

HIGHER ORDER MODELS.

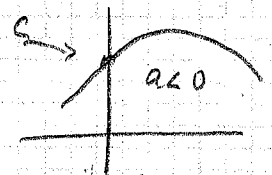
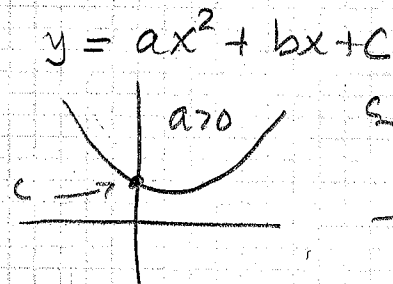
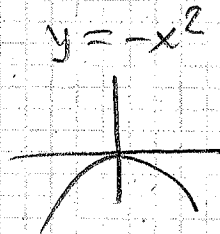
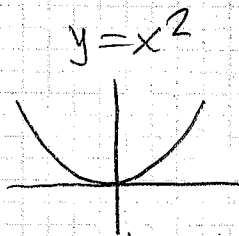
X	Y
128	62
134	86
148	127
159	150
170	170
185	185
201	184
224	160
239	150
252	130

$$y = \beta_0 + \beta_1 x + \epsilon \quad \text{Linear}$$

$$y = \beta_0 + \beta_1 x + \beta_2 x^2 + \epsilon \quad \text{Quadratic}$$

x	x ²	y
⋮	⋮	⋮

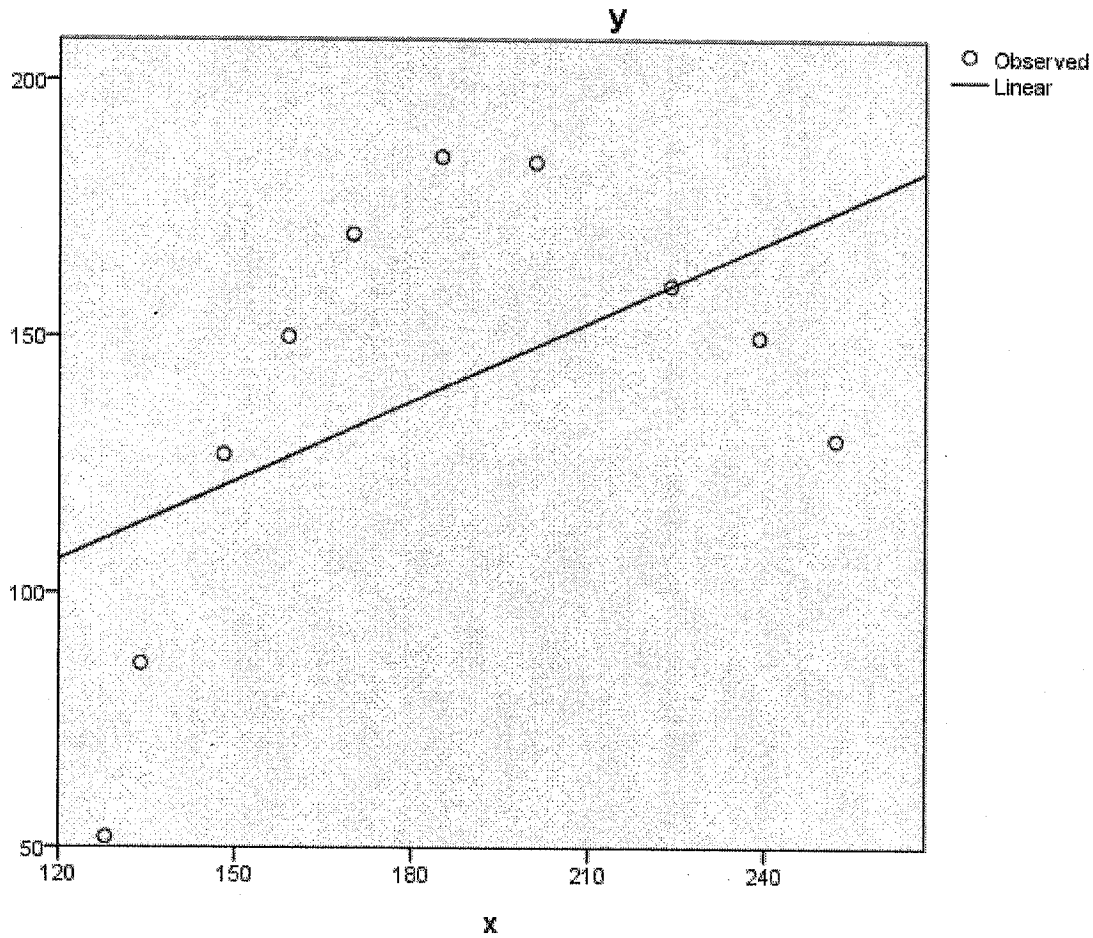
$$\hat{y} = -778.447 + 9.659 x_1 - .024 x_2$$



A complete second order model in two independent variables

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 \cdot X_2 + \beta_4 X_1^2 + \beta_5 X_2^2 + \epsilon$$

