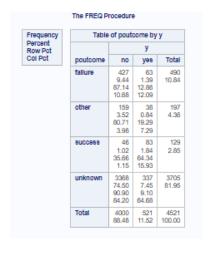Jivko Jeff Uzoff

<u>Conclusions and Recommednations</u>

In this section, we focus on the insights and recommendations derived from the selected attribute models, which have demonstrated superior performance in predicting the likelihood of clients subscribing to a term deposit. The selected attribute models have yielded significantly improved results compared to the all-attribute models, showing better accuracy in predicting whether a client will subscribe (class attribute). By analyzing key factors such as the outcome of previous marketing campaigns, the month of contact, the duration since last contact, and the duration of the last contact, the aim is to provide actionable recommendations that leverage these insights to enhance marketing strategies and improve subscription rates.

<u>Major Findings:</u>

Outcome of Previous Marketing Campaign (Poutcome) and Subscription:

- Significant Association: The very low p-value (< 0.0001) indicates a strong association between the outcome of the previous campaign and whether the client subscribed to a term deposit. Clients with a 'success' outcome in the previous campaign have a significantly higher likelihood (64.34%) of subscribing compared to those with other outcomes. Conversely, clients with 'unknown' or 'failure' outcomes show much lower subscription rates (9.10% and 12.86%, respectively). This highlights the previous campaign's outcome as a critical predictor of future subscription.

The FREQ Procedure

Frequency Percent Row Pct Col Pct	Table of poutcome by y		
		y	
poutcome	no	yes	Total
failure	427 9.44 87.14 10.68	63 1.39 12.86 12.09	490 10.84
other	159 3.52 80.71 3.98	38 0.84 19.29 7.29	197 4.36
success	46 1.02 35.66 1.15	83 1.84 64.34 15.93	129 2.85
unknown	3368 74.50 90.90 84.20	337 7.45 9.10 64.68	3705 81.95
Total	4000 88.48	521 11.52	4521 100.00

Statistics for Table of poutcome by y

Statistic	DF	Value	Prob
Chi-Square	3	386.8774	<.0001
Likelihood Ratio Chi-Square	3	235.5376	<.0001
Mantel-Haenszel Chi-Square	1	30.8628	<.0001
Phi Coefficient		0.2925	
Contingency Coefficient		0.2808	
Cramer's V		0.2925	

Sample Size = 4521

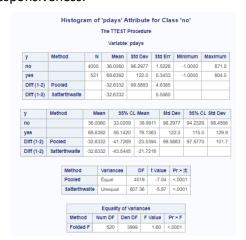Month of Contact and Subscription:

- Significant Association: The very low p-value (< 0.0001) shows a strong association between the month of contact and subscription likelihood. Months like May and August exhibit higher subscription rates, suggesting that the timing of contact impacts subscription probability. This finding emphasizes the importance of optimizing contact timing to enhance subscription rates.
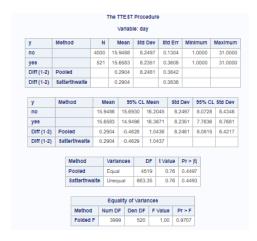
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Table of month by y

Frequency Percent Row Pct Col Pct		y		
month	no	yes	Total	
apr	237 / 5.24 / 80.89 / 5.93	56 / 1.24 / 19.11 / 10.75	293 / 6.48	
aug	554 / 12.25 / 87.52 / 13.85	79 / 1.75 / 12.48 / 15.16	633 / 14.00	
dec	11 / 0.24 / 55.00 / 0.28	9 / 0.20 / 45.00 / 1.73	20 / 0.44	
feb	184 / 4.07 / 82.88 / 4.60	38 / 0.84 / 17.12 / 7.29	222 / 4.91	
jan	132 / 2.92 / 89.19 / 3.30	16 / 0.35 / 10.81 / 3.07	148 / 3.27	
jul	645 / 14.27 / 91.36 / 16.13	61 / 1.35 / 8.64 / 11.71	706 / 15.62	
jun	476 / 10.53 / 89.64 / 11.90	55 / 1.22 / 10.36 / 10.56	531 / 11.75	
mar	28 / 0.62 / 57.14 / 0.70	21 / 0.46 / 42.86 / 4.03	49 / 1.08	
may	1305 / 28.87 / 93.35 / 32.63	93 / 2.06 / 6.65 / 17.85	1398 / 30.92	
nov	350 / 7.74 / 89.97 / 8.75	39 / 0.86 / 10.03 / 7.49	389 / 8.60	
oct	43 / 0.95 / 53.75 / 1.08	37 / 0.82 / 46.25 / 7.10	80 / 1.77	
sep	35 / 0.77 / 67.31 / 0.88	17 / 0.38 / 32.69 / 3.26	52 / 1.15	
Total	4000 / 88.48	521 / 11.52	4521 / 100.00	

