



**MONTE
DEI PASCHI
DI SIENA
BANCA DAL 1472**

An approach to integrate generative
artificial intelligence into automated
credit decision-making processes

Credit Scoring and Credit Control XIX

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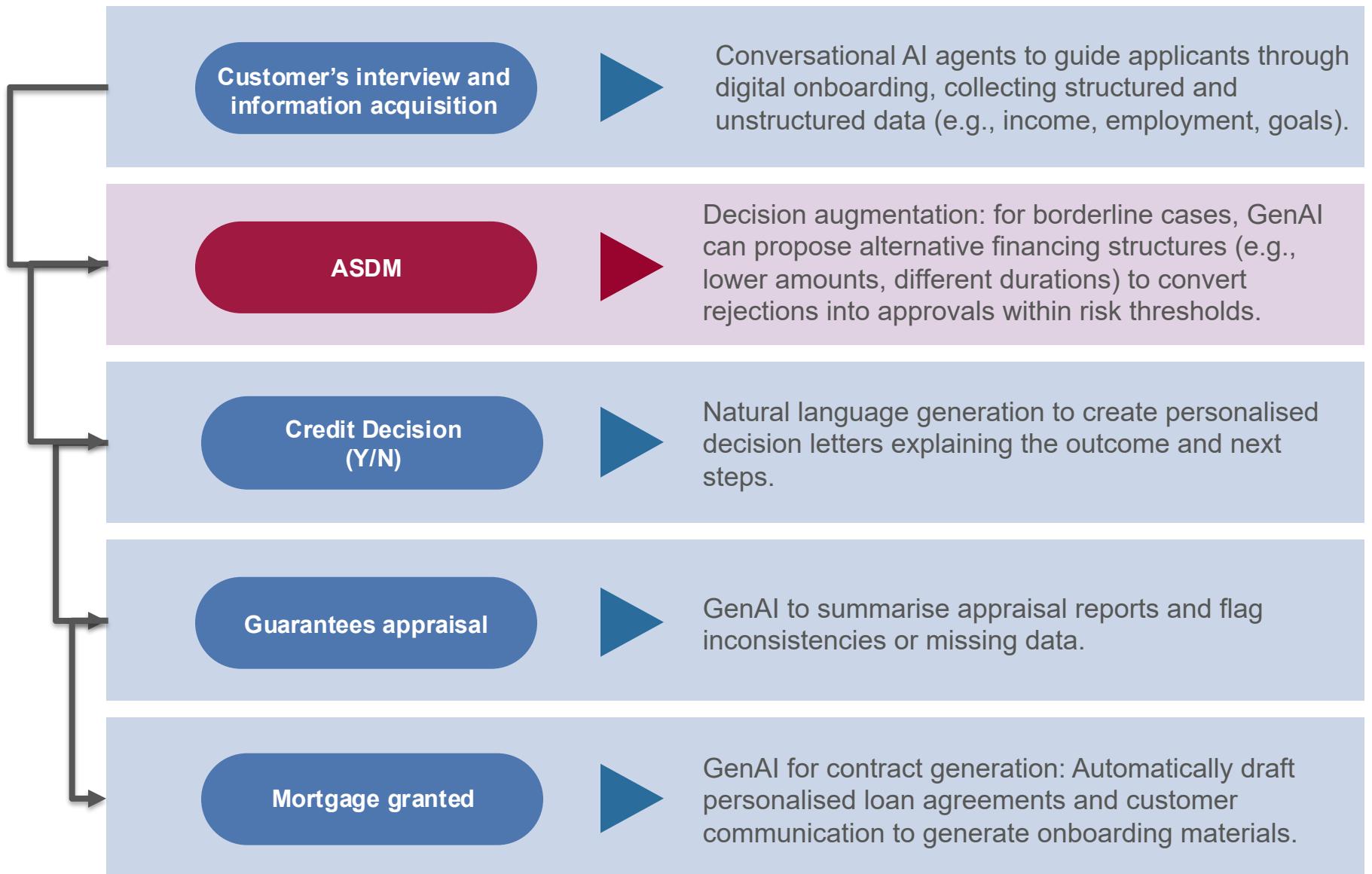
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Experian Decision Analytics

