The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: Satis

Number of Observations Read	100
Number of Observations Used	100

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	46.82587	46.82587	48.92	<.0001
Error	98	93.80173	0.95716		
Corrected Total	99	140.62760			

H₀: $\beta_1 = \beta_2 = \beta_3 = 0$;
H₁: not all $\beta_{j_s} = 0$

$F_{1,98}$=48.92

P-Value <0.0001. Reject is Null.

At least one independent variable helps to explain average satisfaction.

Root MSE	0.97835	**R-Square**	0.3330
Dependent Mean	6.91800	**Adj R-Sq**	0.3262
Coeff Var	14.14203		

H₀: $\beta_1 = 0$;
H₁: $\beta_1 \neq 0$

t_{96}=6.99
P-Value <.0001. Reject is Null.

Delivery Speed helps to explain average satisfaction.

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	3.27907	0.52938	6.19	<.0001
Del_Speed	1	0.93642	0.13388	6.99	<.0001

The **R^2** value of 0.3330 suggests that the regression model explains a moderate amount of the variability in the dependent variable.

The **Se** value of 0.13388 indicates a moderate level of accuracy in the predictions made by the model.

Research Objective: To predict or understand the relationship between a metric independent variable 'Delivery Speed' and the dependent variable 'Satisfaction'. Using simple linear regression to determine if improving delivery speed has a positive impact on the average customer satisfaction.

Regression Equation: $\hat{Y}_i = 3.27907 + 0.93642 Del\_Speed$

My variable delivery speed is approximately normally distributed, and it measures the average amount of time it takes to deliver paper products once an order has been confirmed. The regression equation suggests a base average satisfaction level of 3.27907 when the delivery speed is zero. As the delivery speed increases, average satisfaction also increases with a slope just under 1. Faster delivery times have a linear relationship with average satisfaction, suggesting that faster delivery times are a predictor of increased customer satisfaction. Using the dummy variable distribution shows an increase in the y-intercept of 1.03321 bringing the y-intercept to a value of 4.34935 when customers are sold to directly without a broker, suggesting direct sales have a positive impact on customer satisfaction. Direct sales operations should be considered to improve average customer satisfaction. Normality, homoscedasticity, and independence can be assumed based on the lack of pattern in residual versus predicted values, and the positive linear relationship seen in residual versus quantile plots.