Statistics for Table of month by y

Statistic	DF	Value	Prob
Chi-Square	11	250.5001	<.0001
Likelihood Ratio Chi-Square	11	187.4051	<.0001
Mantel-Haenszel Chi-Square	1	7.5732	0.0059
Phi Coefficient		0.2354	
Contingency Coefficient		0.2291	
Cramer's V		0.2354	

Sample Size = 4521

Duration Since Last Contact (Pdays) and Subscription:

- Significant Association: Clients contacted a longer time ago (higher pdays) are more likely to subscribe. This suggests that giving clients more time between contacts might increase their receptiveness to marketing efforts. However, this could also reflect that those who subscribed are less frequently contacted. Therefore, the contact strategy should balance the timing of follow-ups with client responsiveness.
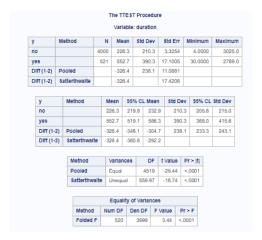
Histogram of 'pdays' Attribute for Class 'no'

The TTEST Procedure

Variable: pdays

y	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
no		4000	36.0060	96.2977	1.5226	-1.0000	871.0
yes		521	68.6392	122.0	5.3433	-1.0000	804.0
Diff (1-2)	Pooled		-32.6332	99.5883	4.6385		
Diff (1-2)	Satterthwaite		-32.6332		5.5560		

y	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
no		36.0060	33.0209	38.9911	96.2977	94.2329	98.4556
yes		68.6392	58.1420	79.1363	122.0	115.0	129.9
Diff (1-2)	Pooled	-32.6332	-41.7269	-23.5394	99.5883	97.5770	101.7
Diff (1-2)	Satterthwaite	-32.6332	-43.5445	-21.7218			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	4519	-7.04	<.0001
Satterthwaite	Unequal	607.36	-5.87	<.0001

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	520	3999	1.60	<.0001

Day of the Month Contact Was Made and Subscription:

- No Significant Association: The p-values are approximately 0.45, indicating no significant difference in subscription likelihood based on the day of the month the contact was made. This suggests that the specific day of the month is not a significant factor in predicting subscription.
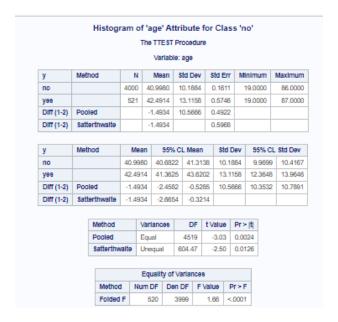
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The TTEST Procedure

Variable: day

y	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
no		4000	15.9488	8.2497	0.1304	1.0000	31.0000
yes		521	15.6583	8.2351	0.3608	1.0000	31.0000
Diff (1-2)	Pooled		0.2904	8.2481	0.3842		
Diff (1-2)	Satterthwaite		0.2904		0.3836		

y	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
no		15.9488	15.6930	16.2045	8.2497	8.0728	8.4346
yes		15.6583	14.9496	16.3671	8.2351	7.7636	8.7681
Diff (1-2)	Pooled	0.2904	-0.4628	1.0436	8.2481	8.0815	8.4217
Diff (1-2)	Satterthwaite	0.2904	-0.4629	1.0437			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	4519	0.76	0.4497
Satterthwaite	Unequal	663.35	0.76	0.4493

