Simon Chen

HUDM5126

3/8/2022

1. Y = SAT verbal X_1 = TeacherPay X_2 = Percent taking

a) $Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{1i}^2 + \beta_4 X_{2i}^2 + \beta_5 X_{1i} \cdot X_{2i} + \varepsilon_i$

α = the average value of SAT verbal at the average value of X_1 and X_2.

β_1 = the effect of a 1-unit increase in X_1 on Y in the neighbourhood of $\bar{X}_1$ and $\bar{X}_2$.

β_2 the effect of a 1-unit increase in X_2 on Y in the neighbourhood of $\bar{X}_1$ and $\bar{X}_2$

β_3 the effect of a 1-unit increase in X_1 on Y in the linear relationship between X_1 & Y

β_4 = the effect of a 1-unit increase in X_2 on Y in the linear relationship between X_1 & Y.

β_5 = for a fixed value of X_1, β_5 is the effect of 1-unit increase in X_2 or slope of the relationship between X_1 & Y.

b)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	555.737	14.435		38.498	<.001
	in thousands of dollars	.535	.453	.099	1.182	.243
	percentTaking	-1.212	.107	-.944	-11.311	<.001
2	(Constant)	510.103	63.533		8.029	<.001
	in thousands of dollars	4.187	3.735	.772	1.121	.268
	percentTaking	-3.356	.543	-2.613	-6.178	<.001
	percentTaking_2	.030	.005	1.835	6.681	<.001
	TeacherPay_2	-.046	.055	-.648	-.847	.401
	TeacherPay_percentTaking	-.005	.017	-.154	-.272	.787

a. Dependent Variable: satVerbal

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.888[a]	.788	.779	15.858	.788	89.288	2	48	<.001
2	.953[b]	.909	.899	10.740	.121	19.885	3	45	<.001

a. Predictors: (Constant), percentTaking, in thousands of dollars

b. Predictors: (Constant), percentTaking, in thousands of dollars, percentTaking_2, TeacherPay_percentTaking, TeacherPay_2

Sig.F for percenttaking^2 < 0.01 → is significant. which means X^2 should be included in the model.

c) $Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{1i} \cdot X_{2i} + \varepsilon_i$

$= \alpha + \beta_1 \text{teacherPay} + \beta_2 \text{percenttaking} + \beta_3 \text{teacherPay} \cdot \text{percenttaking} + \varepsilon_i$

For a fixed value of teacherpay, β_3 is the effect of a 1-unit increase in percenttaking on the slope of the relationship between teacherpay & SAT verbal.

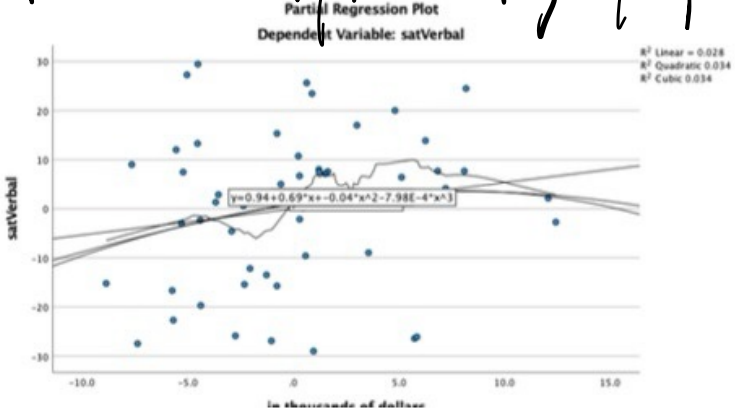
2. Y_i: SAT verbal X_1: TeacherPay X_2: Percenttaking

