

FACTORS AFFECTING LOAN REJECTION

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01

PREPARING DATA

Build the database, import data, and review the data information

TABLE INFORMATION

FIELD	TYPE	DESCRIPTION
id	int – primary key	ID of clients
age	int	The age of client
income	double	The income of client per year
employment_year	double	The number of years the client has been employed
married	int	Marriage status (0. single and 1.married)
dependent	int	The number of dependents the client has
loan_amount	double	The amount of loan requested by the client
loan_term	int	The duration of the loan in years
credit_score	double	A numerical representation of the client's creditworthiness
existing_loan	int	The current number of loans client have to pay
debt_to_income	double	Debt to income ratio
payment_history	int	Payment history review (0. poor and 1. good)
loan_purpose	text	The reason for applying for the loan
approval	int	Approval status (0. rejected and 1. approved)

02

OVERVIEW

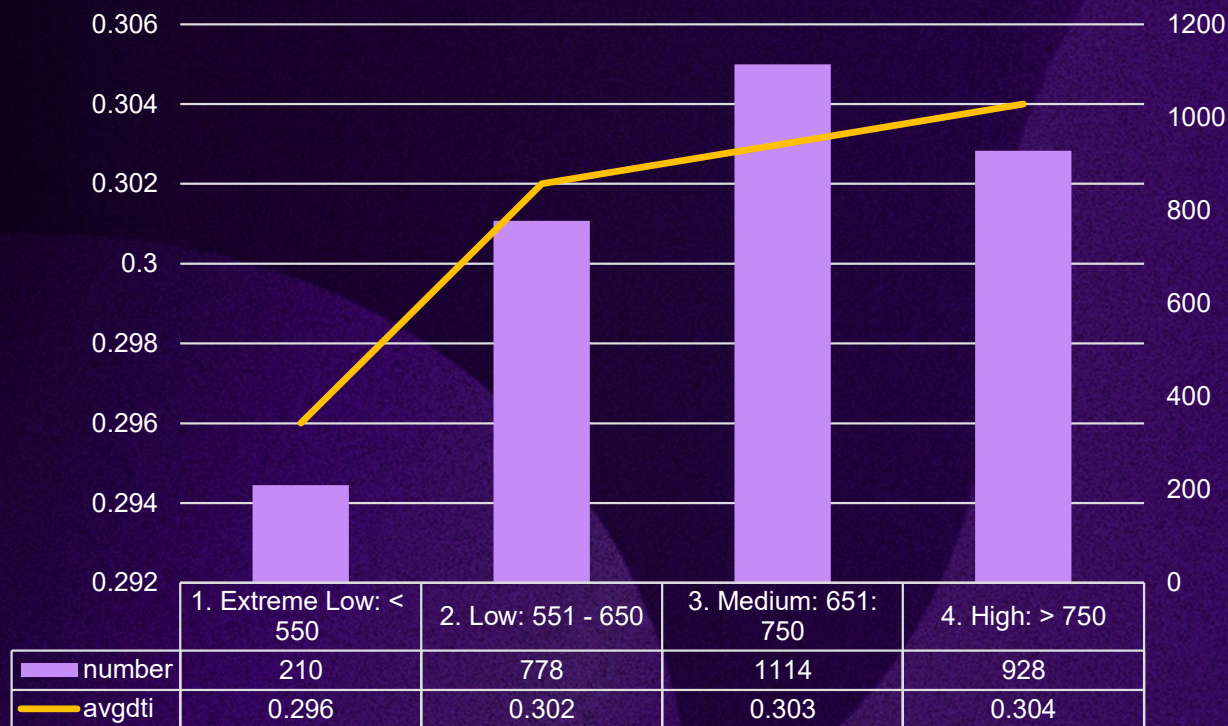
Consider some basic information about the loan data

1. Average of loan application metrics

###	Age	Income	Employment Year	Dependent	Loan Amount	Loan Term	Credit Score	Existing Loan	Debt to Income
Approved	45,114	62179,98	7,899	2,06	152894,9	12,901	703,201	1,087	0,296
Rejected	45,684	52609,61	6,976	2,136	162826,4	13,593	641,909	1,267	0,344

The data in two groups is **accurate** as reality.

2. Do people with good credit scores tend to borrow more?



The **higher** the credit score, the **more** people tend to borrow (number).

Because they tend to **borrow more**, their debt-to-income ratio (deb_to_income) also tends to **increase**.

3. New metric: DTI (debt-to-income) after borrowing

$$\text{new_dti} = (\text{income} * \text{debt_to_income} + \text{loan_amount} / \text{loan_term}) / \text{income}$$

As the New_DTI increases, the loan amount usually **increases** accordingly to ensure profitability.

"The **greater** the risk, the **greater** the reward."

In approved loans, a **low** New_DTI level (0.3 – 0.6) is usually chosen.

→ This **ensures** the customer can **repay** the debt.

new_debt_to_income_group	avg_loan	number
1. Safe: < 0.2	98807.256	118
2. Low: 0.2 - 0.6	135157.602	1537
3. Medium: 0.7 - 1	170414.111	545
4. High: 1.1 - 2	202545.744	301
5. Risk: > 2	170804.251	511

4. Analyzing common loan purposes by age group.

Young people with good credit scores often borrow for education.