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	3999	520	1.00	0.9707

Duration of Last Contact and Subscription:

- Significant Association: The p-values are less than 0.0001, indicating a substantial difference in call durations between subscribers and non-subscribers. Subscribers have significantly longer call durations (mean = 552.7 seconds) compared to non-subscribers (mean = 226.3 seconds). This suggests that longer and more engaging interactions are associated with higher subscription rates.
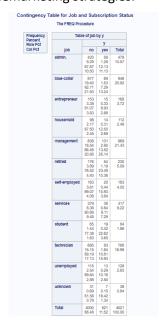
The TTEST Procedure

Variable: duration

y	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
no		4000	226.3	210.3	3.3254	4.0000	3025.0
yes		521	552.7	390.3	17.1005	30.0000	2769.0
Diff (1-2)	Pooled		-326.4	238.1	11.0681		
Diff (1-2)	Satterthwaite		-326.4		17.4208		

y	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
no		226.3	219.8	232.9	210.3	205.8	215.0
yes		552.7	519.1	586.3	390.3	368.0	415.6
Diff (1-2)	Pooled	-326.4	-348.1	-304.7	238.1	233.3	243.1
Diff (1-2)	Satterthwaite	-326.4	-360.6	-292.2			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	4519	-29.44	<.0001
Satterthwaite	Unequal	559.97	-18.74	<.0001

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	520	3999	3.44	<.0001

Age and Subscription:

- Significant Association: The significant p-values from the t-test indicate that there is a statistically significant difference in the mean age between clients who subscribed and those who did not. Clients who subscribed to the term deposit are, on average, older than those who did not subscribe. This difference in age is likely meaningful and could be an important factor in predicting subscription.

Histogram of 'age' Attribute for Class 'no'

The TTEST Procedure

Variable: age

y	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
no		4000	40.9960	10.1884	0.1611	19.0000	86.0000
yes		521	42.4914	13.1158	0.5746	19.0000	87.0000
Diff (1-2)	Pooled		-1.4934	10.5666	0.4922		
Diff (1-2)	Satterthwaite		-1.4934		0.5968		

y	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
no		40.9960	40.6822	41.3138	10.1884	9.9699	10.4167
yes		42.4914	41.3625	43.6202	13.1158	12.3648	13.9646
Diff (1-2)	Pooled	-1.4934	-2.4582	-0.5285	10.5666	10.3532	10.7891
Diff (1-2)	Satterthwaite	-1.4934	-2.6654	-0.3214			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	4519	-3.03	0.0024
Satterthwaite	Unequal	604.47	-2.50	0.0126

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	520	3999	1.66	<.0001

Job and Subscription:

- Significant Association: The very low p-value (< 0.0001) indicates a strong association between job type and whether the client subscribed to a term deposit. This suggests that the job category has a significant impact on the likelihood of subscription. Specifically, clients in the management job category exhibit the highest subscription rate, at 25.14%, indicating that individuals in management positions are notably more inclined to subscribe to a term deposit compared to other job types. Additionally, the retired category shows a relatively high subscription rate of 10.36%, suggesting that retired individuals are also significantly more likely to subscribe than many other job types. These insights emphasize the potential benefits of targeting individuals in management and retired positions for enhanced subscription rates, guiding more effective telemarketing strategies.

