

Bank Marketing Campaign Analysis & Risk Insights

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Sections

- Customer Profiling
- Campaign Effectiveness
- Loan & Risk Insights
- Advanced Risk Analytics

1. Customer Profiling

Objective:

Understand the customer base and identify which demographic groups are more likely to subscribe to a term deposit.

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Average Age of Subscribers vs Non-Subscribers

- Subscribed customers are on average 1 year older (40.9 vs 39.9) than non-subscribers, suggesting slightly higher subscription likelihood among older customers.

```
SELECT y AS subscribed,  
       ROUND(AVG(age),2) AS avg_age,  
       COUNT(*) AS total_customers  
FROM customers  
GROUP BY y;
```

	subscribed	avg_age	total_customers
▶	no	39.91	36548
	yes	40.91	4640

```

SELECT education,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY education
ORDER BY subscription_rate DESC;

```

Distribution of Education Level Among Subscribers

- Customers with higher education tend to subscribe more frequently. Those with minimal education show lower engagement. Campaigns should prioritize university-educated and professional course segments.

education	total_customers	subscribed_customers	subscription_rate
illiterate	18	4	22.22
unknown	1731	251	14.50
university.degree	12168	1670	13.72
professional.course	5243	595	11.35
high.school	9515	1031	10.84
basic.4y	4176	428	10.25
basic.6y	2292	188	8.20
basic.9y	6045	473	7.82

```

SELECT job,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY job
ORDER BY subscription_rate DESC;

```

Job Categories with Highest Subscription Rate

- Students (31.4%) and retired customers (25.2%) show the highest subscription rates, while blue-collar workers (6.9%) and service roles (8.1%) are least likely to subscribe. Campaigns are most effective among younger (students) and older (retired) segments.

job	total_customers	subscribed_customers	subscription_rate
student	875	275	31.43
retired	1720	434	25.23
unemployed	1014	144	14.20
admin.	10422	1352	12.97
management	2924	328	11.22
unknown	330	37	11.21
technician	6743	730	10.83
self-employed	1421	149	10.49
housemaid	1060	106	10.00
entrepreneur	1456	124	8.52
services	3969	323	8.14
blue-collar	9254	638	6.89

Marital Status vs Subscription

- Single customers (14%) have the highest subscription rate, while married (10.2%) and divorced (10.3%) customers are least responsive to the campaign.

```
SELECT marital_status,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
  FROM customers
 GROUP BY marital_status
 ORDER BY subscription_rate DESC;
```

	marital_status	total_customers	subscribed_customers	subscription_rate
▶	unknown	80	12	15.00
	single	11568	1620	14.00
	divorced	4612	476	10.32
	married	24928	2532	10.16

Customers with Loans vs Subscription

- Customers without a loan have a slightly higher subscription rate (11.3%) compared to those with loans (10.9%), suggesting that financial obligations reduce likelihood of subscribing.

```
SELECT loan,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY loan;
SELECT housing,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY housing;
```

	loan	total_customers	subscribed_customers	subscription_rate
▶	no	33950	3850	11.34
	unknown	990	107	10.81
	yes	6248	683	10.93

	housing	total_customers	subscribed_customers	subscription_rate
	no	18622	2026	10.88
	yes	21576	2507	11.62
	unknown	990	107	10.81

Age Groups vs Subscription

- Older customers (60+) show the highest subscription rate at 39.6%, followed by younger customers under 30 (16.3%). Middle-aged groups (30s–50s) are far less likely to subscribe, with the lowest rates in the 40s (7.9%).

```
SELECT CASE
    WHEN age < 30 THEN 'Under 30'
    WHEN age BETWEEN 30 AND 39 THEN '30s'
    WHEN age BETWEEN 40 AND 49 THEN '40s'
    WHEN age BETWEEN 50 AND 59 THEN '50s'
    ELSE '60+'
END AS age_group,
COUNT(*) AS total_customers,
SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY age_group
ORDER BY subscription_rate DESC;
```

	age_group	total_customers	subscribed_customers	subscription_rate
▶	60+	1193	472	39.56
	Under 30	5669	922	16.26
	50s	6862	697	10.16
	30s	16938	1715	10.13
	40s	10526	834	7.92

2. Campaign Effectiveness

Objective:

Evaluate the success of marketing campaigns and identify patterns that improve conversion rates.