The 25-65 age group typically borrows for business or debt consolidation.

→ This is the primary customers.

→ There should be policies that prioritize two groups.

Age scale	Avg loan amount	Avg credit score	Total loans	Most common loan purpose
1. Under 25	153591.529	702.251	241	Education
2. 25-35	158119.879	689.815	639	Business
3. 36-45	152867.588	694.667	647	Debt_Consolidation
4. 46-55	155928.197	692.163	633	Business
5. 56-65	152563.976	695.709	608	Debt_Consolidation
6. Above 65	149983.666	696.104	244	Education



03

FACTORS

Assess the factors influencing the decision to refuse.

FACTORS

- SAFETY FACTORS

- + Financial factors: **income**, **credit_score**, **history_payment**, **existing_loan**, **debt_to_income**

- + Demographic factors: **age**, **employment_year**, **married**, **dependent**

- PROFITABILITY FACTORS

- + Loan factor : **loan_amount**, **loan_term**, **loan_purpose**

THE EFFECTS OF FACTORS

- DOES **EVERY** FACTOR IMPACT THE DECISION-MAKING PROCESS?

- DO THE FACTORS **INTERACT WITH EACH OTHER**?

- WHICH FACTOR **PLAYS THE KEY ROLE** IN THE DECISION?

- TO **WHAT EXTENT** DOES EACH FACTOR CONSTRAIN THE DECISION?

5. Are **age** and **marital status** important factors in the evaluation criteria?

Age Scale	Married Approved	Unmarried Approved	Married Rejected	Unmarried Rejected
18–25	152	157	30	27
26–35	281	290	47	51
36–45	336	311	49	49
46–55	325	308	59	60
56–65	326	282	49	46
Over 65	130	114	32	29

The age group most commonly approved for loans is **36-55**.

Looking at the data **horizontally**, **marriage** does **not affect** loan approval (the data does not differ between the two groups regardless of whether they are married or not).

6. Is a **good payment history** considered a **positive** factor ?

Loan amount scale	Paid approved	Unpaid approved	Paied rejected	Unpaid rejected
Small: 0 - 100.000	624	97	94	18
Medium: 100.001 - 200.000	1324	239	188	46
Large: Over 200.000	648	80	152	30

A good payment history is generally **a plus**, with good payments being **six times** more common than poor payments within the approval group.

7. 8. 9. Which **factor** plays the **key** role?

Assume that **the optimal level** is the average value of the approved group.

→ Values **above this level** have a **higher** probability of **approval**.

We examine **the optimal values** of **each factor** group to see if any **rejected applications** actually **exceed** the **average** values of the **approved** group.

Example – Demographic factors:

- Age 36–55 (Q5)
- Seniority > optimal threshold +5%
- Number of dependents > optimal threshold +5%
- **Married** variable ignored (no impact – Q5)

Do any **rejected** cases still **surpass** these **optimal** levels?

The **more** exceptions found → the **weaker** the constraint from this factor group.

The **fewer** exceptions → the **stronger** the constraint from this group

LEVEL OF CONSTRAINTS OF FACTORS

Level of constrains	Safety factors		Profitability factors
	Demographic	Financial	Loan
Number	46	5	141
By Factors	0		

Level of constrains: **Financial factors** > **Demographic factors** > **Loan factors**.

Safety factors

> **Profitability factors**



04

IDENTIFYING THE GREY AREA

Identify areas where decision-making is difficult.

Combine **safety factors** with each other + **new DTI**, and **raise the thresholds**

5%



20%

age	Income	Employment year	Married	dependent	Loan amount	Loan term	Credit score	Existing loan	Debt to income	Payment history	Loan purpose	new_dti
47	63775.82273	10.07181042	0	1	159997.1663	7	633.041	0	0.345460331	1	Personal	0.704
39	82249.68906	13.87094083	1	2	53582.58047	3	670.188	0	0.349342422	1	Home	0.566
57	70729.453	9.390627448	0	0	145429.5366	10	657.025	1	0.351777286	1	Home	0.557
33	98954.59077	9.455259505	1	0	217515.424	10	590.233	0	0.253748395	1	Personal	0.474
53	76013.33979	11.14299747	1	0	170985.8891	15	672.847	0	0.310270212	1	Home	0.46
47	80618.72516	8.443031954	1	0	219524.9722	20	590.476	1	0.299571863	1	Debt_Consolidation	0.436
51	57553.73074	12.71507954	0	0	81925.67188	30	585.498	1	0.313072201	1	Business	0.361

CONCLUSION

1.

All factors affect the loan to some degree and influence each other (except for **marriage**).

2.

Business and debt consolidation are two common groups that require priority policies to boost sales.

3.

Impact level of factors:
Finance > **Demographics** > **Loan**
Safety > **Profitability**

4.

There are **still** gray areas, so lending criteria need **re-evaluating** for loan sales improvement