This is the scatter plot we got using "Curve Estimation" with a "Linear" model



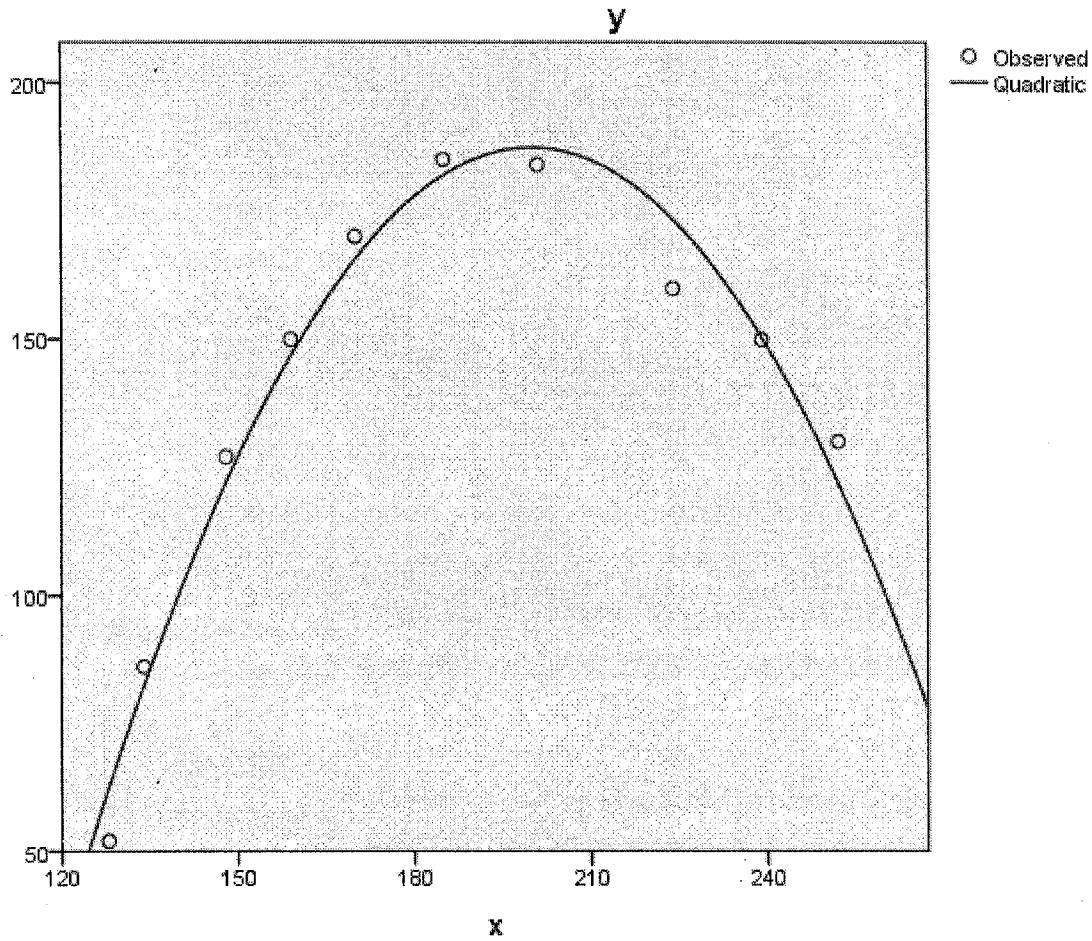
Model Summary and Parameter Estimates

Dependent Variable: y

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.279	3.093	1	8	.117	44.814	.514

The independent variable is x.

This is the scatter plot we got using "Curve Estimation" with a "Quadratic" model



Model Summary and Parameter Estimates

Dependent Variable: y

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Quadratic	.973	127.743	2	7	.000	-778.447	9.659	-.024

This is the model including X and XSQUARED as independent variables

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	xsquared, x ^b		Enter

a. Dependent Variable: y

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.987 ^a	.973	.966	7.901

a. Predictors: (Constant), xsquared, x

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15949.406	2	7974.703	127.743	.000 ^b
	Residual	436.994	7	62.428		
	Total	16386.400	9			

a. Dependent Variable: y

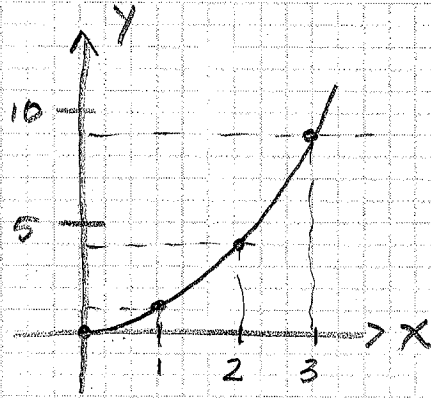
b. Predictors: (Constant), xsquared, x

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-778.447	62.020		-12.552	.000
	x	9.659	.680	9.923	14.205	.000
	xsquared	-.024	.002	-9.432	-13.502	.000

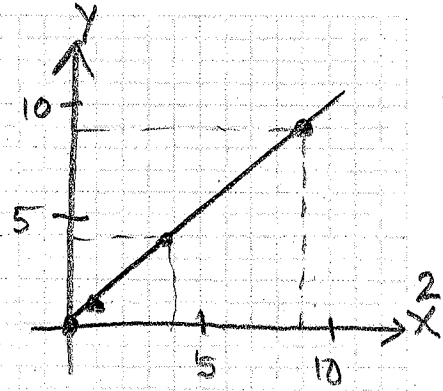
a. Dependent Variable: y

X	Y
0	0
1	1
2	4
3	9



$$y = x^2 + \epsilon$$

X ²	Y
0	0
1	1
4	4
9	9



$$y = \beta_0 + \beta_1 X^2 + \epsilon$$

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

$$y = \beta_0 + \beta_1 X + \beta_2 X^2 + \epsilon$$