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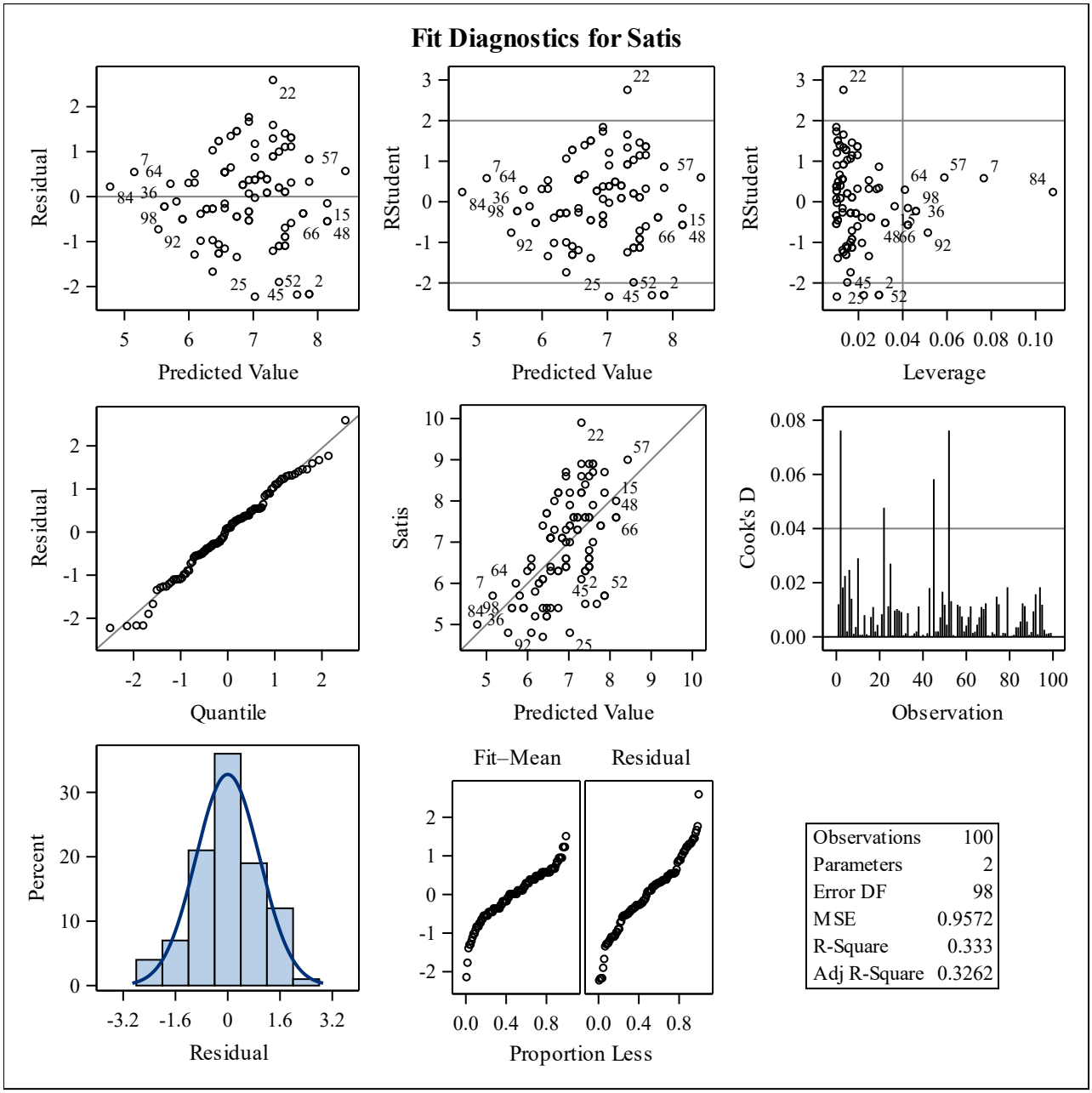

There is a positive linear relationship in the normal probability plot, residuals versus quantiles. The skew is nearly symmetrical, and the data appears normally distributed. The histogram appears to have a normal distribution. The RF plot consisting of side-by-side quantile plots of the centered fit and the residuals shows that the spread in the residuals is no greater than the spread in the centered fit. The residual versus predicted value appears to be randomized with no noticeable pattern, suggesting homoscedasticity.