Driving Smarter Credit Decisions: Presentation Objectives

- We want to illustrate an approach to **integrating generative artificial intelligence tools**, GenAI, into the **credit origination process** suited for households seeking overdrafts, personal loans, and mortgages.
- In particular, we focus our attention on **the relationship between an automated decision-making system (ADSM) and Gen AI**; it evaluates financing requests and delivers three possible outcomes: approval (green), rejection (red), or the need for further assessment (yellow).
- Our goal is **to demonstrate how generative AI can enhance credit decision processes** by increasing approval rates while maintaining compliance with defined risk and profitability constraints.
- Our presentation will include a real-world example demonstrating how generative AI can be integrated into the credit decision process to illustrate the practical value of this approach.

1 Simplified steps in the mortgage origination process

How AI and GenAI boost it



Our current focus

1 Inside ADMS: A Tri-Component Framework for Credit Decisioning

Main properties

Sources

APPLICATION SCORE

- Score which estimates the intensity of the target event at each epoch since origination

- Target event may depend on the financial product
- Survival analysis to estimate the intensity of the target event at each epoch

AFFORDABILITY

- Score (unsupervised) which summarizes some variables linked to customer's affordability

- Debt/Plafond
- LTI
- DSTI
- LTV (for mortgage)
- Other variables linked to debt or income

CREDIT RULES

- Set of binary rules related to the customer's behavior

- Customer's behavior on internal data
- Customer's behavior on credit bureau

		Affordability score and rules		
		A	B	C
Application score and rules	A			
	B			
	C			



PROFITABILITY

- Random Net Present Value
Mean and standard deviation at customer and portfolio level



1 Net Present Value as a random variable

Main drivers

Statistical estimation and data sources

SOURCES OF RISK

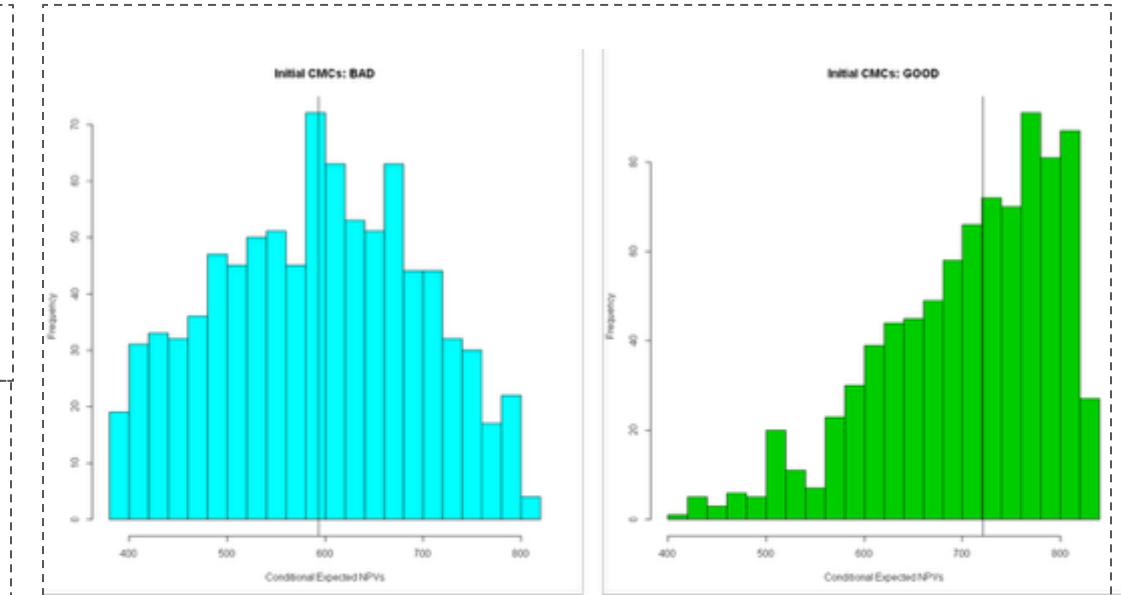
- Default
- Recovery rate
- Prepayment
- Competing Risks for default and prepayment

