SIMPLE OLS REGRESSION, PART II: GOODNESS OF FIT

Richard Lee Rogers

Last Update: February 14, 2016

Example

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Poverty Rate[b]	.	Enter

a. Dependent Variable: Log of Violent Crime Rate

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

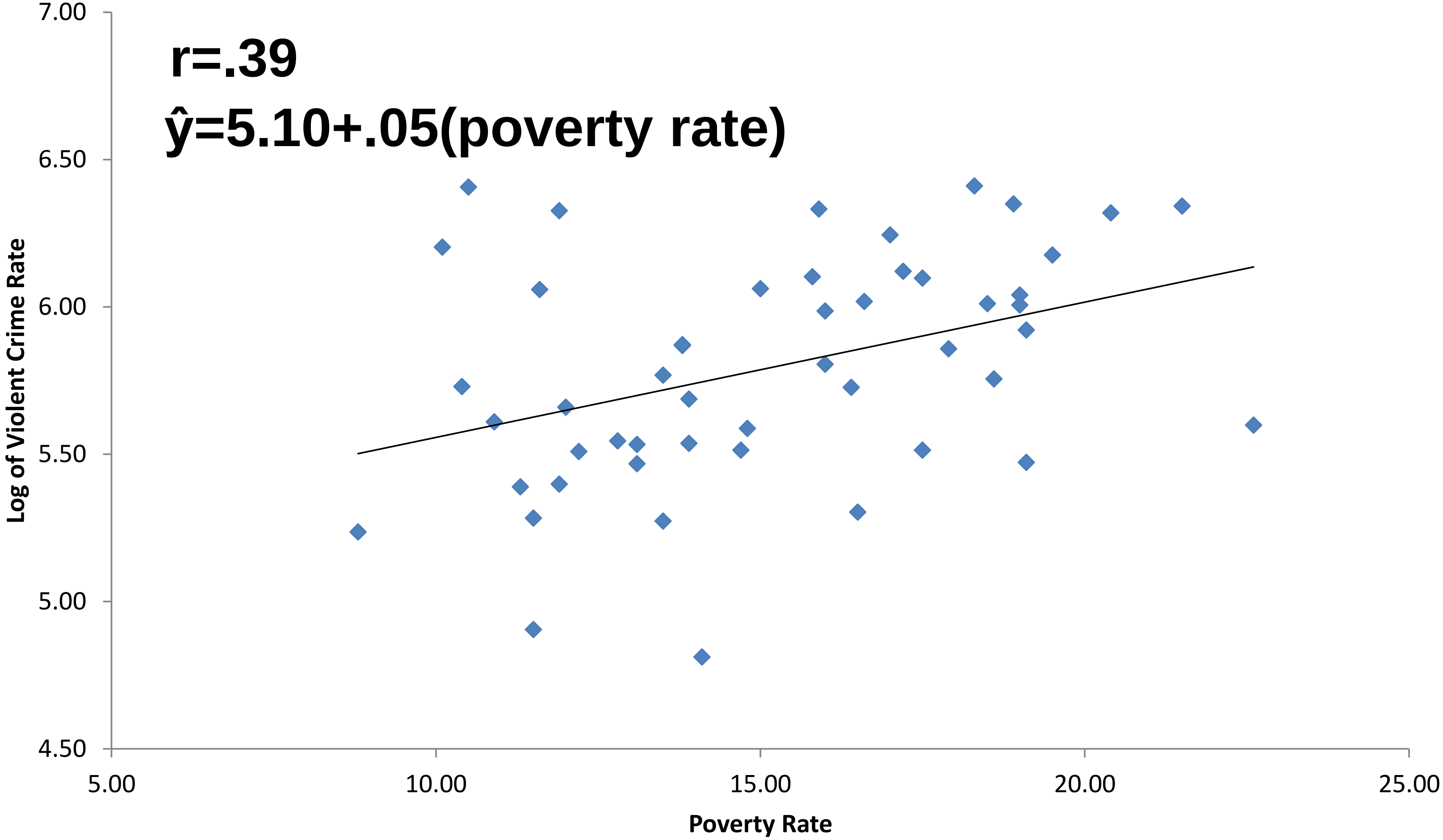
a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.097	.243		20.981	.000
	Poverty Rate	.046	.016	.391	2.939	.005

