Bank Customer Churn Analysis

Project Objective

The objective of the Bank Customer Churn SQL project is to analyze customer behaviour and identify factors contributing to customer attrition. By leveraging SQL queries on a structured dataset, this project aims to extract meaningful insights into customer demographics, account activities, transaction patterns, and service interactions. The primary goal is to detect trends, flag high-risk customers, and pinpoint key indicators of churn. Ultimately, the insights will assist the bank in developing focused retention strategies, increasing customer satisfaction, and minimizing overall churn rates by addressing the root causes of customer disengagement.

Project Summary

A bank customer churn analysis was conducted using a dataset sourced from Kaggle. Three new tables were added to the database: active_customer, credit_card, and exit_customer. The tables were loaded into PostgreSQL and the analysis was performed entirely in PostgreSQL. Exploratory data analysis (EDA) was conducted, and useful insights were derived. Recommendations were then made to reduce customer churn. The analysis revealed that incentives need to be offered to customers who are at risk of churning, such as discounts, additional benefits, or personalized outreach. This includes customers with Fair or Poor credit scores, inactive customers, customers with credit cards, customers in Germany or France, customers who only use one product, customers who have been with the bank for 1 year, and customers in the age group of 41-50 and with a balance of 100,000-150,000.

Dataset Information

- **RowNumber** : corresponds to the record (row) number and has no effect on the output.
- **CustomerId** : contains random values and has no effect on customer leaving the bank.
- **Surname** : the surname of a customer has no impact on their decision to leave the bank.
- **CreditScore** : can have an effect on customer churn, since a customer with a higher credit score is less likely to leave the bank.
- **Credit score**:
    1. Excellent: 800–850
    2. Very Good: 740–799
    3. Good: 670–739
    4. Fair: 580–669
    5. Poor: 300–579
- **Geography** : customer's location.
- **Gender** : gender of the customer.
- **Age** : age of the customers.
- **Tenure** : refers to the number of years that the customer has been a client of the bank.
- **Balance** : amount currently available in the bank.
- **NumOfProducts** : refers to the number of products that a customer has purchased through the bank.
- **HasCrCard** : denotes whether or not a customer has a credit card. 1 represents credit card holder, 0 represents non credit card holder
- **IsActiveMember** : active customers are less likely to leave the bank. 1 represents Active Member, 0 represents Inactive Member
- **EstimatedSalary** : an estimate of the salary of the customer.
- **Exited** : whether or not the customer left the bank. 0 represents Retain, 1 represents Exit.

Queries Used

-- **Table Creation and Data Loading**

```sql
CREATE TABLE IF NOT EXISTS bank_churn
(
    RowNumber SERIAL,

    CustomerId INTEGER PRIMARY KEY,

    Surname VARCHAR(50) NOT NULL,

    CreditScore INTEGER NOT NULL,

    Geography VARCHAR(50),

    Gender VARCHAR(50),

    Age INTEGER,

    Tenure INTEGER,

    Balance FLOAT,

    NumOfProducts INTEGER,

    HasCrCard INTEGER,

    IsActiveMember INTEGER,

    EstimatedSalary FLOAT,

    Exited INTEGER
);


COPY Bank_Churn FROM 'D:\Projects\SQL Project\Bank Churn Project\Bank_Churn.csv' with CSV HEADER;


CREATE TABLE IF NOT EXISTS active_customer
(
    IsActiveMember INTEGER,

    Active_Category VARCHAR(10)
);
```

```sql
COPY Active_Customer FROM 'D:\Projects\SQL Project\Bank Churn Project\Active_Customer.csv'
with CSV HEADER;


CREATE TABLE IF NOT EXISTS credit_card
(
        HasCrCard INTEGER PRIMARY KEY,
        Credit_card VARCHAR(10)
);


COPY Credit_Card FROM 'D:\Projects\SQL Project\Bank Churn Project\Credit_card.csv' with CSV
HEADER;


CREATE TABLE IF NOT EXISTS exit_customer
(
Exited INTEGER PRIMARY KEY,
        Exit_category VARCHAR(10)
);
COPY Exit_Customer FROM 'D:\Projects\SQL Project\Bank Churn Project\Exit_Customer.csv' with CSV
HEADER;
```

-- **First Dataset look**

```sql
SELECT COUNT(*) AS Row_Count FROM bank_churn;

SELECT COUNT(*) AS Row_Count FROM active_customer;

SELECT COUNT(*) AS Row_Count FROM credit_card;

SELECT COUNT(*) AS Row_Count FROM exit_customer;
```

