

# **FORECASTING BASE PRICE IN FOOD DEMAND: A REGRESSION APPROACH USING IBM SPSS**



Turning data into insight-driven decisions for  
pricing strategy.

# OBJECTIVE

To build a predictive model that estimates  
**base\_price** using factors like **checkout\_price**,  
**num\_orders**, **meal\_id**, **week**, and **center\_id**.



In the competitive food logistics market, understanding how various factors impact the base price of a meal is crucial for optimizing profit margins, managing demand, and minimizing pricing inefficiencies.

# WORKFLOW OVERVIEW

- Data Collection
- Data Preparation
- Model Building (Regression)
- Model Evaluation (Model Summary & ANOVA)
- Coefficient Analysis
- Prediction & Interpretation
- Insight Communication



# STEP 1 – DATA COLLECTION & DESCRIPTION

**Dataset Used:** Food Demand Forecasting Dataset

Contains:

- base\_price (target)
- checkout\_price, num\_orders, center\_id, meal\_id, week

**Why This Data?**

Because pricing decisions depend not only on customer orders but also on distribution centers, product types, and time factors.



## STEP 2 - DATA PREPARATION

Data Cleaning & Formatting in SPSS:

- Checked for missing values
- Confirmed scale data types
- Labeled variables



## **STEP 3 – MODEL BUILDING USING MULTIPLE REGRESSION**

**Tool Used:** IBM SPSS → Analyze → Regression → Linear

**Model Goal:**

$$\text{base\_price} = \beta_0 + \beta_1(\text{checkout\_price}) + \beta_2(\text{num\_orders}) + \dots$$
$$(\text{num\_orders}) + \dots$$

**Why Multiple Regression?**

Because price is influenced by multiple variables and we want to isolate and quantify the effect of each.

## STEP 4 – MODEL EVALUATION: MODEL SUMMARY

- Because price is influenced by multiple variables and we want to isolate and quantify the effect of each.

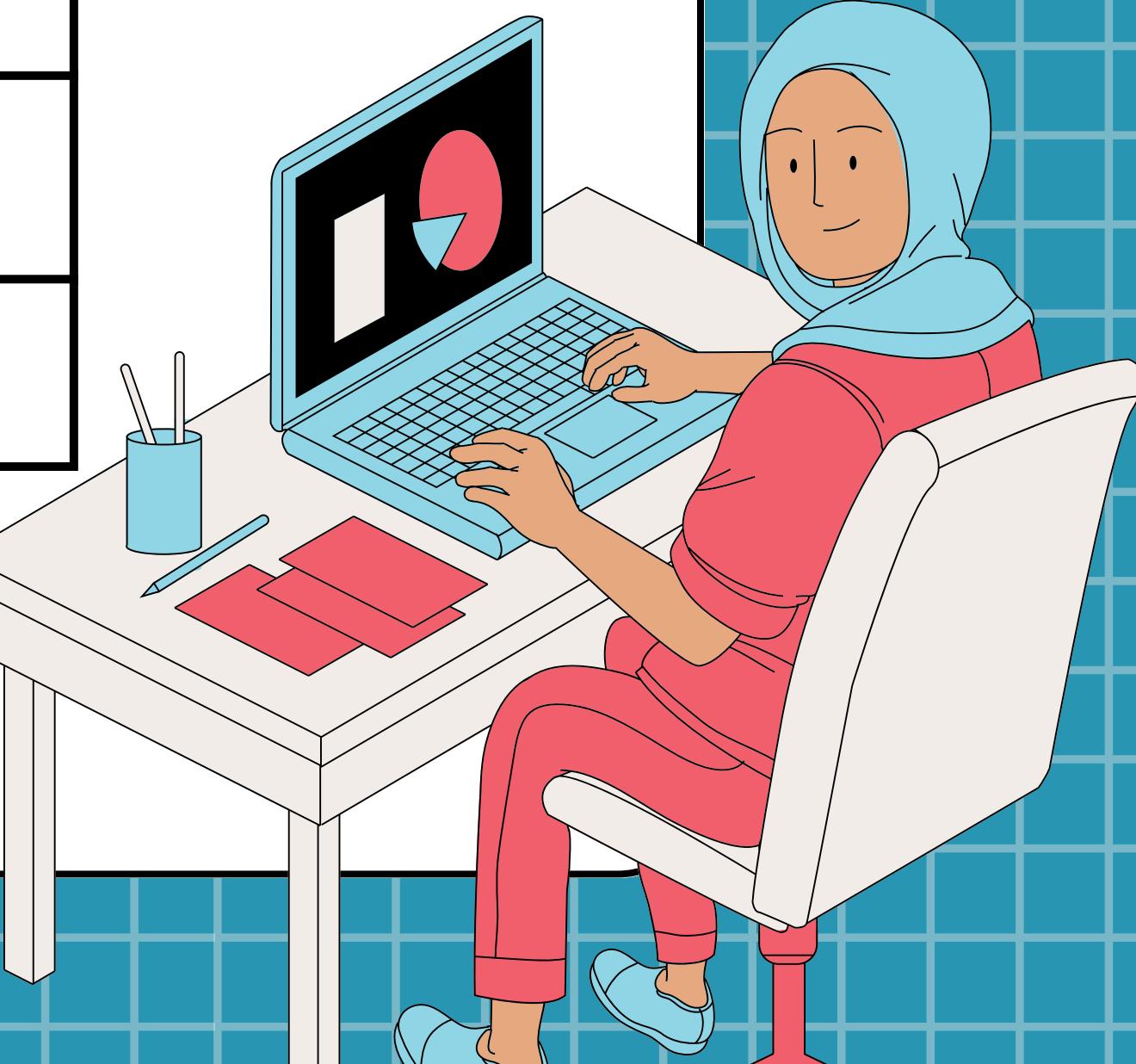
Metric	Value	Meaning
R	0.954	Strong correlation
$R^2$	0.91	91% variance explained by the model
Adjusted $R^2$	0.91	Validated model strength
Std. Error of Est.	47.52	Avg error in prediction