Scatterplot of the Relationship



Model Summary and ANOVA Tables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

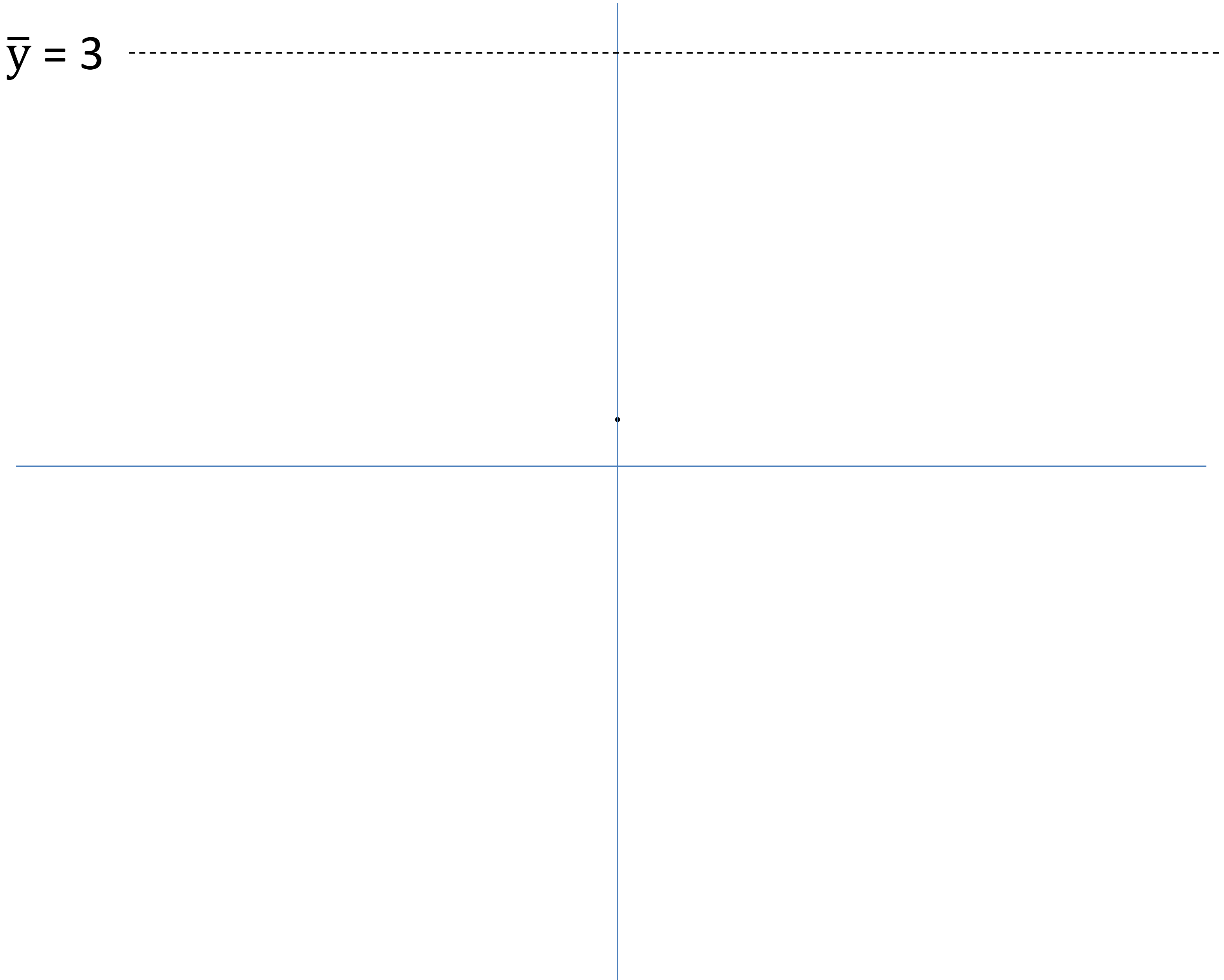
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