Overall Conversion Rate

- The campaign reached 41,188 customers, with 4,640 subscriptions, achieving an overall conversion rate of 11.3%

```
SELECT
    COUNT(*) AS total_customers,
    SUM(CASE WHEN y = 'yes' THEN 1 ELSE 0 END) AS subscribed_customers,
    ROUND(100.0 * SUM(CASE WHEN y = 'yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
FROM customers;
```

	total_customers	subscribed_customers	conversion_rate
▶	41188	4640	11.27

Conversion Rate by Month

- March (50.6%), December (48.9%), September (44.9%), and October (43.9%) had exceptionally high conversion rates, while May (6.4%) and August (10.6%) performed poorly despite high contact volumes. This suggests that campaign timing strongly influences success.

```
SELECT month,
       COUNT(*) AS total_contacts,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
FROM customers
GROUP BY month
ORDER BY conversion_rate DESC;
```

	month	total_contacts	subscribed	conversion_rate
▶	mar	546	276	50.55
	dec	182	89	48.90
	sep	570	256	44.91
	oct	718	315	43.87
	apr	2632	539	20.48
	aug	6178	655	10.60
	jun	5318	559	10.51
	nov	4101	416	10.14
	jul	7174	649	9.05
	may	13769	886	6.43

Contact Method Effectiveness

- Cellular contacts (14.7%) were nearly 3x more effective than telephone contacts (5.2%), making mobile outreach the most successful communication channel.

```
SELECT contact,
       COUNT(*) AS total_contacts,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
  FROM customers
 GROUP BY contact
 ORDER BY conversion_rate DESC;
```

	contact	total_contacts	subscribed	conversion_rate
▶	cellular	26144	3853	14.74
	telephone	15044	787	5.23

Number of Contacts in Campaign vs Success

- Conversion rates are highest when customers are contacted fewer times (1–3 contacts ≈ 9–11%), but effectiveness drops sharply with repeated contacts, reaching nearly 0% beyond 10+ contacts. This suggests diminishing returns and even possible customer fatigue when over-contacted.

```
SELECT campaign AS num_contacts,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
  FROM customers
 GROUP BY campaign
 ORDER BY num_contacts;
```

num_contacts	total_customers	subscribed	conversion_rate
2	10570	1211	11.46
3	5341	574	10.75
4	2651	249	9.39
5	1599	120	7.50
6	979	75	7.66
7	629	38	6.04
8	400	17	4.25
9	283	17	6.01
10	225	12	5.33
11	177	12	6.78
12	125	3	2.40
13	92	4	4.35
14	69	1	1.45
15	51	2	3.92
16	51	0	0.00
17	58	4	6.90
18	33	0	0.00
19	26	0	0.00
20	30	0	0.00
21	24	0	0.00
22	17	0	0.00
23	16	1	6.25
24	15	0	0.00
25	8	0	0.00
26	8	0	0.00
27	11	0	0.00
28	8	0	0.00

Previous Campaign Influence

- Customers with a previous successful campaign outcome had a very high conversion rate (65.1%), while those with no prior campaign (8.8%) or a failed outcome (14.2%) were much less likely to subscribe.
- This shows that past campaign success is the strongest predictor of future subscription, making it a key segmentation variable.

```
SELECT poutcome,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
FROM customers
GROUP BY poutcome
ORDER BY conversion_rate DESC;
```

	poutcome	total_customers	subscribed	conversion_rate
▶	success	1373	894	65.11
	failure	4252	605	14.23
	nonexistent	35563	3141	8.83