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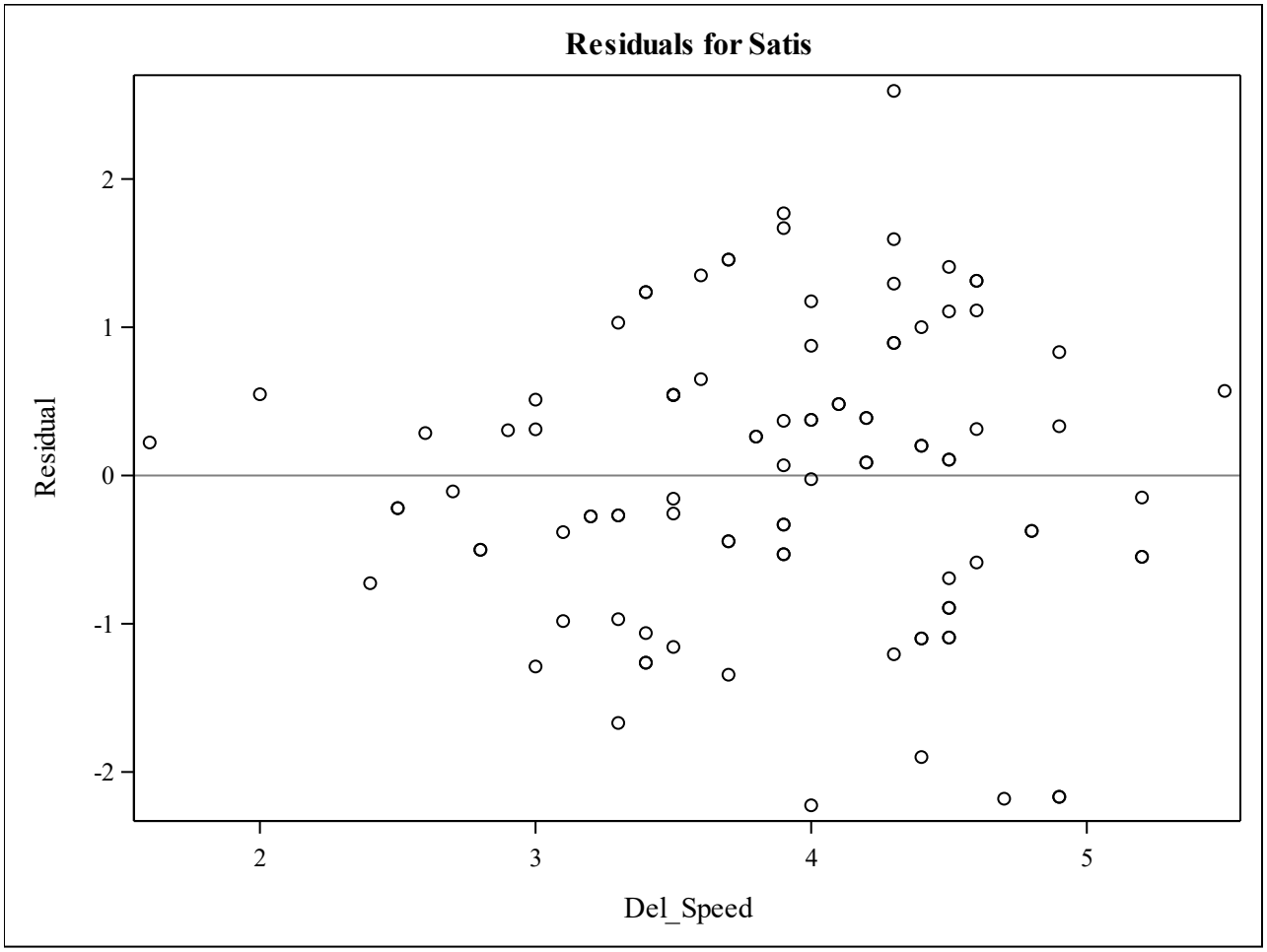
The REG Procedure
Model: MODEL1
Dependent Variable: Satis



Residuals for the metrical variable delivery speed are normally distributed with about 68% of the residuals should be within 1 standard deviation of the mean of 0; 95% within 2 standard deviations, and about 99% within 3 standard deviations.

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: Satis

Number of Observations Read	100
Number of Observations Used	100

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	2	72.17165	36.08583	51.13	<.0001
Error	97	68.45595	0.70573		
Corrected Total	99	140.62760			

H₀: $\beta_1 = \beta_2 = \beta_3 = 0$;
H₁: not all $\beta_{j_s} = 0$

$F_{2,97}$=51.13

P-Value <0.0001.Reject the Null.

At least one independent variable helps to explain average satisfaction.

Root MSE	0.84008	**R-Square**	0.5132
Dependent Mean	6.91800	**Adj R-Sq**	0.5032
Coeff Var	12.14337		

H₀: $\beta_1 = 0$;
H₁: $\beta_1 \neq 0$

t_{97}=7.29

P-Value <.0001. Reject the Null.

Delivery Speed helps to explain average satisfaction.

Parameter Estimates						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	1	3.31614	0.45461	7.29	<.0001	0
Del_Speed	1	0.81255	0.11680	6.96	<.0001	1.03233
Distribution	1	1.03321	0.17241	5.99	<.0001	1.03233

H₀: $\beta_2 = 0$;
H₁: $\beta_2 \neq 0$

t_{97}=5.99

P-Value <.0001. Reject the Null.