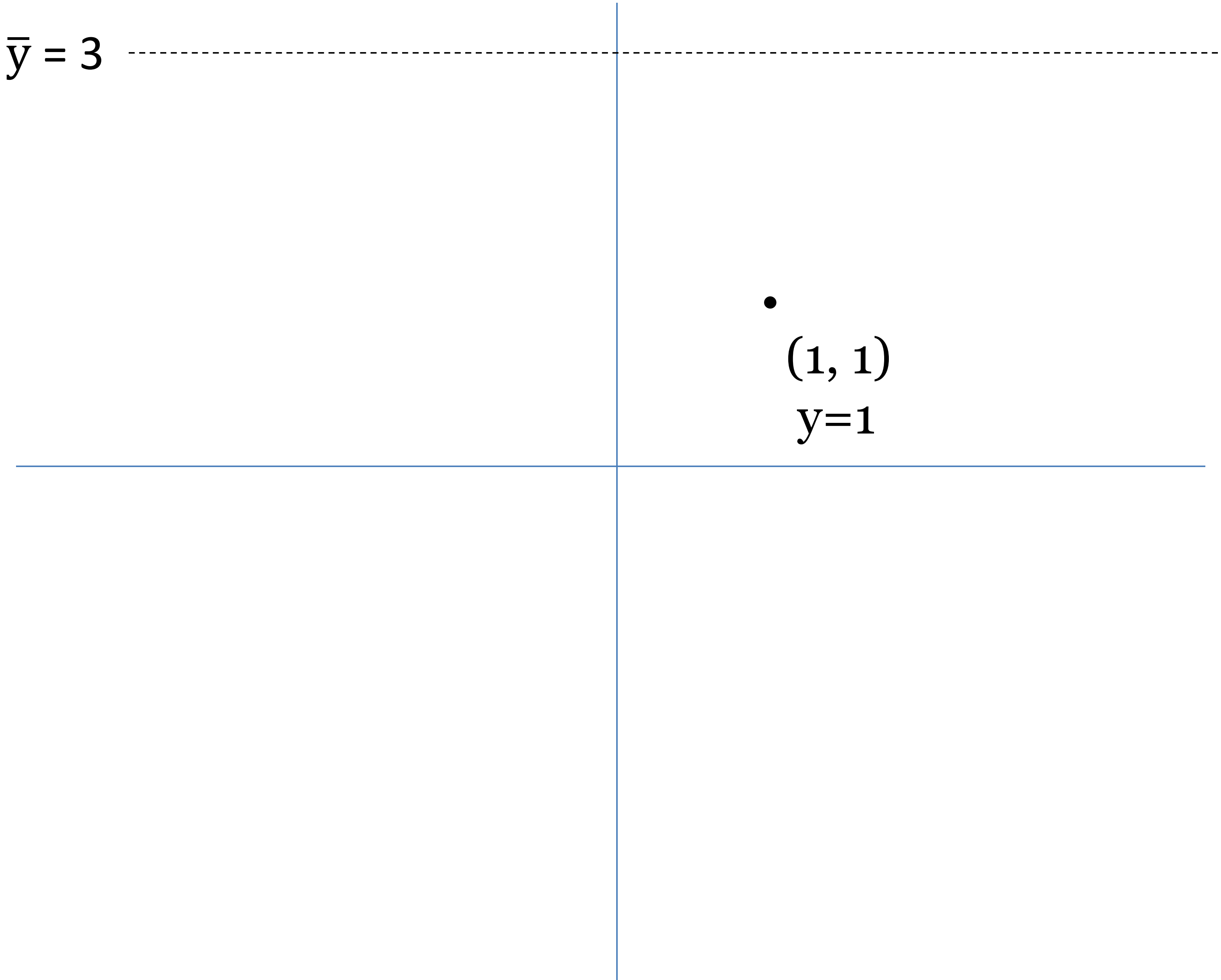
a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