-- **Column count of bank_churn table**

```sql
SELECT COUNT(*) AS column_Count

FROM INFORMATION_SCHEMA.COLUMNS

WHERE TABLE_NAME = 'bank_churn';
```

-- Check Dataset Information of bank_churn table

*SELECT ***

FROM INFORMATION_SCHEMA.COLUMNS

WHERE TABLE_NAME = 'bank_churn';

-- Get column names with data type from bank_churn table

SELECT column_name,data_type

FROM INFORMATION_SCHEMA.COLUMNS

WHERE TABLE_NAME='bank_churn';

-- Calculating number of null values in each column

SELECT

  COUNT(CASE WHEN RowNumber IS NULL THEN 1 END) AS RowNumber_null_count,

  COUNT(CASE WHEN CustomerId IS NULL THEN 1 END) AS CustomerId_null_count,

  COUNT(CASE WHEN Surname IS NULL THEN 1 END) AS Surname_null_count,

  COUNT(CASE WHEN CreditScore IS NULL THEN 1 END) AS CreditScore_null_count,

  COUNT(CASE WHEN Geography IS NULL THEN 1 END) AS Geography_null_count,

  COUNT(CASE WHEN Gender IS NULL THEN 1 END) AS Gender_null_count,

  COUNT(CASE WHEN Age IS NULL THEN 1 END) AS Age_null_count,

  COUNT(CASE WHEN Tenure IS NULL THEN 1 END) AS Tenure_null_count,

  COUNT(CASE WHEN Balance IS NULL THEN 1 END) AS Balance_null_count,

  COUNT(CASE WHEN NumOfProducts IS NULL THEN 1 END) AS NumOfProducts_null_count,

  COUNT(CASE WHEN HasCrCard IS NULL THEN 1 END) AS HasCrCard_null_count,

  COUNT(CASE WHEN IsActiveMember IS NULL THEN 1 END) AS IsActiveMember_null_count,

  COUNT(CASE WHEN EstimatedSalary IS NULL THEN 1 END) AS EstimatedSalary_null_count,

  COUNT(CASE WHEN Exited IS NULL THEN 1 END) AS Exited_null_count

FROM bank_churn;

-- Dropping Unnecessary column like rownumber

ALTER TABLE bank_churn

DROP COLUMN rownumber;

-- Total customers of Bank

SELECT COUNT(*) AS total_customers

FROM bank_churn;

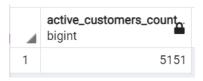|	total_customers bigint
1	10000

-- Total active members

SELECT COUNT(*) AS active_customers_count FROM bank_churn

INNER JOIN active_customer

ON bank_churn.IsActiveMember = active_customer.IsActiveMember

WHERE active_customer.active_category = 'Yes';

	active_customers_count bigint
1	5151

-- Total In-active members

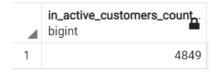*SELECT COUNT(*) - (SELECT COUNT(*) FROM bank_churn*

INNER JOIN active_customer

ON bank_churn.IsActiveMember = active_customer.IsActiveMember

WHERE active_customer.active_category = 'Yes')
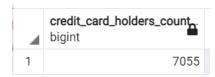
AS in_active_customers_count

FROM bank_churn;

	in_active_customers_count bigint
1	4849

-- Total credit card holders

SELECT COUNT(*) AS credit_card_holders_count FROM bank_churn

INNER JOIN credit_card

ON bank_churn.hascrcard = credit_card.hascrcard

WHERE credit_card.credit_card = 'Yes';

	credit_card_holders_count 🔒 bigint
1	7055

-- Total non-credit card holders

SELECT COUNT(*) AS non_credit_card_holders_count

FROM bank_churn

INNER JOIN credit_card

ON bank_churn.hascrcard = credit_card.hascrcard

WHERE credit_card.credit_card = 'No';

	non_credit_card_holders_count 🔒 bigint
1	2945

-- Total customers Exited

SELECT COUNT(*) AS customers_exited_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.exited = exit_customer.exited

WHERE exit_customer.exit_category = 'Yes';

	customers_exited_count 🔒 bigint
1	2037

-- Total retained customers

SELECT COUNT(*) AS customers_retained_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.exited = exit_customer.exited

WHERE exit_customer.exit_category = 'No';

	customers_retained_count 🔒 bigint
1	7963

-- Credit score type based on credit score

SELECT creditscore,

CASE

   WHEN creditscore >= 800 AND creditscore <= 850 THEN 'Excellent'