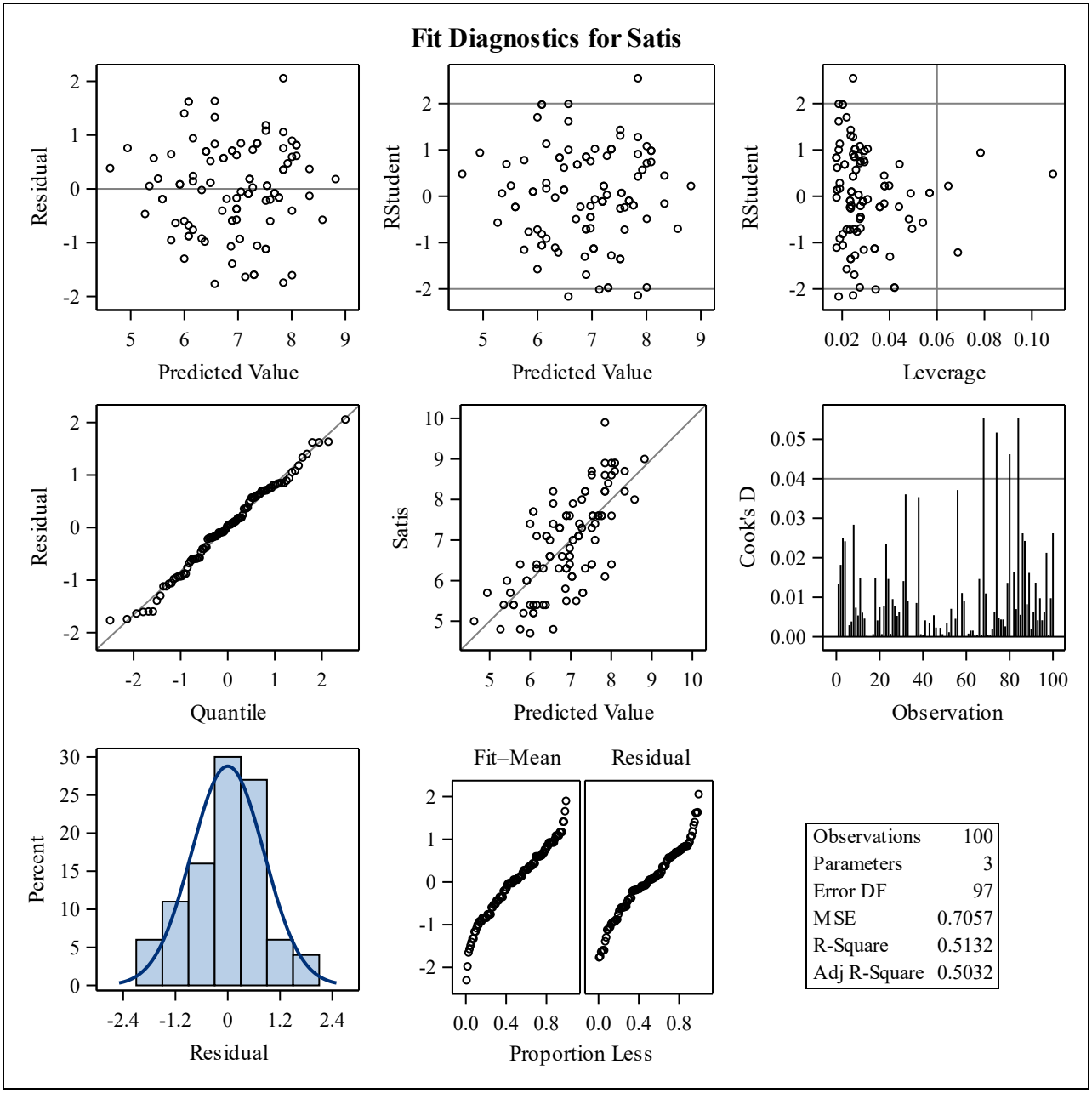
Distribution helps to explain average satisfaction.

