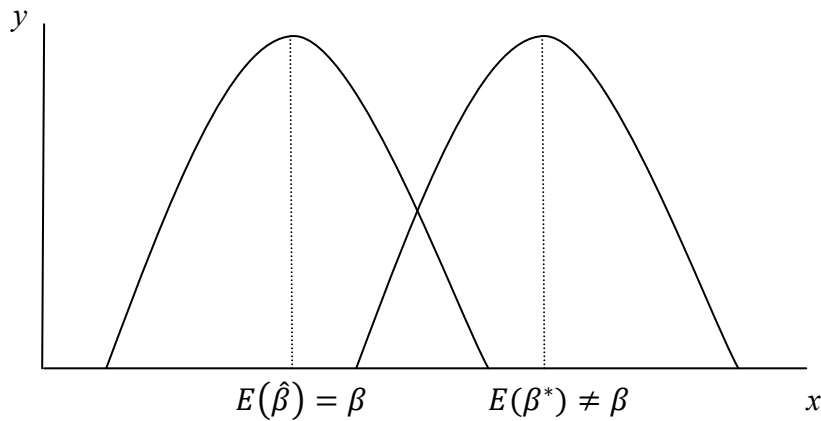


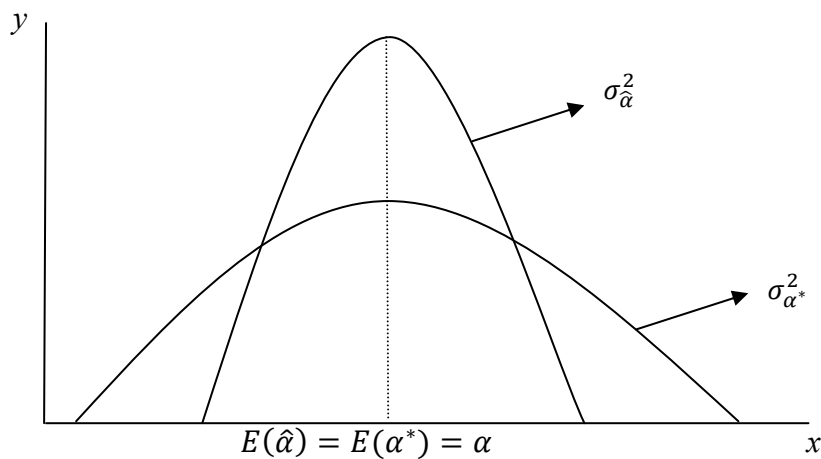
**Practice 4 – Introduction to Econometrics (deadline: before next tutorial)**

1) Suppose that  $\hat{\beta}$  and  $\beta^*$  are estimators of the population parameter  $\beta$ . Explain, with your own words, what you understand by this graphic. Be as explicit and comprehensive as possible and watch carefully.



$\hat{\beta}$  and  $\beta^*$  are two estimators of the same population parameter  $\beta$ . Since they are estimators they are also random variables, so each has its own distribution function. However, there is a significant difference between the two. While the former is an unbiased estimator of  $\beta$ , the latter is not. In other words, for the former we have that, **on average**, we will get the real/population value (that is,  $\beta$ ), whereas for the latter we will not get (on average) the real/population value. Remember that the real/population value is an unknown to be estimated.

2) Suppose now that  $\hat{\alpha}$  and  $\alpha^*$  are estimators of the population parameter  $\alpha$ . What do you have to say about this new graphic? Please be clear and exhaustive.



Here we are faced with a different issue, that of efficiency. Notice that we have two different estimators of  $A$  and both are now unbiased (a feature that is of most importance for estimators). However,  $\hat{A}$  is more efficient since its variance/standard error is smaller than that of  $A^*$ . In other words, according to the graphic above, the frequencies for the distribution function of  $\hat{A}$  are more concentrated around its mean than for the case of  $A^*$ . Therefore, even though the two estimators are ok, in the sense that in being unbiased they will provide (on average) with the real/population value of the parameter  $A$ , we should stick with  $\hat{A}$  since it has a smaller variance/standard error. This means that its variability, from sample to sample, is lower; or in words, that its accuracy is higher.