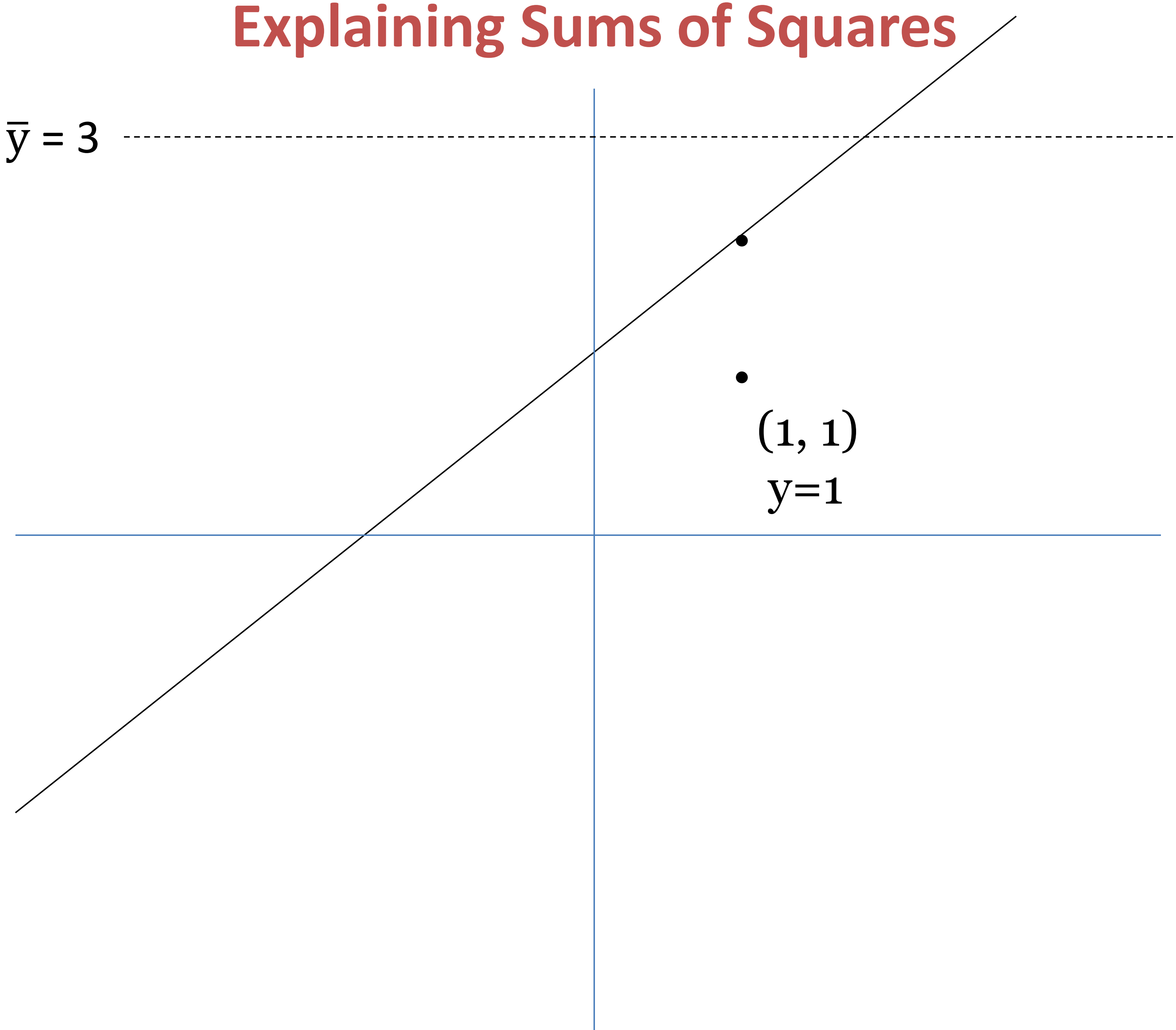
Explaining Sums of Squares



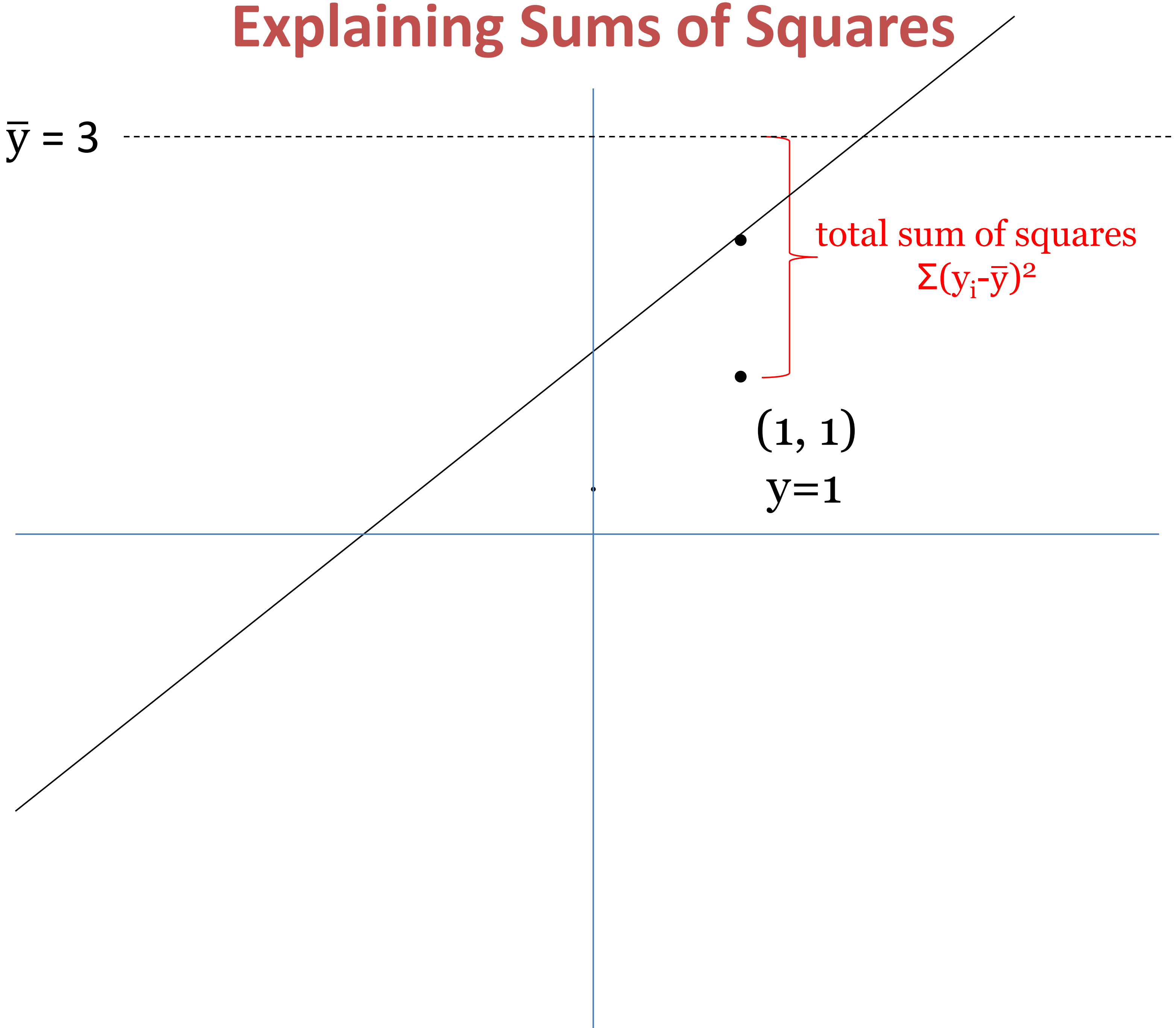
Explaining Sums of Squares



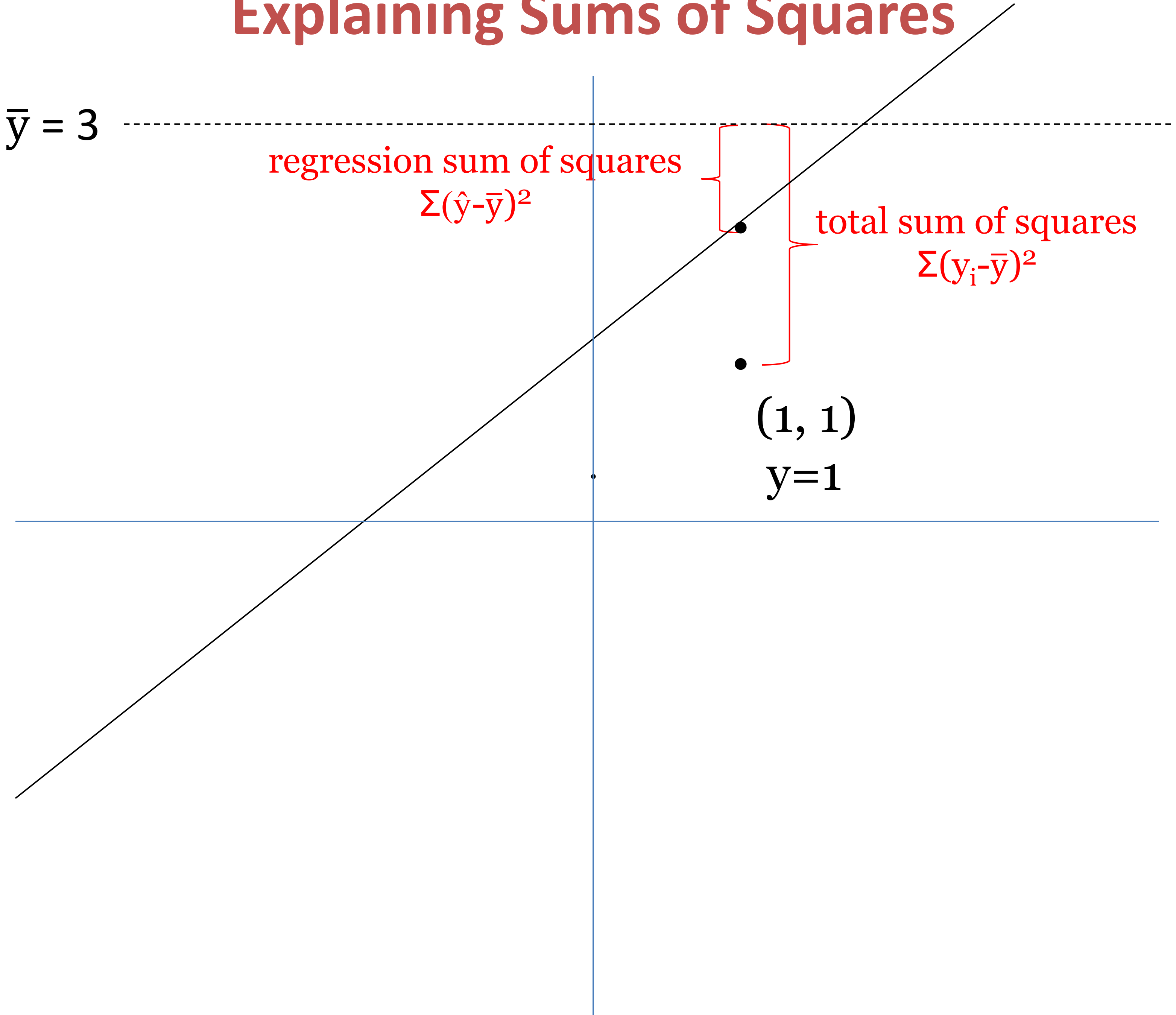
Explaining Sums of Squares



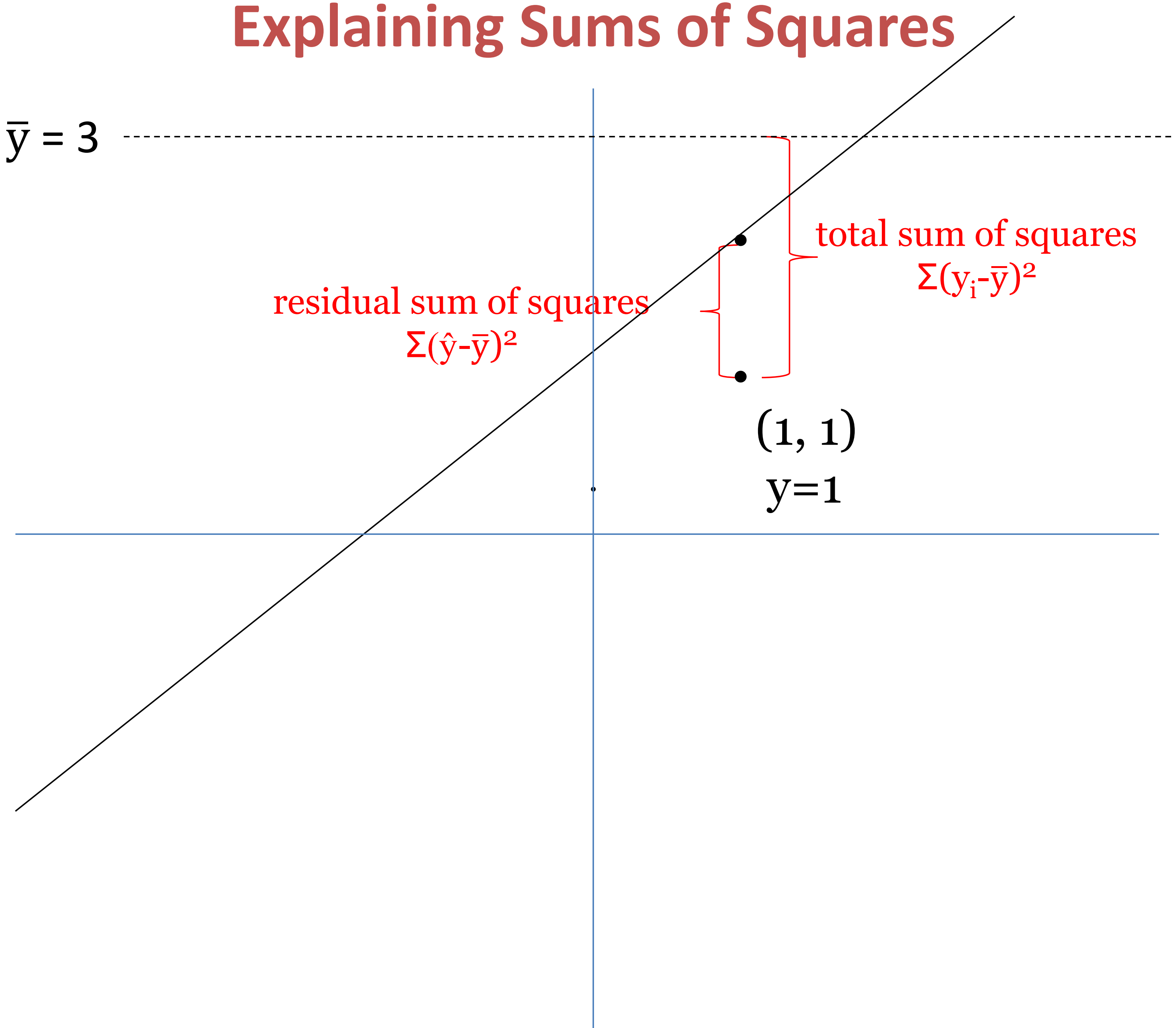
Explaining Sums of Squares



Explaining Sums of Squares



Explaining Sums of Squares



Sum of Squares

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

R^2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

$$R^2 = \frac{\text{regression ss}}{\text{total ss}}$$

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

R

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Adjusted R^2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

$$\text{Adj. } R^2 = 1 - (1 - R2)\frac{n-1}{n-p-1} = R^2 - (1-R^2)\frac{p}{n-p-1}$$

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Statistical Significance of the Model

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Degrees of Freedom

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Degrees of Freedom

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

Mean Square (Mean Square Error)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