      WHEN creditscore >= 740 AND creditscore <= 799 THEN 'Very Good'

      WHEN creditscore >= 670 AND creditscore <= 739 THEN 'Good'

      WHEN creditscore >= 580 AND creditscore <= 669 THEN 'Fair'

      ELSE 'Poor'

END AS credit_score_type

FROM bank_churn

LIMIT 5;

	creditscore 🔒 integer	credit_score_type 🔒 text
1	619	Fair
2	608	Fair
3	502	Poor
4	699	Good
5	850	Excellent

-- Customer churn with respect to credit score type

SELECT

CASE

   WHEN creditscore >= 800 AND creditscore <= 850 THEN 'Excellent'

       WHEN creditscore >= 740 AND creditscore <= 799 THEN 'Very Good'

       WHEN creditscore >= 670 AND creditscore <= 739 THEN 'Good'

       WHEN creditscore >= 580 AND creditscore <= 669 THEN 'Fair'

       ELSE 'Poor'

END AS credit_score_type,COUNT(CustomerId)AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.Exited = exit_customer.Exited

WHERE exit_customer.exit_category = 'Yes'

GROUP BY credit_score_type

ORDER BY exit_customer_count DESC;

	credit_score_type text	exit_customer_count bigint
1	Fair	685
2	Poor	520
3	Good	452
4	Very Good	252
5	Excellent	128

This shows that the customers who have Fair and poor credit score type are more prone to exit bank and the customer who have credit score type as Excellent are least expected to exit the bank.

-- Customer churn with respect to whether the customer is an active member or not

SELECT Active_Category, COUNT(CustomerId)AS exit_customer_count FROM bank_churn

INNER JOIN exit_customer ON bank_churn.Exited = exit_customer.Exited

INNER JOIN active_customer ON bank_churn.IsActiveMember = active_customer.IsActiveMember

WHERE exit_customer.exit_category = 'Yes'

GROUP BY Active_Category

ORDER BY exit_customer_count DESC;

	active_category character varying (10)	exit_customer_count bigint
1	No	1302
2	Yes	735

This shows that the customers who are inactive have higher chance to exit bank than the ones who are active.

-- Customer churn with respect to HasCrCard

SELECT credit_card,COUNT(customerId) AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer ON bank_churn.Exited = exit_customer.Exited

INNER JOIN credit_card ON bank_churn.HasCrCard = credit_card.HasCrCard

WHERE exit_customer.exit_category = 'Yes'

GROUP BY credit_card

ORDER BY exit_customer_count DESC;

	credit_card character varying (10)	exit_customer_count bigint
1	Yes	1424
2	No	613

Customers who have credit card are more likely to exit bank as compared to who don't have credit card.

-- Customer churn with respect to Geography

SELECT geography,count(customerId) AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.exited = exit_customer.exited

WHERE exit_customer.exit_category= 'Yes'

GROUP BY geography

ORDER BY exit_customer_count DESC;

	geography character varying (50)	exit_customer_count bigint
1	Germany	814
2	France	810
3	Spain	413

Customers from Germany and France are most likely to exit the bank.

-- Customer churn with respect to Number of products

SELECT NumOfProducts,COUNT(customerId) AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.Exited = exit_customer.Exited

WHERE exit_customer.exit_category = 'Yes'

GROUP BY NumOfProducts

ORDER BY exit_customer_count DESC;

	numofproducts integer	exit_customer_count bigint
1	1	1409
2	2	348
3	3	220
4	4	60

Customers who avail only 1 product are most likely to exit the bank.

-- Customer churn with respect to Tenure

SELECT Tenure,COUNT(customerId) AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.Exited = exit_customer.Exited

WHERE exit_customer.exit_category = 'Yes'

GROUP BY Tenure

ORDER BY exit_customer_count DESC

LIMIT 5;

	tenure integer	exit_customer_count bigint
1	1	232
2	3	213
3	9	213
4	5	209
5	4	203

Customers who have a tenure of 1 year are most likely to exit the bank.