CREDIT MARKET CONDITIONS (CMC)

- Evolving according a Hidden Markov Chain having at least two states*
- Internal/System
- Estimation of the parameters for a HMM

PARAMETERS

- Discount rate (deterministic and fixed)
- Loan's financial parameters



Contractual NPV = €1,607
NPV Mean
Initial CMCs
Bad = €593 Good = €721

*L. Quirini, G. Mariani: Creditworthiness dynamics and Hidden Markov Models in volatile scenarios; in Credit Scoring and Credit Control XVIII

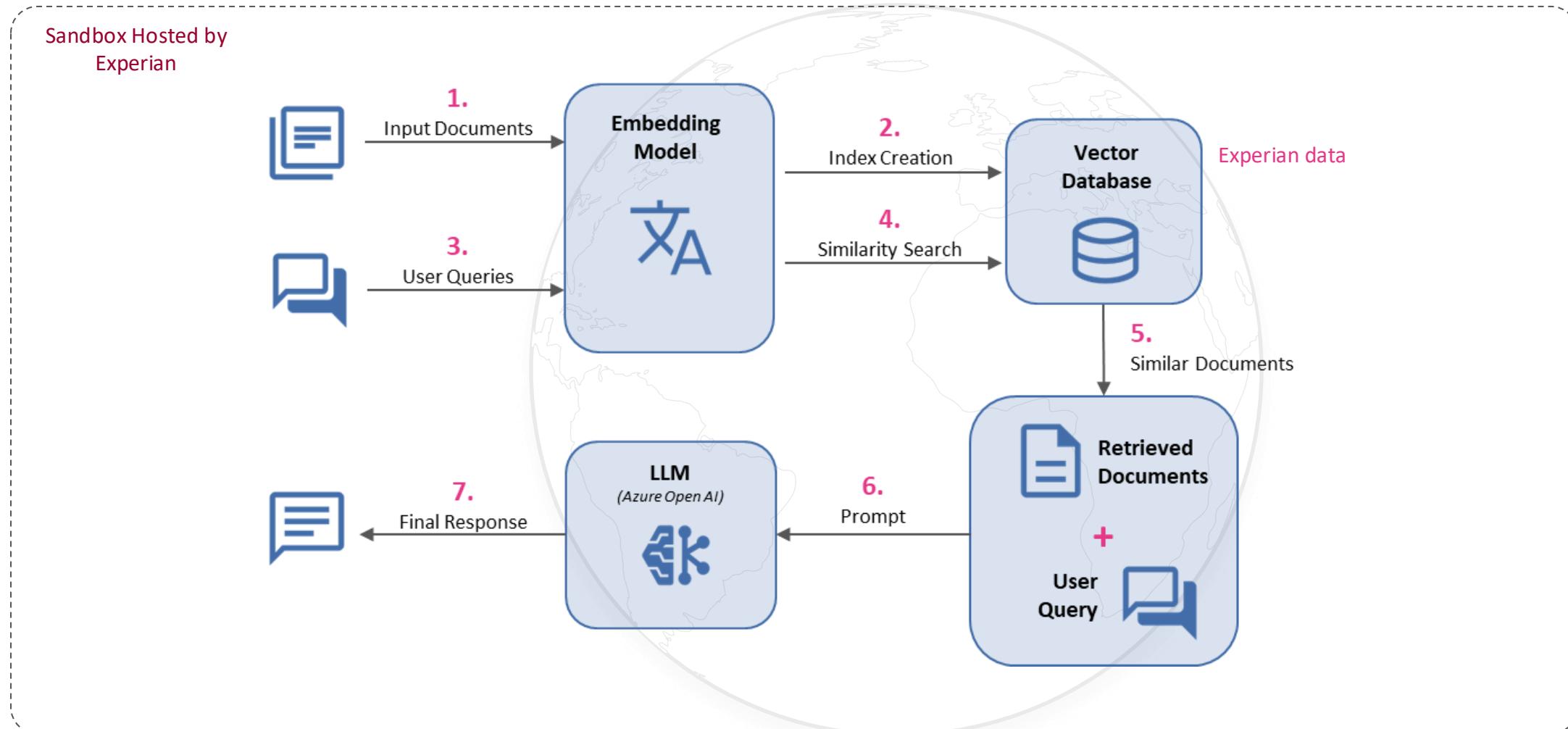
*Quirini, L., Vannucci, L., & Quirini, G.: Modelling Prepayment and Default under Changing Credit Market Conditions for a Net Present Value Analysis



