

Statistics for Marketing MGT 6469

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SPSS Case #4 Hot Wheels

Question 1: Please conduct the following analyses, and describe in words what they mean for the toy store and Mattel's Hot Wheels® promotions:

1. Run a multiple regression equation to determine what variables have an impact on sales of Hot Wheels cars (use only the scale variables, that is, interval & ratio variables).
2. Next, add a dummy variable to the regression model to see whether having an end aisle display has an impact on Hot Wheels car sales.

Answer 1:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.478 ^a	.228	.224	3.40304

a. Predictors: (Constant), Price, Coupon

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1180.493	2	590.246	50.968	<.001 ^b
	Residual	3995.336	345	11.581		
	Total	5175.829	347			

a. Dependent Variable: Hot Wheels Sales

b. Predictors: (Constant), Price, Coupon

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.327	.600		20.538	<.001
	Coupon	1.650	.611	.132	2.703	.007
	Price	-1.659	.190	-.427	-8.720	<.001

a. Dependent Variable: Hot Wheels Sales

Answer 2: (Next page)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.514 ^a	.264	.258	3.32738

a. Predictors: (Constant), Display, Price, Coupon

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1367.253	3	455.751	41.165	<.001 ^b
	Residual	3808.576	344	11.071		
	Total	5175.829	347			

a. Dependent Variable: Hot Wheels Sales

b. Predictors: (Constant), Display, Price, Coupon

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.639	.610		19.071	<.001
	Price	-1.683	.186	-.433	-9.041	<.001
	Coupon	1.574	.597	.126	2.635	.009
	Display	1.468	.357	.190	4.107	<.001

a. Dependent Variable: Hot Wheels Sales

Yes, having an end aisle display does have an impact on sales of hot wheel cars as $t=4.107$ and $p < 0.001 < 0.05$.

Answer 3:

(1) Is the overall model of the relationship between the independent variable(s) and the dependent variable significant? How can you tell?

Yes, the overall model of the relationship between the independent variables (Price & Coupon) and the dependent variable (Sales) is significant as $F=50.968$ and $p < 0.01 < 0.05$

(2) What percentage of the variance in the dependent variable is explained by this regression? How do you know this?

The percentage of variance that is explained by this regression is **22.8%**, however, since R^2 increases even if we add predictors/independent variables which have no relation/do not affect the dependent variable whatsoever – it is not a reliable measure. However, **Adjusted R^2** accounts for that. Therefore, the true percentage of variance explained by this regression is **22.4%**.

(3) What is the relationship between each of the independent variables and the dependent variable? Is this relationship significant? How do you know this?

The relationship between the variables is as follows:

a. The relationship between coupons and sales of hot wheels cars is significant as per our overall model as $t=2.703$ and $p = 0.007 < 0.05$.

Upon running a separate regression test for this variable, we find:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.241 ^a	.058	.055	3.75396