-- Customer churn with respect to age group

```sql
WITH CTE_1 AS
(
        SELECT *,
CASE
   WHEN age >= 18 AND age <= 20 THEN '18-20'
        WHEN age >= 21 AND age <= 30 THEN '21-30'
        WHEN age >= 31 AND age <= 40 THEN '31-40'
        WHEN age >= 41 AND age <= 50 THEN '41-50'
        WHEN age >= 51 AND age <= 60 THEN '51-60'
        ELSE '>60'
END AS age_group
FROM bank_churn
)
SELECT age_group,COUNT(CustomerId)AS exit_customer_count
FROM CTE_1
INNER JOIN exit_customer
ON CTE_1.Exited = exit_customer.Exited
WHERE exit_customer.exit_category = 'Yes'
GROUP BY age_group
ORDER BY exit_customer_count DESC;
```

	age_group text	exit_customer_count bigint
1	41-50	788
2	31-40	538
3	51-60	448
4	21-30	143
5	>60	115
6	18-20	5

Customers in the age group of 41-50 are most likely to exit the bank.

-- Customer churn with respect to balance group

```sql
WITH CTE_1 AS
(
        SELECT *,
CASE
   WHEN balance >= 0 AND balance <= 100000 THEN '0-100000'
        WHEN balance >= 100001 AND balance <= 150000 THEN '100000-150000'
        WHEN balance >= 150001 AND balance <= 200000 THEN '150001-200000'
        WHEN balance >= 200001 AND balance <= 250000 THEN '200001-250000'
        ELSE '>250000'
END AS balance_group
FROM bank_churn
)
,CTE_2 AS
(
SELECT balance_group,COUNT(CustomerId)AS exit_customer_count,
        DENSE_RANK() OVER(ORDER BY COUNT(CustomerId) DESC) AS rank
FROM CTE_1
INNER JOIN exit_customer
ON CTE_1.Exited = exit_customer.Exited
WHERE exit_customer.exit_category = 'Yes'
GROUP BY balance_group
)
SELECT balance_group, exit_customer_count
FROM CTE_2
WHERE rank = 1;
```

	balance_group 🔒 text	exit_customer_count 🔒 bigint
1	100000-150000	987

Customers in the balance group 100000-150000 are most likely to exit the bank.

-- Customer churn with respect to Gender

SELECT Gender,COUNT(customerId) AS exit_customer_count

FROM bank_churn

INNER JOIN exit_customer

ON bank_churn.Exited = exit_customer.Exited

WHERE exit_customer.exit_category = 'Yes'

GROUP BY Gender

ORDER BY exit_customer_count DESC;

	gender character varying (50)	exit_customer_count bigint
1	Female	1139
2	Male	898

Female customers are more likely to exit the bank in comparison to male customers. Since Female customers are having more tendency to exit the bank, so now studying the effect of other parameters on the female customers churn.

-- Effect of Geography leading to Female customers churn

CREATE EXTENSION tablefunc;

SELECT Gender,France,Germany,Spain

FROM CROSSTAB('SELECT Gender

        , Geography

        , COUNT(customerId) as exit_customer_count

        FROM Bank_churn

        INNER JOIN exit_customer

        ON Bank_churn.Exited = exit_customer.Exited

        WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

        GROUP BY Gender,Geography

        ORDER BY Gender,Geography',

        'VALUES (''France''), (''Germany''), (''Spain'')')

    AS final_result(Gender VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);

	gender character varying	france bigint	germany bigint	spain bigint
1	Female	460	448	231

Female Customers who are from France are most likely to exit bank.

-- Effect of credit score type and Geography leading to female customers churn

```sql
CREATE TEMPORARY TABLE credit_score AS

(SELECT *,

CASE    WHEN creditscore >= 800 AND creditscore <= 850 THEN 'Excellent'

        WHEN creditscore >= 740 AND creditscore <= 799 THEN 'Very Good'

        WHEN creditscore >= 670 AND creditscore <= 739 THEN 'Good'

        WHEN creditscore >= 580 AND creditscore <= 669 THEN 'Fair'

        ELSE 'Poor'

END AS credit_score_type FROM bank_churn);


SELECT credit_score_type,France,Germany,Spain

FROM CROSSTAB('SELECT credit_score_type

                , Geography

                , COUNT(customerId) as exit_customer_count

                 FROM credit_score

                 INNER JOIN exit_customer

                 ON credit_score.Exited = exit_customer.Exited

                 WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

                 GROUP BY credit_score_type,Geography

                 ORDER BY credit_score_type,Geography',

                 'VALUES (''France''), (''Germany''), (''Spain'')')

   AS final_result(credit_score_type VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);
```

	credit_score_type character varying	france bigint	germany bigint	spain bigint
1	Excellent	27	27	15
2	Fair	145	159	91
3	Good	109	97	53
4	Poor	120	101	50
5	Very Good	59	64	22

Female Customers having Fair credit score type and who are from Germany are most likely to exit bank.