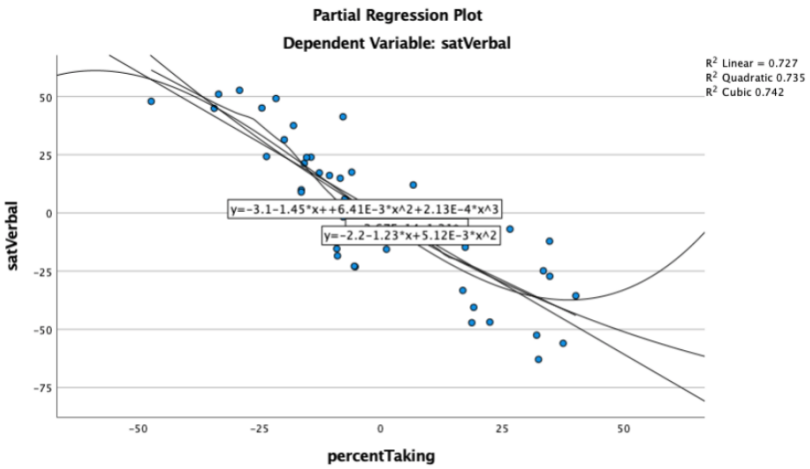
X_2 has a non-linear relationship with Y.

a) $Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i$

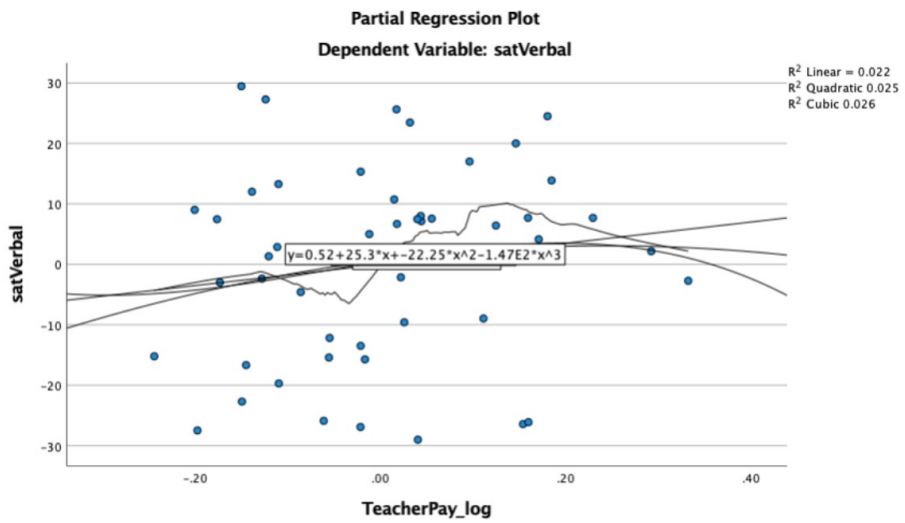
SAT verbal $= \alpha + \beta_1$ teacherPay $+ \beta_2$ percenttaking $+ \varepsilon_i$

b)

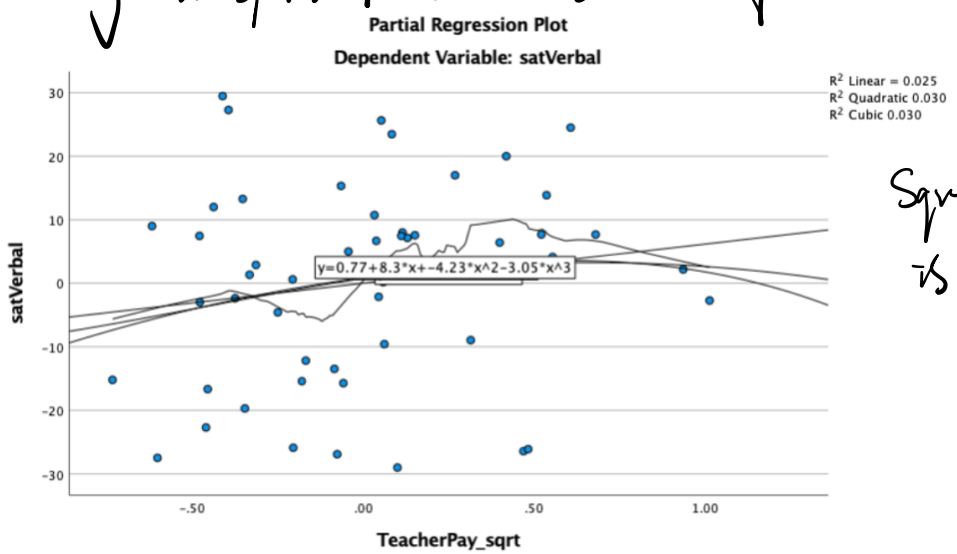




C.



log Transformation is not successful.



Sqrt Transformation is not successful.