2 ExperianGPT: RAG (Retrieval-Augmented Generation) from Experian



Experian has developed a RAG (Retrieval-Augmented Generation) architecture that integrates the generative capabilities of large language models (LLMs), such as GPT, with a robust orchestration layer. This system retrieves relevant information from internal databases and operates within a segregated sandbox environment, reinforced by ICT security safeguards to ensure data protection and compliance.



Experian's PROB Framework

Responses are evaluated on a scale from 0 to 10 based on adherence to the PROB criteria. If the score is below 7, users are advised to manually verify the response before making operational or regulatory decisions.

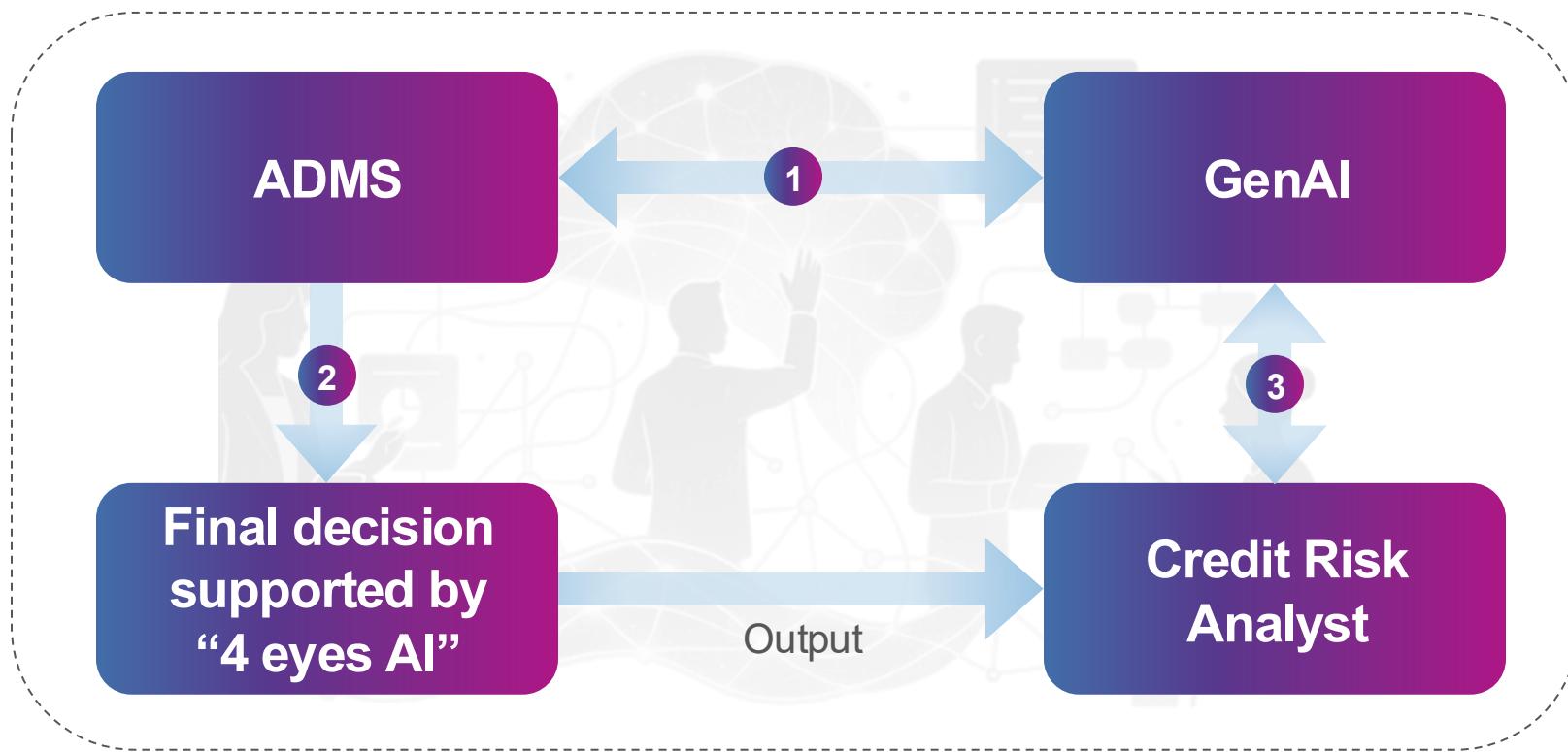
- **Provenance:** Ensure that the source of the information is credible and reliable.
- **Relevance:** Assess the pertinence of the information to the context or question.
- **Obsession with Consistency:** Maintain a high standard of logical consistency and coherence in the information provided.
- **Barrier to Extrapolation:** Prevent unjustified or speculative extrapolations beyond the available data.