## STEP 5 – ANOVA TABLE (OVERALL MODEL SIGNIFICANCE)

Metric	Value	Meaning
F	4054.17	Very high → strong model
p-value	< 0.0005	Model is statistically significant

### Why ANOVA ?

To validate that all predictors, as a group, significantly explain base\_price.

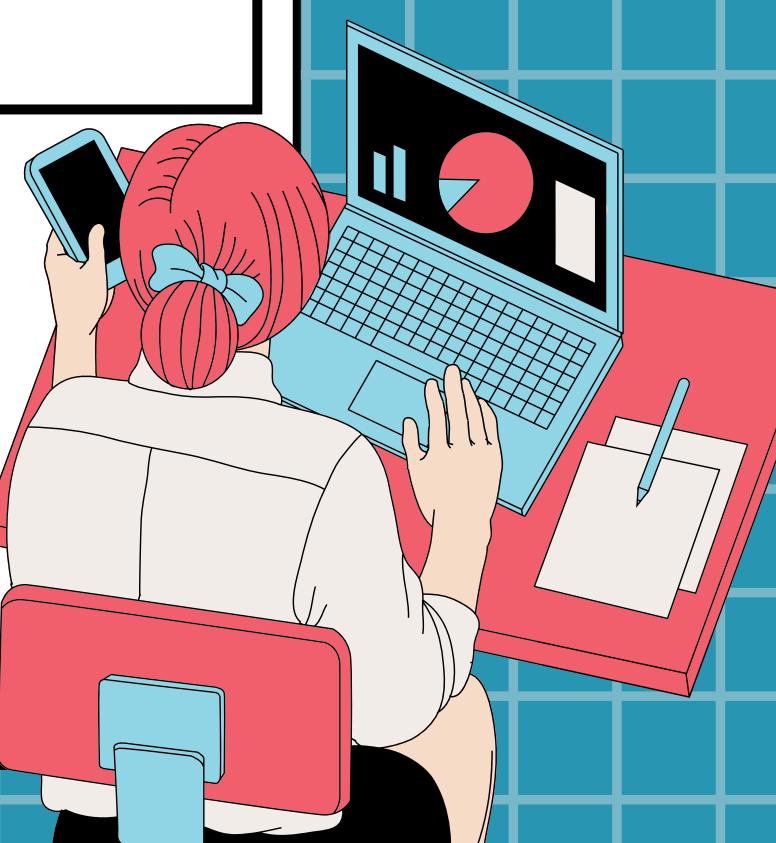


## STEP 6 – COEFFICIENT ANALYSIS

Predictor	B (Unstd.)	p-value	Interpretation
checkout_price	1.015	0	Most influential, significant
num_orders	0.021	0	Also significant predictor
week, center_id, meal_id	Not significant	✗	Minimal effect

### Regression Equation:

$$\text{base\_price} = 11.254 + 1.015(\text{checkout\_price}) + 0.021(\text{num\_orders})$$



## **STEP 7 – PREDICTION & INTERPRETATION**

**Predicted values** were calculated using:

Transform → Compute Variable in SPSS **or via**

Save → Predicted Values

**Compared actual vs predicted base\_price**

**Residual analysis confirms model stability**

**Business Takeaway:**

We can now confidently forecast base prices to adjust pricing strategies dynamically.