-- Effect of age group and Geography leading to Female customers churn

```sql
CREATE TEMPORARY TABLE age_table AS

(        SELECT *,

CASE

    WHEN age >= 18 AND age <= 20 THEN '18-20'

        WHEN age >= 21 AND age <= 30 THEN '21-30'

        WHEN age >= 31 AND age <= 40 THEN '31-40'

        WHEN age >= 41 AND age <= 50 THEN '41-50'

        WHEN age >= 51 AND age <= 60 THEN '51-60'

        ELSE '>60'

END AS age_group

FROM bank_churn

);


SELECT age_group

, COALESCE(France, 0) AS France

, COALESCE(Germany, 0) AS Germany

, COALESCE(Spain, 0) AS Spain

FROM CROSSTAB('SELECT age_group

                , Geography

                , COUNT(customerId) as exit_customer_count

                FROM age_table

                INNER JOIN exit_customer

                ON age_table.Exited = exit_customer.Exited

                WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

                GROUP BY age_group,Geography

                ORDER BY age_group,Geography',

                'VALUES (''France''), (''Germany''), (''Spain'')')

    AS final_result(age_group VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);
```

	age_group character varying	france bigint	germany bigint	spain bigint
1	>60	28	27	9
2	18-20	0	2	0
3	21-30	28	31	26
4	31-40	130	120	55
5	41-50	164	173	91
6	51-60	110	95	50

Female customers in the age group of 41-50 who are from Germany are most likely to exit bank.

-- Effect of Tenure and Geography leading to Female customers churn

SELECT Tenure

, COALESCE(France, 0) AS France

, COALESCE(Germany, 0) AS Germany

, COALESCE(Spain, 0) AS Spain

FROM CROSSTAB('SELECT Tenure

　　　　, Geography

　　　　, COUNT(customerId) as exit_customer_count

　　　　FROM bank_churn

　　　　INNER JOIN exit_customer

　　　　ON bank_churn.Exited = exit_customer.Exited

　　　　WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

　　　　GROUP BY Tenure,Geography

　　　　ORDER BY Tenure,Geography',

　　　　'VALUES (''France''), (''Germany''), (''Spain'')')

　AS final_result(Tenure VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);

	tenure character varying	france bigint	germany bigint	spain bigint
1	0	24	20	11
2	1	49	57	24
3	2	55	31	27
4	3	50	43	26
5	4	47	40	20
6	5	41	54	29
7	6	35	44	27
8	7	39	37	24
9	8	35	51	23
10	9	51	45	14
11	10	34	26	6

Female customers with a tenure of 1 year and who are from Germany are most likely to exit bank.

-- Effect of having credit card and Geography leading to Female customers churn

SELECT Credit_card,France,Germany,Spain

    FROM CROSSTAB('SELECT Credit_card

        , Geography

        , COUNT(customerId) as exit_customer_count

        FROM bank_churn

        INNER JOIN exit_customer ON bank_churn.Exited = exit_customer.Exited

        INNER JOIN credit_card ON bank_churn.HasCrCard = credit_card.HasCrCard

        WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

        GROUP BY Credit_card,Geography

        ORDER BY Credit_card,Geography',

        'VALUES (''France''), (''Germany''), (''Spain'')')

    AS final_result(Credit_card VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);

	credit_card character varying	france bigint	germany bigint	spain bigint
1	No	139	131	74
2	Yes	321	317	157

Female customers with credit card and who are from France and Germany are most likely to exit bank.

-- Effect of active customer status and Geography leading to Female customers churn

SELECT Active_Category,France,Germany,Spain

FROM CROSSTAB('SELECT Active_Category

> *, Geography*

> *, COUNT(customerId) as exit_customer_count*

> *FROM bank_churn*

> *INNER JOIN exit_customer ON bank_churn.Exited = exit_customer.Exited*

> *INNER JOIN active_customer*

> *ON bank_churn.IsActiveMember = active_customer.IsActiveMember*

> *WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''*

> *GROUP BY Active_Category,Geography*

> *ORDER BY Active_Category,Geography',*

> *'VALUES (''France''), (''Germany''), (''Spain'')')*

> *AS final_result(Active_Category VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);*

	active_category character varying	france bigint	germany bigint	spain bigint
1	No	288	283	154
2	Yes	172	165	77

Female customers who are not active members and who are from France and Germany are most likely to exit bank.