F

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.152	.135	.36130

a. Predictors: (Constant), Poverty Rate

$$F = \frac{\text{Regression Mean Square}}{\text{Residual Mean Square}}$$

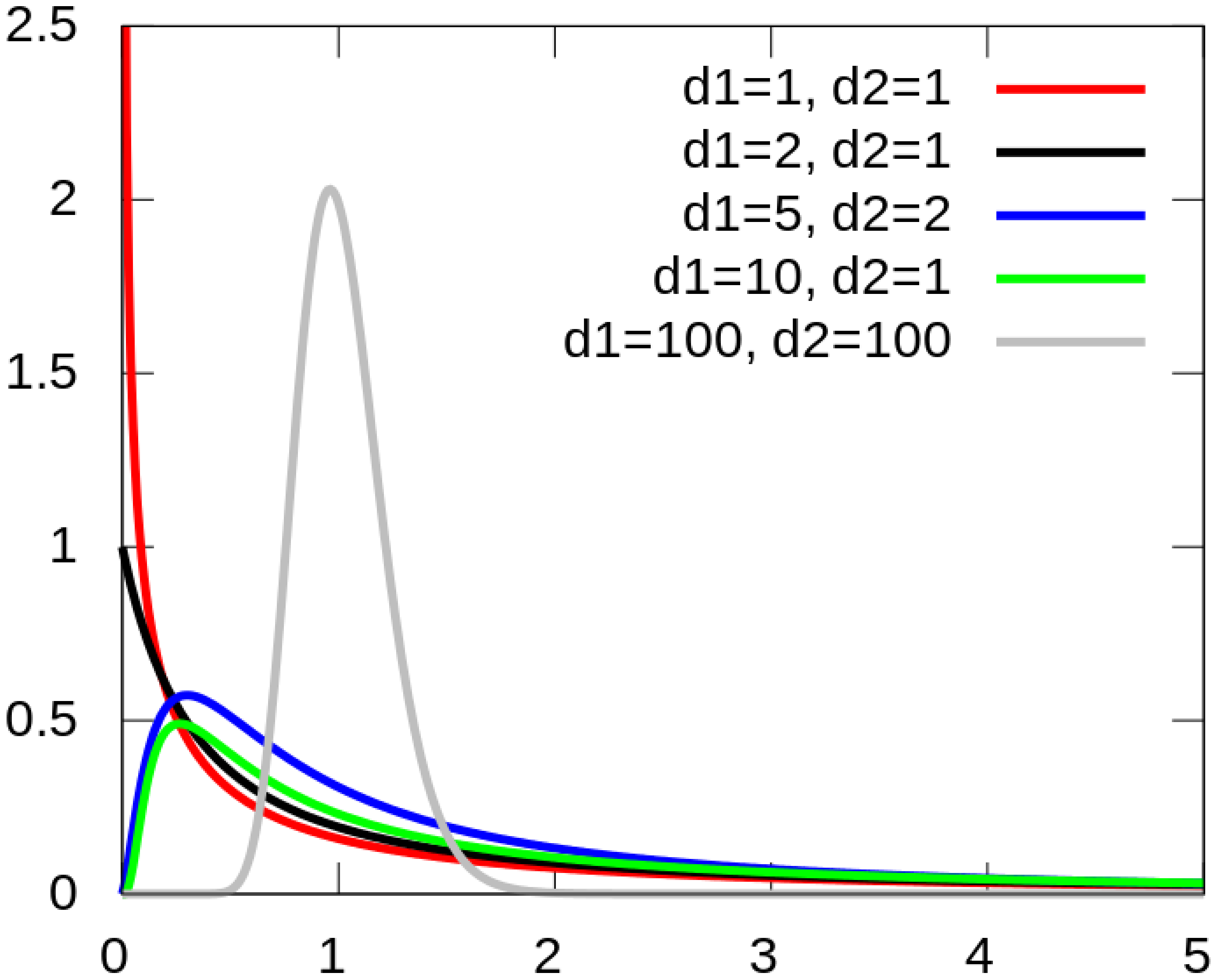
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.127	1	1.127	8.637	.005[b]
	Residual	6.266	48	.131		
	Total	7.393	49			

a. Dependent Variable: Log of Violent Crime Rate

b. Predictors: (Constant), Poverty Rate

F-Distribution



Simple OLS Regression

- Simple OLS regression is used when both dependent and independent variables are numeric.

- From beta and the standardized beta, we learn direction and magnitude. The beta coefficients can be tested for their statistical significance.

- We can use the sum of squares to estimate the fit of the model (R^2). The fit of the model also has statistical significance.

Simple OLS Regression

- Simple OLS regression is used when both dependent and independent variables are numeric.

- From beta and the standardized beta, we learn direction and magnitude. The beta coefficients can be tested for their statistical significance.

- We can use the sum of squares to estimate the fit of the model (R^2). The fit of the model also has statistical significance.