Duration of Last Call vs Subscription

- Longer calls strongly correlate with higher conversions — customers spoken to for 600+ seconds converted at 48.6%, while short calls under 100s had almost no impact (0.8%).
- This shows that quality conversations matter far more than the number of calls.

```
SELECT
  CASE
    WHEN duration < 100 THEN 'Under 100s'
    WHEN duration BETWEEN 100 AND 300 THEN '100-300s'
    WHEN duration BETWEEN 301 AND 600 THEN '301-600s'
    ELSE '600+ seconds'
  END AS call_duration_group,
  COUNT(*) AS total_calls,
  SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
  ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
FROM customers
GROUP BY call_duration_group
ORDER BY conversion_rate DESC;
```

	call_duration_group	total_calls	subscribed	conversion_rate
▶	600+ seconds	3464	1684	48.61
	301-600s	7740	1438	18.58
	100-300s	20102	1440	7.16
	Under 100s	9882	78	0.79

3. Loan & Risk Insights

Objective:

Examine how credit/loan status influences subscription and identify high-risk customer segments.

Customers with Both Loans (Personal + Housing)

- Customers with housing loans but no personal loans had the highest conversion rate (11.7%), while those with both loans subscribed less (10.9%).
- This suggests that having multiple loans may reduce responsiveness, but housing loan alone is not a barrier.

```
SELECT loan, housing,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*), 2) AS subscription_rate
FROM customers
GROUP BY loan, housing
ORDER BY subscription_rate DESC;
```

	loan	housing	total_customers	subscribed_customers	subscription_rate
▶	no	yes	17885	2098	11.73
	yes	yes	3691	409	11.08
	no	no	16065	1752	10.91
	unknown	unknown	990	107	10.81
	yes	no	2557	274	10.72

Combined Risk Segmentation

- Customers classified as High Risk show a slightly higher subscription rate (11.5%) compared to Low Risk (10.9%).

```
SELECT
    CASE
        WHEN "default" = 'yes' OR loan = 'yes' OR housing = 'yes'
        THEN 'High Risk'
        ELSE 'Low Risk'
    END AS risk_segment,
    COUNT(*) AS total_customers,
    SUM(CASE WHEN y = 'yes' THEN 1 ELSE 0 END) AS subscribed_customers,
    ROUND(100.0 * SUM(CASE WHEN y = 'yes' THEN 1 ELSE 0 END) / COUNT(*), 2) AS subscription_rate
FROM customers
GROUP BY risk_segment;
```

	risk_segment	total_customers	subscribed_customers	subscription_rate
▶	Low Risk	17055	1859	10.90
	High Risk	24133	2781	11.52

Age Group × Loan Status

- Younger clients (<30) show the highest responsiveness regardless of loan status (~16% subscription rate).
- 30s and 40s have much lower subscription rates (7–10%), showing reduced interest in new deposits.

	age_group	loan	total_customers	subscribed_customers	subscription_rate
▶	30s	no	13934	1448	10.39
	30s	yes	2602	236	9.07
	30s	unknown	402	31	7.71
	40s	unknown	252	23	9.13
	40s	no	8698	696	8.00
	40s	yes	1576	115	7.30
	50s	yes	1035	119	11.50
	50s	unknown	170	18	10.59
	50s	no	5657	560	9.90
	60+	unknown	29	12	41.38
	60+	yes	161	66	40.99
	60+	no	1003	394	39.28
	Under 30	yes	874	147	16.82
	Under 30	unknown	137	23	16.79
	Under 30	no	4658	752	16.14

```

SELECT
    CASE
        WHEN age < 30 THEN 'Under 30'
        WHEN age BETWEEN 30 AND 39 THEN '30s'
        WHEN age BETWEEN 40 AND 49 THEN '40s'
        WHEN age BETWEEN 50 AND 59 THEN '50s'
        ELSE '60+'
    END AS age_group,
    loan,
    COUNT(*) AS total_customers,
    SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed_customers,
    ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*), 2) AS subscription_rate
FROM customers
GROUP BY age_group, loan
ORDER BY age_group, subscription_rate DESC;
  
```

- 50s with loans still maintain a decent conversion rate (~11.5%), close to average.
- 60+ customers are the most responsive group — with or without loans — conversion rates ~39–41%, extremely high.

Loan presence reduces subscription probability slightly in younger and mid-age groups, but in older customers (60+), loans do not act as a barrier — they are highly responsive to campaigns.