Examples of domain limits

- The chatbot only responds to questions within the banking, regulatory, or credit domains.
- The chatbot does not produce programming code.



3 Integrating Generative AI into Automated Decision Systems



1 System to System

2 ADMS + AI

3 GenAI is designed for the credit analyst

3 A running example

DSTI (number)	Debt/ Plafond (number)	Debt on personal loans / Income (months)	Amount (euro)	Term (months)	APR (number)	Target event prob (year) (number)	Recovery rate (Number)	Discount rate (number)	RNPV mean (euro)
42%	87%	16	17000	60	0,0744	0,052	0,1	0,030	-373
33%	60%	13	17000	60	0,0744	0,043	0,1	0,030	-10
33%	60%	13	17000	60	0,0744	0,042	0,1	0,030	31
30%	60%	10	17000	60	0,0744	0,013	0,1	0,030	1261*



3 Real-world example : Meet the Credit Analyst Assistant

institution's ESG policies.

Summary Table

Key Indicator	Threshold/Benchmark	Risk Interpretation	Final Impact on Decision
Instalment Income Ratio	< 40%	Within acceptable limits	Positive
Debt Ceiling Ratio	< 50%	Within acceptable limits	Positive
Short-Term Debt/Income Ratio	< 12 months	Within ideal threshold	Positive
Expected Loss	N/A	€975	Positive
Affordability and Indebtedness	Regulatory compliance	Likely to meet additional financial obligations	Positive
Basel III/IV Guidelines	Adequate capital	No negative impact on capital adequacy	Positive
Environmental Impact	Sustainable projects	Positive contribution to reducing carbon emissions	Positive
Social Impact	Community benefits	Improved financial well-being of the borrower	Positive
Governance	Regulatory compliance	Alignment with ESG policies	Positive

Recommendation

Decision: Yes, I would approve this sustainable loan.

Rationale: The applicant's financial ratios are within acceptable limits, indicating a lower risk of default and better

Assistente al Deliberante 2.0: Assistente AI progettato per supportare i processi decisionali relativi alla concessione del credito bancario, come mutui e prestiti, secondo le normative europee e le politiche interne fornite.

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Misunderstanding of the present is the inevitable consequence of ignorance of the past
(Marc Bloch, 1886-1944)