Contingency Table for Job and Subscription Status

The FREQ Procedure

Table of job by y

Frequency / Percent / Row Pct / Col Pct

job	no	yes	Total
admin.	420 / 9.29 / 87.87 / 10.50	58 / 1.28 / 12.13 / 11.13	478 / 10.57
blue-collar	877 / 19.40 / 92.71 / 21.93	69 / 1.53 / 7.29 / 13.24	946 / 20.92
entrepreneur	153 / 3.38 / 91.07 / 3.83	15 / 0.33 / 8.93 / 2.88	168 / 3.72
housemaid	98 / 2.17 / 87.50 / 2.45	14 / 0.31 / 12.50 / 2.69	112 / 2.48
management	838 / 18.54 / 86.48 / 20.95	131 / 2.90 / 13.52 / 25.14	969 / 21.43
retired	176 / 3.89 / 76.52 / 4.40	54 / 1.19 / 23.48 / 10.36	230 / 5.09
self-employed	163 / 3.61 / 89.07 / 4.08	20 / 0.44 / 10.93 / 3.84	183 / 4.05
services	379 / 8.38 / 90.89 / 9.48	38 / 0.84 / 9.11 / 7.29	417 / 9.22
student	65 / 1.44 / 77.38 / 1.63	19 / 0.42 / 22.62 / 3.65	84 / 1.86
technician	685 / 15.15 / 89.19 / 17.13	83 / 1.84 / 10.81 / 15.93	768 / 16.99
unemployed	115 / 2.54 / 89.84 / 2.88	13 / 0.29 / 10.16 / 2.50	128 / 2.83
unknown	31 / 0.69 / 81.58 / 0.78	7 / 0.15 / 18.42 / 1.34	38 / 0.84
Total	4000 / 88.48	521 / 11.52	4521 / 100.00

Statistics for Table of job by y

Statistic	DF	Value	Prob
Chi-Square	11	68.9683	<.0001
Likelihood Ratio Chi-Square	11	62.6171	<.0001
Mantel-Haenszel Chi-Square	1	3.3936	0.0654
Phi Coefficient		0.1235	
Contingency Coefficient		0.1226	
Cramer's V		0.1235	

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Recommendations:

1. Leverage Previous Campaign Outcomes (Poutcome):

- Recommendation: Focus marketing efforts on clients who had a 'success' outcome in previous campaigns. This group has a significantly higher likelihood of subscribing to a term deposit (64.34%). Tailoring strategies to engage this segment more intensively could enhance overall subscription rates. Implement follow-up strategies that prioritize reaching out to these successful past clients with personalized offers or incentives.

2. Optimize Contact Timing (Month of Contact):

- Recommendation: Schedule marketing campaigns during months with historically higher subscription rates, such as May and August. Use this information to plan your outreach efforts to coincide with these optimal times, potentially increasing engagement and subscription rates. Additionally, analyze monthly trends to continuously refine the timing of future campaigns.

3. Review Contact Strategy Based on Duration Since Last Contact (Pdays):

- Recommendation: Consider extending the time between contacts for clients who have not recently been engaged. This approach could improve their receptiveness to marketing efforts, as clients contacted a longer time ago are more likely to subscribe. Ensure that follow-up strategies balance client responsiveness with effective engagement to avoid missed opportunities.

4. Enhance Engagement in Calls (Duration of Last Contact):

- Recommendation: Develop strategies to increase the duration and quality of customer interactions. Focus on making longer, more meaningful calls, as subscribers tend to have significantly longer call durations. Training your sales team to engage more effectively during calls could lead to higher subscription rates.

5. Target Based on Age:

- Recommendation: Tailor marketing strategies to target older clients, who are statistically more likely to subscribe. Use age-related data to refine your customer profiles and focus on segments with higher average ages. Adjust messaging and offers to better resonate with this demographic.

6. Target by Job Type:

- Recommendation: Prioritize marketing efforts towards clients in management and retired job categories, as they exhibit higher subscription rates. Specifically, management professionals have the highest subscription rate (25.14%), and retired individuals also show a relatively high rate (10.36%). Develop targeted marketing campaigns and personalized offers for these job categories to improve subscription outcomes.

7. Reassess the Impact of Day of Contact:

- Recommendation: Since the day of the month does not significantly affect subscription likelihood, it should not be a primary factor in scheduling contacts. Focus resources on other

impactful variables such as previous campaign outcomes, contact timing, and call duration for more effective marketing strategies.

By implementing these recommendations, the company can enhance its marketing strategies, better target potential clients, and ultimately improve subscription rates for term deposits.