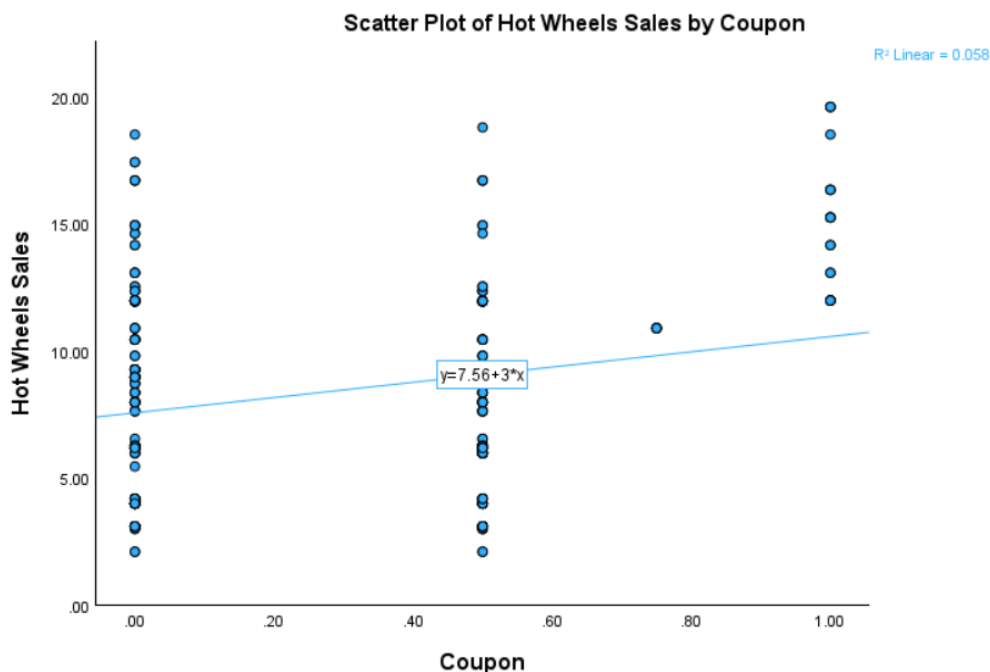
a. Predictors: (Constant), Coupon

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.564	.274		27.556	<.001
	Coupon	3.005	.651	.241	4.613	<.001

a. Dependent Variable: Hot Wheels Sales

Only 5.5% of the variation of hot wheels sales can be explained by coupons (as **Adjusted $R^2=0.055$**) and there is a significant relationship between coupons and sales of hot wheels for sure as **$t=4.613$** and **$p < 0.001 < 0.05$** .

There is a positive correlation between coupon and hot wheel sales. However, only 5.5% of variation in sales is explained by coupons so they have a very small effect.



(b) The relationship between price and sales of hot wheels is significant as per our overall model as **$t=-8.720$** and **$p < 0.001 < 0.05$** .

Upon running a separate regression test for this variable, we find:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.460 ^a	.212	.209	3.43392