## FINAL INSIGHTS

✓ Model Strength:

- 91% of price variability explained

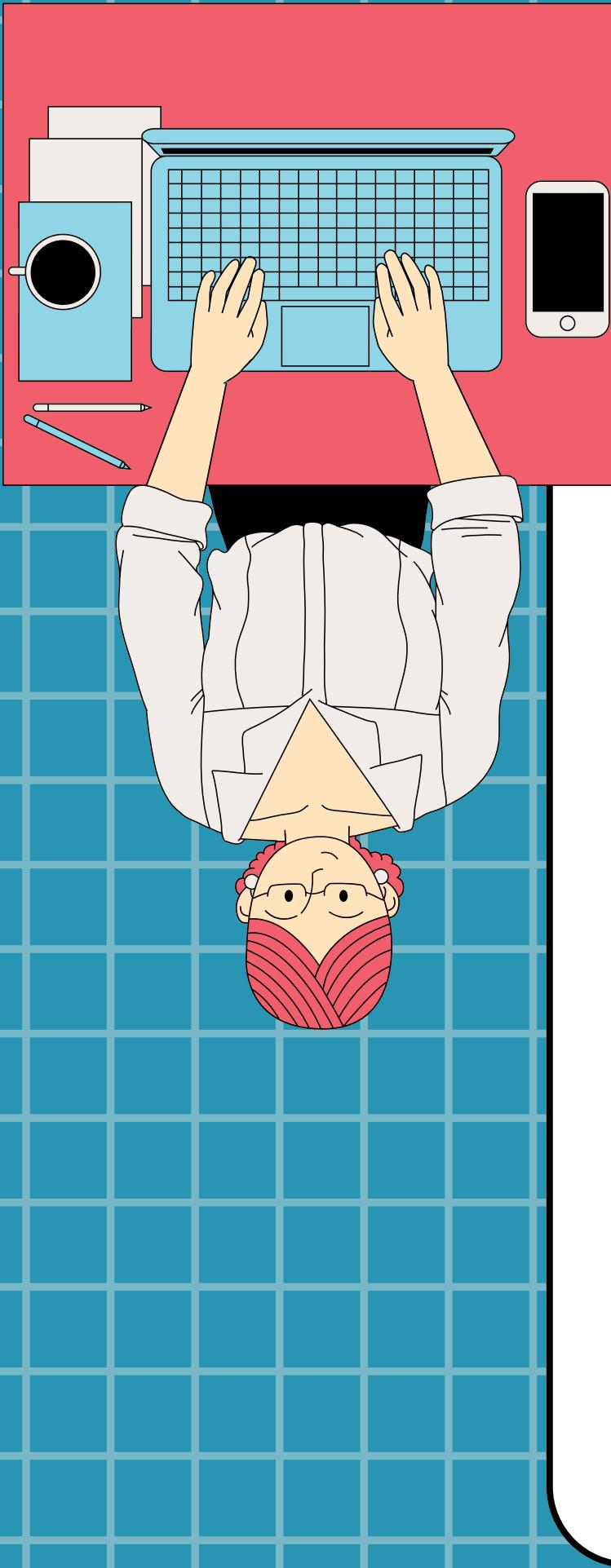
✓ Key Drivers:

- checkout\_price (strongest)
- num\_orders (moderate)

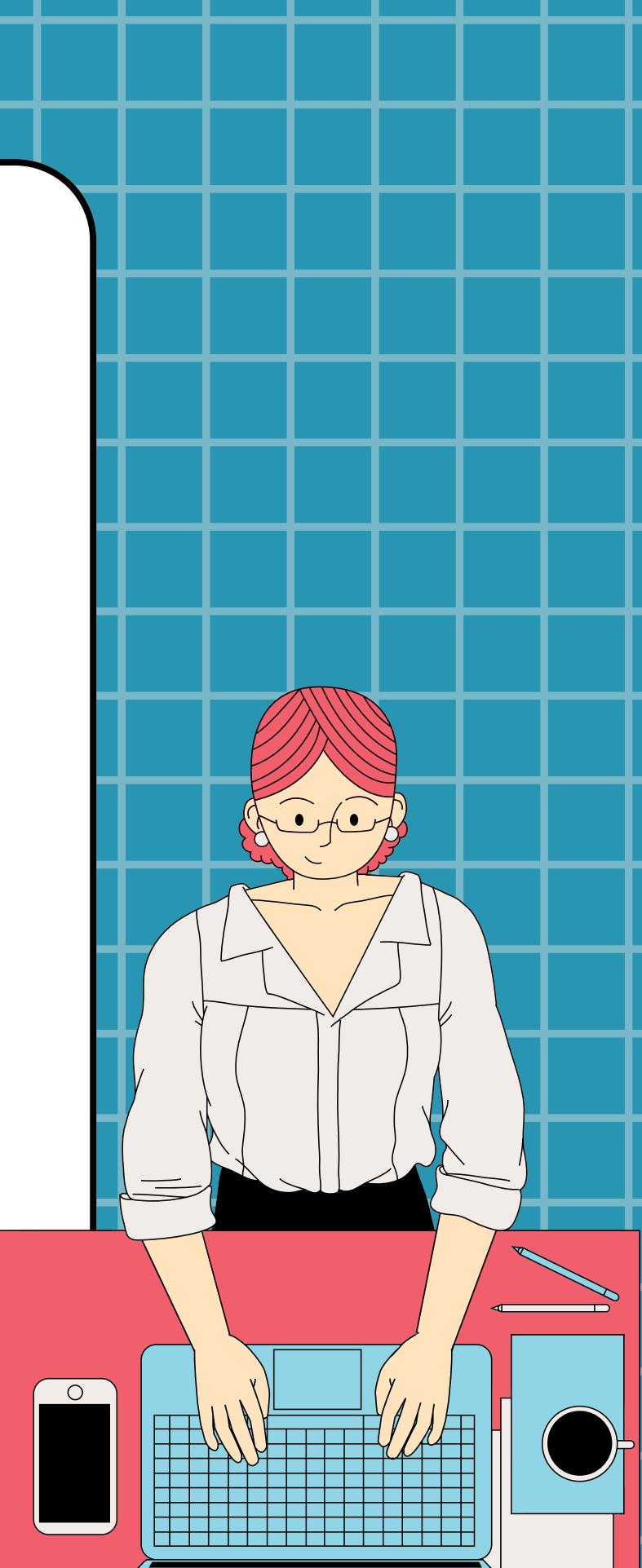
✗ Irrelevant Predictors:

- week, meal\_id, center\_id





## WHY THIS ANALYSIS MATTERS



We moved from raw variables to real business decisions by mathematically decoding how food items are priced.

### Bridged the gap:

- Between raw numbers and insights
- Between analysis and actionable strategy

# IMPORTING DATASET



Untitled3 [Dataset] IBM SPSS Statistics Data Editor (Final Mode)

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Visible: 9 of 9 Variables

	id	week	center_id	meal_id	checkout_price	base_price	emailer_for_promotion	homepage_featured	num_orders	var	var	var	var	var
1	1000000	3	157	2760	233.83	231.83	0	0	149					
2	1000001	100	104	2956	486.03	583.03	0	0	161					
3	1000002	143	75	1971	328.86	327.86	0	0	149					
4	1000003	41	24	2539	145.53	145.53	0	0	540					
5	1000004	45	83	2539	95.06	120.34	0	0	271					
6	1000005	101	65	1754	291.03	290.03	0	0	541					
7	1000006	107	153	2126	533.53	533.53	0	0	53					
8	1000007	11	50	1062	160.11	159.11	0	0	432					
9	1000008	114	57	1962	467.54	639.23	1	1	486					
10	1000009	68	36	1216	406.43	408.43	0	0	28					
11	1000010	10	76	2760	243.53	241.53	0	0	108					
12	1000011	18	104	2867	618.86	619.86	0	0	53					
13	1000012	33	36	2494	256.08	243.50	0	1	94					
14	1000013	140	88	1571	485.03	631.53	0	0	81					
15	1000014	105	81	2139	290.03	290.03	0	0	55					
16	1000015	112	43	2290	286.15	288.15	0	0	1863					
17	1000016	131	77	2290	255.11	257.11	0	0	418					
18	1000017	9	80	2826	298.76	298.76	0	0	771					
19	1000018	101	92	1445	459.78	709.13	0	0	27					
20	1000019	18	52	1311	158.14	158.14	0	0	742					
21	1000020	88	24	2704	243.47	292.03	0	0	473					
22	1000021	111	57	1248	153.26	153.26	0	0	27					
23	1000022	49	89	2760	242.53	242.53	0	0	134					
24	1000023	6	68	1971	290.06	289.06	0	0	230					
25	1000024	30	55	1109	255.14	309.43	0	1	715					
26	1000025	91	14	2640	291.03	291.03	0	0	69					
27	1000026	104	41	1885	152.35	151.35	0	0	175					
28	1000027	140	97	1571	486.03	629.53	0	0	242					
29	1000028	30	94	1207	307.49	308.49	0	0	204					

Overview Data View Variable View

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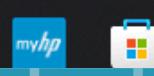
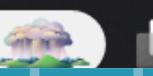