-- Effect of balance group and Geography leading to Female customers churn

```sql
CREATE TEMPORARY TABLE balance_table AS

(SELECT *,

CASE    WHEN balance >= 0 AND balance <= 100000 THEN '0-100000'

        WHEN balance >= 100001 AND balance <= 150000 THEN '100000-150000'

        WHEN balance >= 150001 AND balance <= 200000 THEN '150001-200000'

        WHEN balance >= 200001 AND balance <= 250000 THEN '200001-250000'

        ELSE '>250000'

END AS balance_group

FROM bank_churn

 );


SELECT balance_group

, COALESCE(France, 0) AS France

, COALESCE(Germany, 0) AS Germany

, COALESCE(Spain, 0) AS Spain

FROM CROSSTAB('SELECT balance_group

                , Geography

                , COUNT(customerId) as exit_customer_count

                FROM balance_table

                INNER JOIN exit_customer

                ON balance_table.Exited = exit_customer.Exited

                WHERE exit_customer.exit_category = ''Yes'' AND gender = ''Female''

                GROUP BY balance_group,Geography

                ORDER BY balance_group,Geography',

                'VALUES (''France''), (''Germany''), (''Spain'')')

AS final_result(balance_group VARCHAR, France BIGINT, Germany BIGINT, Spain BIGINT);
```

	balance_group character varying	france bigint	germany bigint	spain bigint
1	0-100000	275	69	142
2	100000-150000	134	345	54
3	150001-200000	46	34	30
4	200001-250000	5	0	5

Female customers with account balance between 100000 and 150000 and who are from Germany are most likely to exit bank.

Insights

1. The customers who have Fair and poor credit score type are more prone to exit bank and the customer who have credit score type as Excellent are least expected to exit the bank.

2. The customers who are inactive have higher chance to exit bank than the ones who are active.

3. Customers who have credit card are more likely to exit bank as compared to who don't have credit card.

4. Customers from Germany and France are most likely to exit the bank.

5. Customers who avail only 1 product are most likely to exit the bank.

6. Customers who have a tenure of 1 year are most likely to exit the bank.

7. Customers in the age group of 41-50 are most likely to exit the bank.

8. Customers in the balance group 100000-150000 are most likely to exit the bank.

9. Female customers are more likely to exit the bank in comparison to male customers.

10. Female Customers who are from France are most likely to exit bank.

11. Female Customers having Fair credit score type and who are from Germany are most likely to exit bank.

12. Female customers in the age group of 41-50 who are from Germany are most likely to exit bank.

13. Female customers with a tenure of 1 year and who are from Germany are most likely to exit bank.

14. Female customers with a number of products as 1 and who are from Germany are most likely to exit bank.

15. Female customers with credit card and who are from France are most likely to exit bank.

16. Female customers who are not active members and who are from France are most likely to exit bank.

17. Female customers with account balance between 100000 and 150000 and who are from Germany are most likely to exit bank.

Recommendations

1. Target customers with Fair or Poor credit scores. These customers are more likely to churn, so it is important to focus on keeping them satisfied. This could involve offering them special incentives, such as discounts on interest rates or fees.

2. Offer incentives to inactive customers. Inactive customers are more likely to churn, so it is important to try to get them engaged again. This could involve sending them personalized emails or phone calls, or offering them special promotions.

3. Provide additional benefits to customers with credit cards. Customers with credit cards are more likely to churn, so it is important to provide them with additional benefits, such as rewards programs or extended warranties.

4. Focus on marketing to customers in Germany and France. These countries have the highest churn rates, so it is important to focus on marketing to customers in these areas. This could involve creating marketing materials that are specific to these countries, or running targeted advertising campaigns.

5. Offer more products and services to customers who only use one product. Customers who only use one product are more likely to churn, so it is important to offer them more options. This could involve offering them additional products, such as loans or investments, or providing them with access to more services, such as online banking or mobile banking.

6. Reach out to customers who have been with the bank for 1 year. Customers who have been with the bank for a certain number of years are more likely to churn, so it is important to reach out to them and see if there is anything the bank can do to keep them as customers. This could involve sending them a personalized email or phone call, or offering them a special promotion.

7. Target customers in the age group of 41-50 and with a balance of 100,000-150,000. These customers are more likely to churn, so it is important to target them specifically. This could involve offering them special products or services, or reaching out to them personally.

8. Churn rate is higher for female customers in comparison to male customers. so, Understand the needs of female customers,Women often have busy lives and need banks that offer flexible banking options, such as online banking,mobile banking, and ATMs. Women are often on a budget, so it is important to offer competitive rates