Regression Equation: $\hat{Y}_i = 3.31614 + 0.81255 del\_speed + 1.03321 distribution$

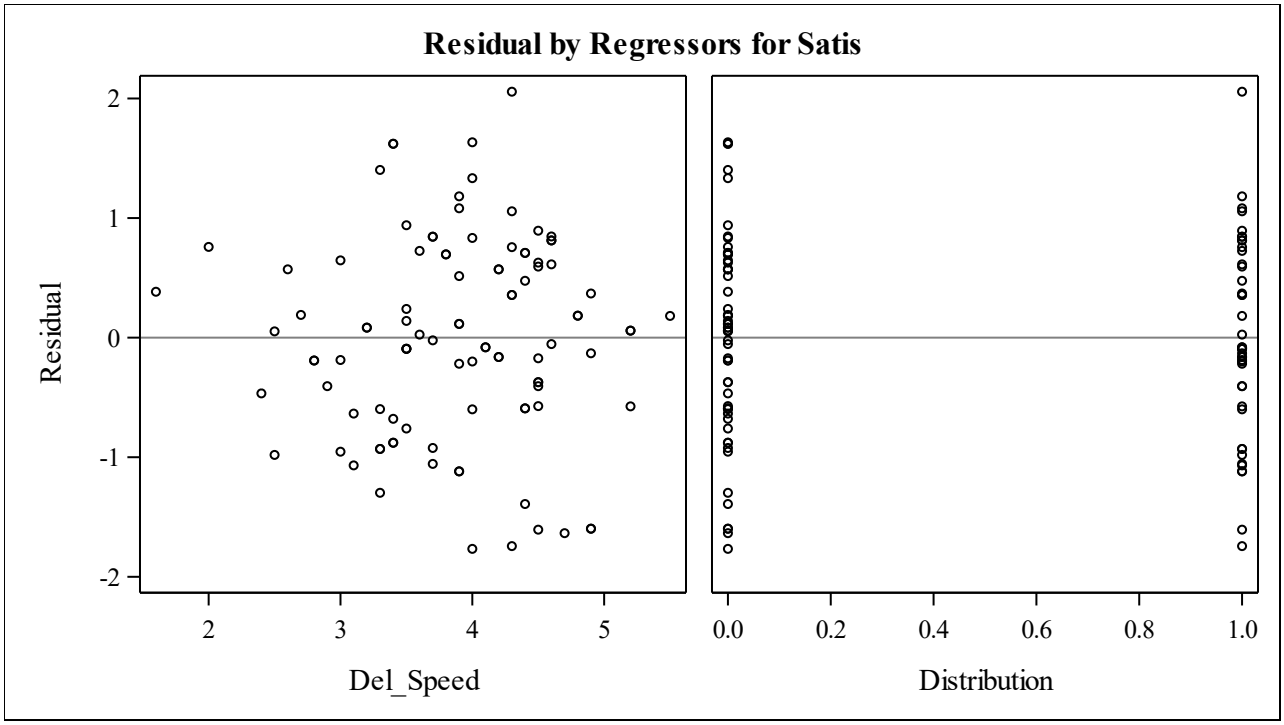
Average satisfaction for a sale to a customer with a broker (when *distribution*=0)
$\hat{Y}_i = 3.31614 + 0.81255 del\_speed$

Average satisfaction for a direct sale to a customer without a broker (when *distribution*=1)
$\hat{Y}_i = 3.31614 + 0.81255 del\_speed + 1.03321 \longrightarrow \hat{Y}_i = 4.34935 + 0.81255 del\_speed$

With α=0.05 for each additional unit increase in delivery speed, average customer satisfaction with past HBAT purchases increases by 0.81255.



There is a positive linear relationship in the normal probability plot, residuals versus quantiles. The skew is nearly symmetrical, and the data appears normally distributed. The histogram appears to have a normal distribution. The RF plot consisting of side-by-side quantile plots of the centered fit and the residuals shows that the spread in the residuals is no greater than the spread in the centered fit. The residual versus predicted value appears to be randomized with no noticeable pattern, suggesting homoscedasticity.



Residuals for the metrical variable delivery speed are normally distributed with about 68% of the residuals should be within 1 standard deviation of the mean of 0; 95% within 2 standard deviation, and about 99% within 3 standard deviations. Residuals for the non-metric qualitative variable distribution indicate a linear relationship.