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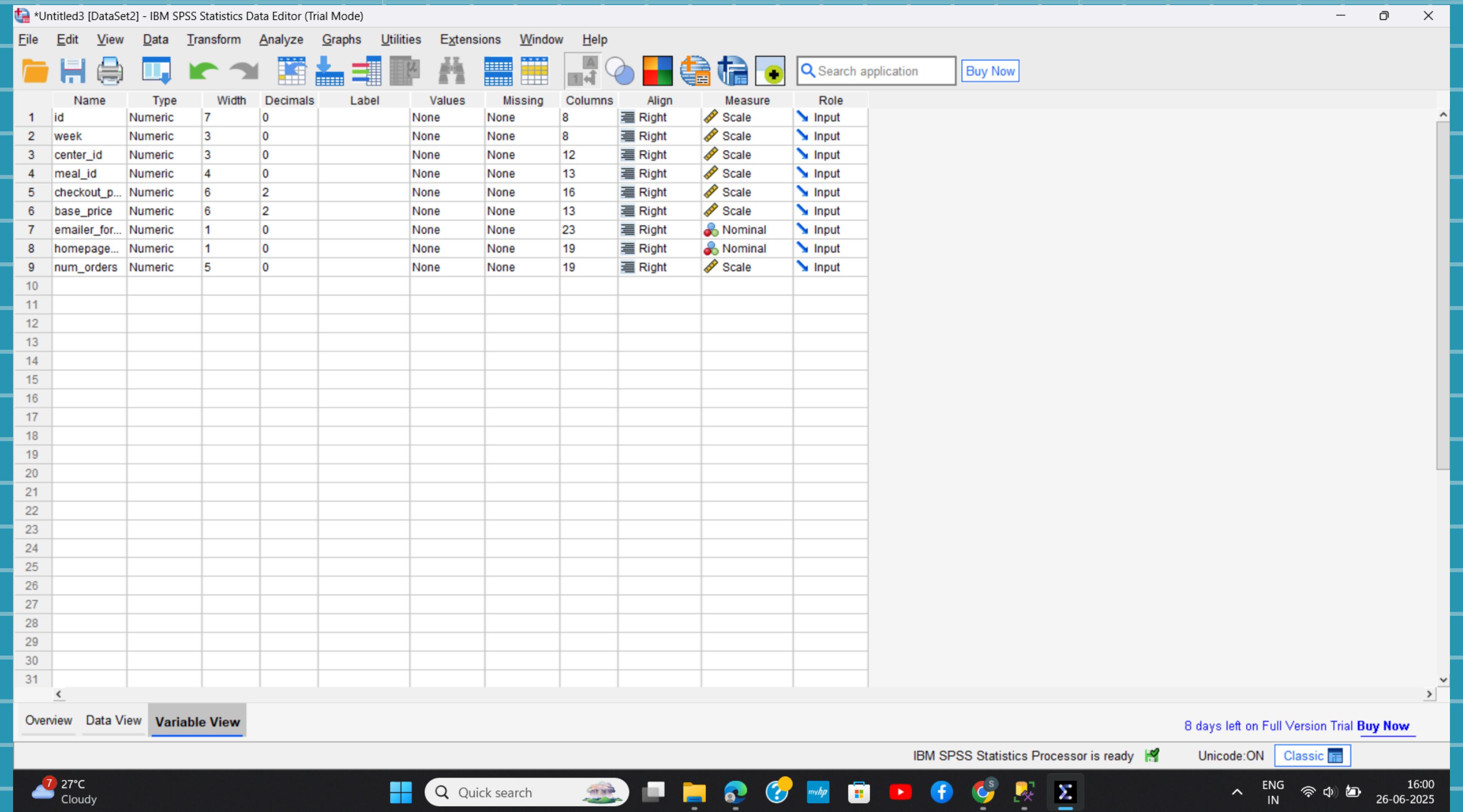
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# **RUNNING MULTIPLE LINEAR REGRESSION**



\*Untitled3 [DataSet2] - IBM SPSS Statistics Data Editor (Trial Mode)

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Visible: 9 of 9 Variables

	id	week	center_id	meal_id	checkout_price	base_price	emailer_for_promotion	homepage_featured	num_orders	var	var	var	var	var
1	1000000	3	157	2760	233.83	231.83	0	0	149					
2	1000001	100	104	2956	486.03	583.03	0	0	161					
3	1000002	143	75	1971	328.86									
4	1000003	41	24	2539	145.53									
5	1000004	45	83	2539	95.06									
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7	1000006	107	153	2126	533.53									
8	1000007	11	50	1062	160.11									
9	1000008	114	57	1962	467.54									
10	1000009	68	36	1216	406.43									
11	1000010	10	76	2760	243.53									
12	1000011	18	104	2867	618.86									
13	1000012	33	36	2494	256.08									
14	1000013	140	88	1571	485.03									
15	1000014	105	81	2139	290.03									
16	1000015	112	43	2290	286.15									
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28	1000027	140	97	1571	486.03	629.53	0	0	242					
29	1000028	30	94	1207	307.49	308.49	0	0	204					
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Linear Regression

Dependent: base\_price

Block 1 of 1

Independent(s): week, center\_id, meal\_id

Method: Enter

Selection Variable: Rule...

Case Labels:

WLS Weight:

OK Paste Reset Cancel Help

Overview Data View Variable View

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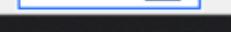
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Output Regression Title Notes Variables Entered/Removed Model Summary ANOVA Coefficients

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**Regression**

**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

a. Dependent Variable: base\_price  
b. All requested variables entered.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954 <sup>a</sup>	.910	.910	47.51923

a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45773167.619	5	9154633.524	4054.172	<.001 <sup>b</sup>
	Residual	4500347.657	1993	2258.077		
	Total	50273515.276	1998			

a. Dependent Variable: base\_price  
b. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**Coefficients<sup>a</sup>**

	Unstandardized Coefficients	Standardized Coefficients
B		
t		
P		
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Output Regression Title Notes Variables Entered/Removed Model Summary ANOVA Coefficients

a. Dependent Variable: base\_price  
b. All requested variables entered.