4. Advanced Risk Analytics

Objective:

Identify high-risk or resistant customers, analyze unusual patterns, and explore customer behavior for business decisions.

Customers Who Previously Said "No" but Subscribed Now

- Strongest predictor of success = prior success
- Customers with a successful past campaign have extremely high conversion rates (60–80%), regardless of the number of prior contacts.
- Even 1 prior success → 60% conversion, which is 5x higher than average (11.27%).
- Failures drag conversion down
- Prior failures drastically reduce effectiveness.
- 1 prior failure → only 12% conversion (close to average).
- More failures → diminishing returns (down to 0%).
- Multiple contacts + success = best ROI
- When customers have multiple past successes (2–6 contacts), conversion rates are consistently 70%+.
- This suggests that loyal/repeat converters remain highly engaged.

```
SELECT previous,
       poutcome,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
  FROM customers
 WHERE previous > 0
 GROUP BY previous, poutcome
 ORDER BY conversion_rate DESC;
```

	previous	poutcome	total_customers	subscribed	conversion_rate
▶	5	success	15	12	80.00
	3	success	128	96	75.00
	6	success	4	3	75.00
	2	success	320	238	74.38
	4	success	40	29	72.50
	1	success	865	516	59.65
	3	failure	88	32	36.36
	5	failure	3	1	33.33
	4	failure	30	9	30.00
	2	failure	434	112	25.81
	1	failure	3696	451	12.20
	6	failure	1	0	0.00
	7	success	1	0	0.00

High-Risk Customers Who Still Subscribed

- High-risk customers (24,133) show a slightly better subscription rate of 11.52% (2,781 conversions) compared to the overall average of 11.27%.
- This means riskier customers are not less likely to subscribe — they actually convert a bit better.

```
SELECT COUNT(*) AS total_high_risk_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS high_risk_subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
  FROM customers
 WHERE "default"='yes' OR loan='yes' OR housing='yes';
```

	total_high_risk_customers	high_risk_subscribed	subscription_rate
▶	24133	2781	11.52

Top Risk Segments by Age × Loan × Default

- Senior customers (60+) consistently show the highest subscription rates (37%–42%), regardless of loan/housing/default status. In contrast, younger segments (Under 30, 30s, 40s, 50s) show much lower subscription rates, typically between 6%–19%.

SELECT

```
CASE
    WHEN age < 30 THEN 'Under 30'
    WHEN age BETWEEN 30 AND 39 THEN '30s'
    WHEN age BETWEEN 40 AND 49 THEN '40s'
    WHEN age BETWEEN 50 AND 59 THEN '50s'
    ELSE '60+'
END AS age_group,
loan, housing, "default",
COUNT(*) AS total_customers,
SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY age_group, loan, housing, "default"
ORDER BY subscription_rate DESC;
```

age_group	loan	housing	default	total_customers	subscribed	subscription_rate
60+	yes	no	default	52	22	42.31
60+	unknown	unknown	default	29	12	41.38
60+	no	yes	default	534	220	41.20
60+	yes	yes	default	109	44	40.37
60+	no	no	default	469	174	37.10
Under 30	yes	no	default	367	70	19.07
Under 30	no	yes	default	2490	420	16.87
Under 30	unknown	unknown	default	137	23	16.79
Under 30	no	no	default	2168	332	15.31
Under 30	yes	yes	default	507	77	15.19
50s	yes	yes	default	594	71	11.95
50s	yes	no	default	441	48	10.88
50s	unknown	unknown	default	170	18	10.59
30s	no	yes	default	7347	765	10.41
30s	no	no	default	6587	683	10.37
50s	no	yes	default	3017	310	10.28
50s	no	no	default	2640	250	9.47
30s	yes	yes	default	1548	144	9.30
40s	unknown	unknown	default	252	23	9.13
30s	yes	no	default	1054	92	8.73
40s	no	yes	default	4497	383	8.52
40s	yes	yes	default	933	73	7.82
30s	unknown	unknown	default	402	31	7.71
40s	no	no	default	4201	313	7.45
40s	yes	no	default	643	42	6.53