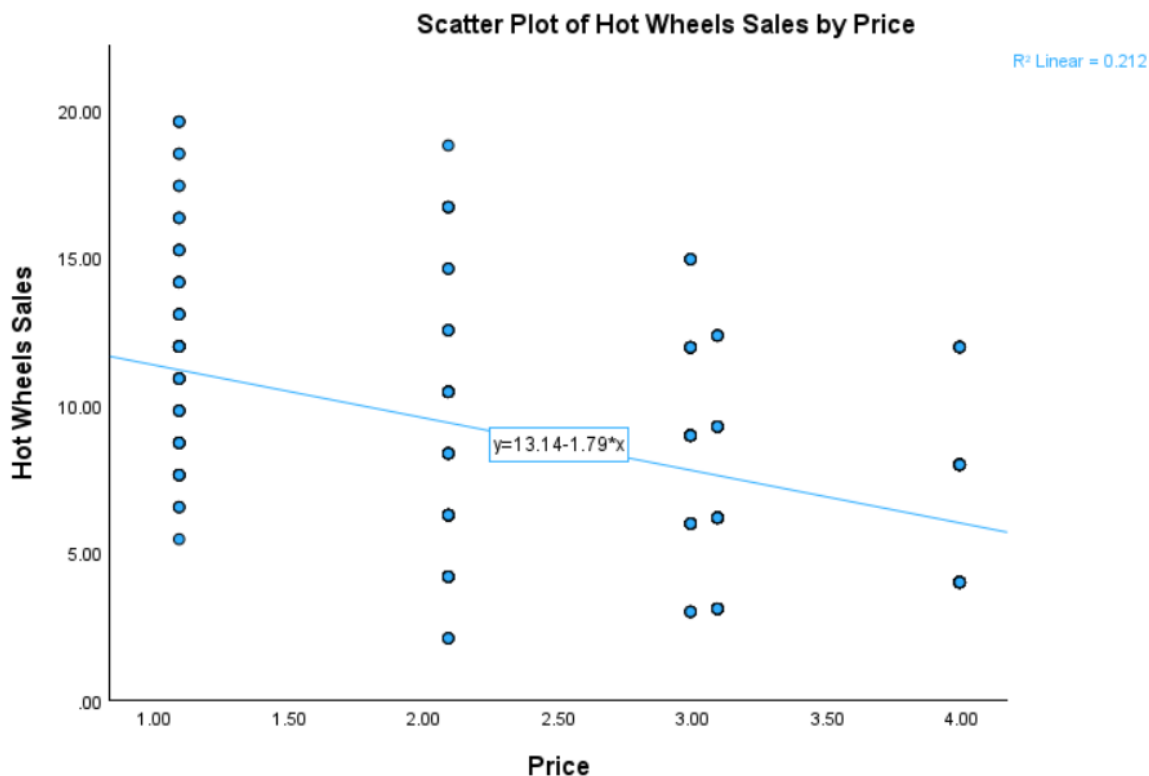
a. Predictors: (Constant), Price

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.145	.523		25.133	<.001
	Price	-1.790	.186	-.460	-9.640	<.001

a. Dependent Variable: Hot Wheels Sales

20.9% of the variation of hot wheels sales can be explained by change in price (as **Adjusted $R^2=0.209$**) and there is a significant relationship between price and sales of hot wheels for sure as **$t=-9.640$** and **$p < 0.001 < 0.05$** .

There is a negative correlation between price and sales. Decreasing the price increases the sales.



(4) Please write out the equation for the line (or multi-dimensional plane) produced by these two regression analyses to fit the data.

(i) First Model

We know, equation of regression:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$$

Our α or the intercept = **12.327**

β_1 (Coupon) = **1.650**

β_2 (Price) = **-1.659**

Plugging in the values, we get:

$$Y (\text{Sales}) = 12.327 + 1.650 X_1 - 1.659 X_2$$

(ii) Second Model

We know, equation of regression:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Our α or the intercept = **11.639**

β_1 (Coupon) = **1.574**

β_2 (Price) = **-1.683**

β_3 (Display) = **1.468**

Plugging in the values, we get:

$$Y (\text{Sales}) = 11.639 + 1.574 x_1 - 1.683 x_2 + 1.468 x_3$$

- (5) For the first multiple regression, if the price of a Hot Wheels car is 2 dollars and there is a 50 cent coupon, how much money will a customer spend on Hot Wheels cars?

Using the equation we obtained from Q4, we get:

$$Y (\text{Sales}) = 12.327 + 1.650 x_1 - 1.659 x_2$$

As per the question,

$$x_1 = 0.50$$

$$x_2 = 2$$

Plugging in the values, we get:

$$\begin{aligned} Y &= 12.327 + 1.650(0.50) - 1.659(2) \\ &= 12.327 + 0.825 - 3.318 \\ &= \mathbf{\$9.834} \end{aligned}$$

Therefore, under the said conditions, the customer will spend **\$9.834** on Hot Wheels cars.

- (6) For the dummy variable regression, what is the effect of having an end aisle display? (Extra credit: Is this model better or worse than the first model? How can you tell?)

(i) The effect of having an end aisle display is significant as it significantly impacts the sales of hot wheel cars as $t=4.107$ and $p < 0.001 < 0.05$.

Upon running its own model, we get:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.183 ^a	.033	.031	3.80245

a. Predictors: (Constant), Display

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	173.137	1	173.137	11.975	<.001 ^b
	Residual	5002.692	346	14.459		
	Total	5175.829	347			

a. Dependent Variable: Hot Wheels Sales

b. Predictors: (Constant), Display

From this we can confirm that there is a significant relationship between having an end aisle display on sales of hotwheels as $F=11.975$ and $p < 0.001 < 0.05$ however only **3.1%** of variation of sales can be explained as per this independent variable.

(ii) This model (the dummy variable regression model with 3 IVs) is **better** than the first model as more variation of sales of hot wheels cars can be explained. The first model only explains **22.4%** (Adjusted $R^2=0.224$) of the sales variation whilst the second model explains **25.8%** (Adjusted $R^2=0.258$).

(7) Finally, include managerial recommendations based on what these results mean for the store managers, for each regression model. Your managerial insights can be brief.

From our research we noticed that price explains the variation in sales of hot wheels the most **(20.9%)**, so the store manager must prioritise on finding an optimal price first. After that, he can focus on finding ways to distribute coupons more as they positively impact sales as well as an end aisle display, however, since these two don't explain much of the variation of the sales, they are not priority. He can also do additional research to find what the other factors affecting sales are.