**Model Summary**

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**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	11.254	5.397		2.085	.037
	week	-.015	.026	-.004	-.578	.563
	center_id	.032	.023	.009	1.368	.172
	meal_id	-.001	.002	-.004	-.587	.557
	checkout_price	1.015	.007	.965	139.886	<.001
	num_orders	.021	.003	.054	7.868	<.001

a. Dependent Variable: base\_price

# INTERPRETING MODEL SUMMARY



The screenshot shows the IBM SPSS Statistics Data Editor interface. A 'Linear Regression' dialog box is open in the foreground, overlaid on a data view window. The data view window displays a table with 29 rows and 9 columns, labeled '19 :'. The columns are: id, week, center\_id, meal\_id, checkout\_price, base\_price, emailer\_for\_promotion, homepage\_featured, and num\_orders. The 'base\_price' column is highlighted in blue. The 'emailer\_for\_promotion' and 'homepage\_featured' columns are colored with a green and red gradient respectively. The status bar at the bottom right indicates '8 days left on Full Version Trial Buy Now'. The bottom navigation bar includes tabs for Overview, Data View (selected), and Variable View, along with icons for Quick search, Cloud, and various system functions.

\*Untitled3 [DataSet2] - IBM SPSS Statistics Data Editor (Trial Mode)

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19 : Visible: 9 of 9 Variables

	id	week	center_id	meal_id	checkout_price	base_price	emailer_for_promotion	homepage_featured	num_orders	var	var	var	var	var
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29	1000028	30	94	1207	307.49	308.49	0	0	204					
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Linear Regression

Linear Regression: Statistics

Regression Coefficients Estimates Model fit  
 Estimates  R squared change  
 Confidence intervals  Descriptives  
 meal\_id  Part and partial correlations  
 center\_id  Covariance matrix  Collinearity diagnostics  
 checkout\_price  emailer\_for\_promotion  Selection criteria  
 homepage\_featured  num\_orders

Residuals

PRESS Durbin-Watson Casewise diagnostics  
 PRESS  Durbin-Watson  Casewise diagnostics  
 Outliers outside: 3 standard deviations  
 All cases

Continue Cancel Help OK Paste Reset Cancel Help

Overview Data View Variable View

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**Regression****Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

a. Dependent Variable: base\_price

b. All requested variables entered.

**Model Summary**

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a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

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	Total	50273515.276	1998			

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**Coefficients<sup>a</sup>**

	Unstandardized Coefficients	Standardized Coefficients
	B std. Error t Sig.	Beta std. Beta t Sig.





Output
Regression
Title
Notes
Variables Entered/Removed <sup>a</sup>
Model Summary
ANOVA
Coefficients
Regression
Title
Notes
Variables Entered/Removed <sup>a</sup>
Model Summary
ANOVA
Coefficients

Total 50273515.276 1998  
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### Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1	(Constant)	11.254	5.397	2.085	.037
	week	-.015	.026	-.004	.563
	center_id	.032	.023	.009	.172
	meal_id	-.001	.002	-.004	.557
	checkout_price	1.015	.007	.965	139.886
	num_orders	.021	.003	.054	7.868

a. Dependent Variable: base\_price

### Regression

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1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

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Output Regression Title Notes Variables Entered Model Summary ANOVA Coefficients

Regression Title Notes Variables Entered Model Summary ANOVA Coefficients

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
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Output

- Regression
  - Title
  - Notes
  - Variables Entered/Removed
  - Model Summary
  - ANOVA
  - Coefficients