Outlier Campaign Customers (Over-Contacted)

- Earlier campaigns (lower numbers, e.g., 11–13) have some conversions, but overall conversion rates drop sharply as campaign numbers increase.
- Most higher-numbered campaigns (16+) show 0% conversion, indicating diminishing returns from repeated campaigns.
- Key takeaway: Running too many campaigns without refining targeting reduces effectiveness and wastes resources.

```
SELECT campaign,
       COUNT(*) AS total_customers,
       SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
       ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS conversion_rate
  FROM customers
 WHERE campaign > 10
 GROUP BY campaign
 ORDER BY campaign;
```

	campaign	total_customers	subscribed	conversion_rate
▶	11	177	12	6.78
	12	125	3	2.40
	13	92	4	4.35
	14	69	1	1.45
	15	51	2	3.92
	16	51	0	0.00
	17	58	4	6.90
	18	33	0	0.00
	19	26	0	0.00
	20	30	0	0.00
	21	24	0	0.00
	22	17	0	0.00
	23	16	1	6.25
	24	15	0	0.00
	25	8	0	0.00
	26	8	0	0.00
	27	11	0	0.00
	28	8	0	0.00
	29	10	0	0.00
	30	7	0	0.00
	31	7	0	0.00
	32	4	0	0.00
	33	4	0	0.00
	34	3	0	0.00
	35	5	0	0.00
	37	1	0	0.00
	39	1	0	0.00

Probability of Subscription by Credit Risk Status

- Customers with Moderate Debt have the highest subscription rate (11.6%), followed by High Debt (11.1%) and Low Risk (10.9%).
- Debt level has only a slight effect on subscription — customers with moderate or high debt are almost as likely, or slightly more likely, to subscribe than low-risk customers.

```
SELECT
    CASE
        WHEN "default"='yes' THEN 'Default Risk'
        WHEN loan='yes' AND housing='yes' THEN 'High Debt (Loan + Housing)'
        WHEN loan='yes' OR housing='yes' THEN 'Moderate Debt'
        ELSE 'Low Risk'
    END AS risk_group,
    COUNT(*) AS total_customers,
    SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) AS subscribed,
    ROUND(100.0 * SUM(CASE WHEN y='yes' THEN 1 ELSE 0 END) / COUNT(*),2) AS subscription_rate
FROM customers
GROUP BY risk_group
ORDER BY subscription_rate DESC;
```

risk_group	total_customers	subscribed	subscription_rate
Moderate Debt	20442	2372	11.60
High Debt (Loan + Housing)	3691	409	11.08
Low Risk	17055	1859	10.90

“Resistant” Customers (Contacted Many Times but Still No)

- Most customers are contacted 30–50 times in the dataset.
- High number of contacts does not guarantee conversion — we can drop these customers
- Over-contacting leads to diminishing returns and may even annoy customers

```
SELECT customer_id, campaign, y
FROM customers
WHERE campaign >= 10 AND y='no'
ORDER BY campaign DESC
LIMIT 20;
```

	customer_id	campaign	y
▶	4108	56	no
	18729	43	no
	13448	43	no
	4169	42	no
	5305	42	no
	11034	41	no
	11770	40	no
	18755	40	no
	4115	39	no
	11594	37	no
	18685	35	no
	18718	35	no
	10432	35	no
	4140	35	no
	13025	35	no
	18665	34	no
	17898	34	no
	12698	34	no
	18568	33	no
	12643	33	no
●	NULL	NULL	NULL

KEY TAKEAWAYS

- **Target high-potential groups:** Seniors, students, retired, university-educated, and previously successful customers.
- **Optimize campaign efforts:** Focus on cellular calls, longer call durations, and fewer targeted contacts.
- **Prioritize past successes:** Re-engage customers with prior positive outcomes for maximum ROI.
- **Avoid over-contacting:** More campaigns or repeated calls beyond 3–5 times yield diminishing returns
- **Loan & risk considerations:** Financial obligations have minor influence; moderate/high-risk segments still convert well.

Bottom Line:

Campaign success is driven more by customer profile, past engagement, and quality of contact than by financial risk or repeated outreach.