a. Dependent Variable: base\_price  
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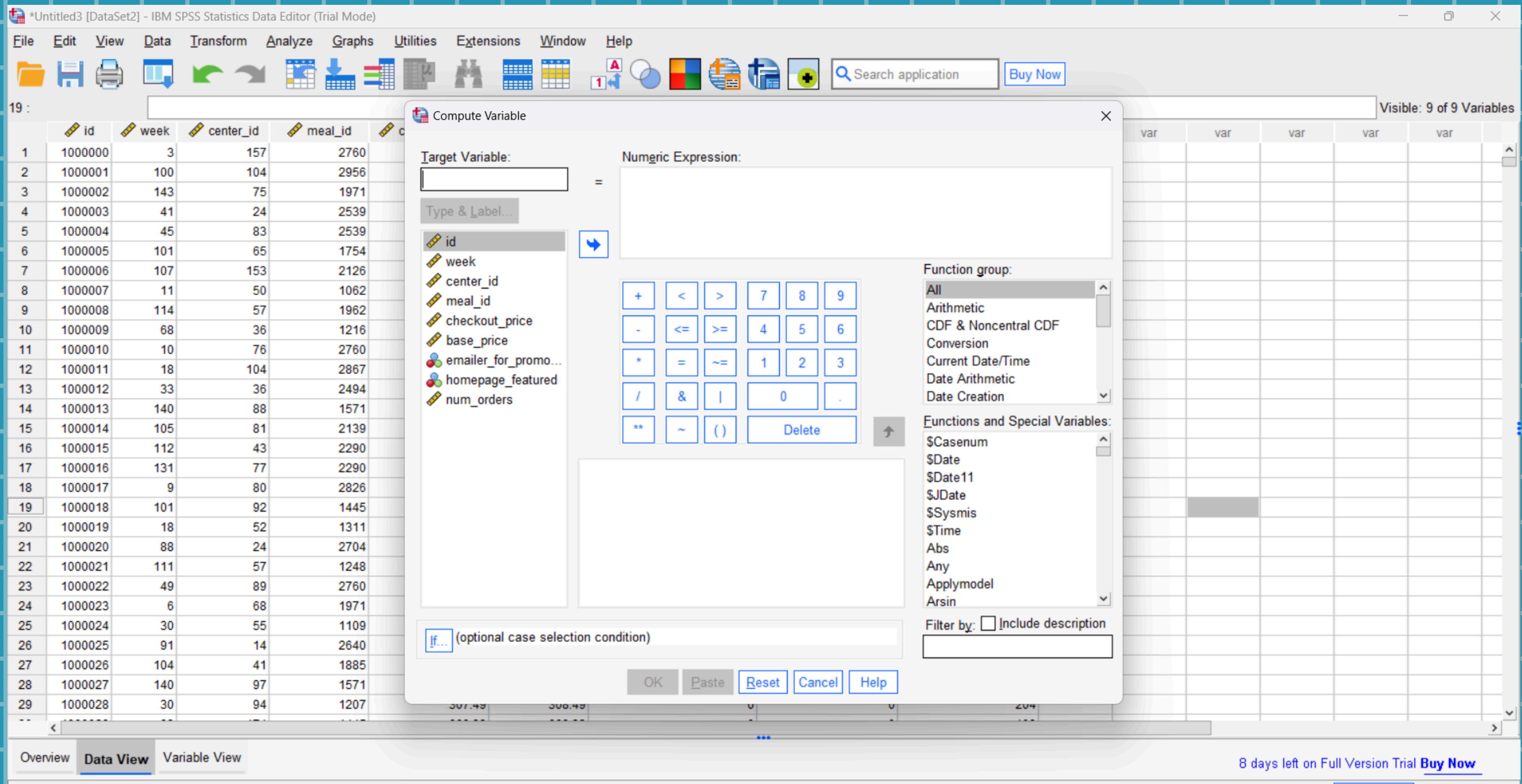
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	checkout_price	1.015	.007	.965	139.886	<.001
	num_orders	.021	.003	.054	7.868	<.001

a. Dependent Variable: base\_price

# **DETERMINING HOW WELL THE MODEL FITS**





Overview Data View Variable View

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19 :

	id	week	center_id	meal_id	...
1	1000000	3	157	2760	
2	1000001	100	104	2956	
3	1000002	143	75	1971	
4	1000003	41	24	2539	
5	1000004	45	83	2539	
6	1000005	101	65	1754	
7	1000006	107	153	2126	
8	1000007	11	50	1062	
9	1000008	114	57	1962	
10	1000009	68	36	1216	
11	1000010	10	76	2760	
12	1000011	18	104	2867	
13	1000012	33	36	2494	
14	1000013	140	88	1571	
15	1000014	105	81	2139	
16	1000015	112	43	2290	
17	1000016	131	77	2290	
18	1000017	9	80	2826	
19	1000018	101	92	1445	
20	1000019	18	52	1311	
21	1000020	88	24	2704	
22	1000021	111	57	1248	
23	1000022	49	89	2760	
24	1000023	6	68	1971	
25	1000024	30	55	1109	
26	1000025	91	14	2640	
27	1000026	104	41	1885	
28	1000027	140	97	1571	
29	1000028	30	94	1207	

Compute Variable

Target Variable: predicted\_base\_price

Numeric Expression:

$$11.254 + (1.015 * \text{checkout\_price}) + (0.021 * \text{num\_orders}) - (0.015 * \text{week}) + (0.032 * \text{center\_id}) - (0.001 * \text{meal\_id})$$

Type & Label...

Function group:

- All
- Arithmetic
- CDF & Noncentral CDF
- Conversion
- Current Date/Time
- Date Arithmetic
- Date Creation

Functions and Special Variables:

- \$Casenum
- \$Date
- \$Date11
- \$JDate
- \$Sysmis
- \$Time
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- Any
- Applymodel
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If... (optional case selection condition)

OK Paste Reset Cancel Help

Visible: 9 of 9 Variables

Overview Data View Variable View

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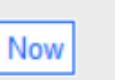
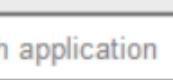
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Model Summary
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Variables Entered/Removed <sup>a</sup>
Model Summary
ANOVA
Coefficients

## Regression

### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

a. Dependent Variable: base\_price

b. All requested variables entered.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954 <sup>a</sup>	.910	.910	47.51923

a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45773167.619	5	9154633.524	4054.172	<.001 <sup>b</sup>
	Residual	4500347.657	1993	2258.077		
	Total	50273515.276	1998			

a. Dependent Variable: base\_price

b. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

### Coefficients<sup>a</sup>

Unstandardized Coefficients  
B  
Partial Correlation  
Beta

Standardized Coefficients  
Beta  
Partial Correlation  
B

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Variables Entered/Removed <sup>a</sup>
Model Summary
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Coefficients

### Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
1	(Constant)	11.254	5.397	2.085	.037
	week	-.015	.026	-.004	-.578
	center_id	.032	.023	.009	1.368
	meal_id	-.001	.002	-.004	-.587
	checkout_price	1.015	.007	.965	139.886 <.001
	num_orders	.021	.003	.054	7.868 <.001

a. Dependent Variable: base\_price

### Regression

#### Variables Entered/Removed<sup>a</sup>

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

a. Dependent Variable: base\_price

b. All requested variables entered.

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954 <sup>a</sup>	.910	.910	47.51923

a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

### ANOVA<sup>a</sup>

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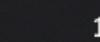


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WEEK, CHECKOUT\_PRICE

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45773167.619	5	9154633.524	4054.172	<.001 <sup>b</sup>
	Residual	4500347.657	1993	2258.077		
	Total	50273515.276	1998			

a. Dependent Variable: base\_price

b. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	
	B	Std. Error	Beta	t		
1	(Constant)	11.254	5.397		2.085	.037
	week	-.015	.026	-.004	-.578	.563
	center_id	.032	.023	.009	1.368	.172
	meal_id	-.001	.002	-.004	-.587	.557
	checkout_price	1.015	.007	.965	139.886	<.001
	num_orders	.021	.003	.054	7.868	<.001

a. Dependent Variable: base\_price

**Regression****Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

The screenshot shows the IBM SPSS Statistics Viewer interface with the title bar "\*Output2 [Document2] - IBM SPSS Statistics Viewer". The menu bar includes File, Edit, View, Data, Transform, Insert, Format, Analyze, Graphs, Utilities, Extensions, Window, and Help. The toolbar contains icons for various functions like Open, Save, Print, and Search. A search bar "Search application" and a "Buy Now" button are also present.

The left sidebar displays a hierarchical tree view of the output sections:

- Output
- Regression (selected)
- Title
- Notes
- Variables Entered/Removed<sup>a</sup>
- Model Summary
- ANOVA
- Coefficients
- Regression (another section)
- Title
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- Model Summary
- ANOVA
- Coefficients
- Regression (another section)
- Title
- Notes
- Variables Entered/Removed<sup>a</sup>
- Model Summary
- ANOVA
- Coefficients

The main content area shows the following results:

**Regression**

**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	num_orders, meal_id, center_id, week, checkout_price <sup>b</sup>	.	Enter

a. Dependent Variable: base\_price  
b. All requested variables entered.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954 <sup>a</sup>	.910	.910	47.51923

a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45773167.619	5	9154633.524	4054.172	<.001 <sup>b</sup>
	Residual	4500347.657	1993	2258.077		
	Total	50273515.276	1998			

a. Dependent Variable: base\_price  
b. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**Coefficients<sup>a</sup>**

\*Output2 [Document2] - IBM SPSS Statistics Viewer

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Output

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  - Coefficients
- Regression
  - Title
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  - Variables Entered/Removed
  - Model Summary
  - ANOVA
  - Coefficients

a. Dependent Variable: base\_price  
b. All requested variables entered.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954 <sup>a</sup>	.910	.910	47.51923

a. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45773167.619	5	9154633.524	4054.172	<.001 <sup>b</sup>
	Residual	4500347.657	1993	2258.077		
	Total	50273515.276	1998			

a. Dependent Variable: base\_price  
b. Predictors: (Constant), num\_orders, meal\_id, center\_id, week, checkout\_price

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta				Lower Bound	Upper Bound
1	(Constant)	11.254	5.397		2.085	.037	.669	21.839
	week	-.015	.026	-.004	-.578	.563	-.065	.035
	center_id	.032	.023	.009	1.368	.172	-.014	.077
	meal_id	-.001	.002	-.004	-.587	.557	-.005	.003
	checkout_price	1.015	.007	.965	139.886	<.001	1.001	1.029
	num_orders	.021	.003	.054	7.868	<.001	.016	.026

a. Dependent Variable: base\_price

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# CONCLUSION

This project demonstrates how statistical modeling, when combined with domain knowledge and clean data, can convert raw transactional records into actionable business intelligence. The regression approach not only quantified key relationships but also highlighted where pricing efforts should be focused to maximize revenue efficiency.





**THANK YOU**

