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FinTech and SME Credit in North Macedonia: Alternative-Data Risk Scoring Models and Regulatory Implications

Abstract

Small and medium-sized enterprises (SMEs) in North Macedonia remain strongly dependent on bank credit, while many firms face "thin-file" constraints that limit access to finance. FinTech-enabled lending and alternative-data credit scoring offer the potential to expand credit supply by reducing information asymmetries and improving predictive accuracy, yet they also introduce legal, governance, and consumer-protection risks—especially around privacy, explainability, bias, and model risk management. This study develops a structured framework for evaluating alternative-data scoring models for SME credit in North Macedonia and derives regulatory implications aligned with European supervisory expectations. Using standards-based control mapping (EBA Guidelines on loan origination and monitoring; World Bank credit scoring guidance; IMF supervisory approaches; BIS research on privacy regulation), the paper proposes proportionate rules for data governance, transparency, and risk controls. The results indicate that alternative data can enhance inclusion and portfolio quality when integrated with robust governance, while weak oversight risks discriminatory outcomes and systemic vulnerabilities.

Keywords: FinTech lending; SME finance; alternative data; credit scoring; regulation; North Macedonia; model governance

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1. Introduction

SMEs constitute the backbone of most emerging European economies, but their access to finance remains structurally constrained by limited collateral, volatile cash flows, incomplete financial statements, and informational opacity. These frictions are particularly acute in bank-dominated systems with shallow capital markets, where relationship lending and collateral-based underwriting remain prevalent. North Macedonia exhibits many of these characteristics, while also pursuing financial modernization and digital innovation. A recent "FinTech Strategy for Financial Regulators (2023–2027)" explicitly positions technological innovation as a lever for financial-system transformation, indicating increasing policy salience for FinTech business models and supervisory adaptation (Insurance Supervision Agency [MAPAS], 2023).

Within this context, FinTech and "alternative lending" models can potentially extend credit to underserved SMEs by augmenting or substituting traditional credit bureau and financial-statement inputs with alternative data sources (e.g., transaction data, e-commerce footprints, invoice and receivables information, utility payments, cash-flow proxies, and behavioral signals). The conceptual claim is that more granular and timely data reduces information asymmetry and improves risk discrimination—an argument increasingly supported by international evidence and policy guidance. The World Bank's credit scoring guidance highlights the evolution from conventional scorecards toward AI/ML methods and expanded data inputs, while cautioning about privacy, fairness, interpretability, and unintended consequences (World Bank Group, 2019a).

However, the same innovation that increases predictive capacity can undermine accountability. Alternative-data credit scoring raises four interlocking challenges:

1. **Data protection and lawful processing**: Alternative data frequently includes personal or commercially sensitive information, triggering compliance constraints and consent/legitimacy requirements, particularly where EU-aligned data protection regimes are applied contractually or through harmonization pathways (European Union, 2016).
2. **Fairness and discrimination risk**: Non-traditional variables may proxy protected characteristics, creating disparate impacts even without explicit intent (World Bank Group, 2019a).
3. **Explainability and adverse-action logic**: Credit decisions are high-impact; opaque models can degrade consumer protection and challenge contestability (Office of the Comptroller of the Currency et al., 2019).
4. **Model risk management and supervisory oversight**: ML models can drift under macroeconomic shocks; weak monitoring can amplify credit cycles and stability risks (International Monetary Fund [IMF], 2023a).

European supervisory expectations also matter, even outside the EU. For banks and credit institutions, the EBA Guidelines on loan origination and monitoring set demanding standards for data quality, creditworthiness assessment, governance, and monitoring across the lending lifecycle, effectively shaping "best practice" for underwriting in Europe and adjacent markets (European Banking Authority [EBA], 2020).

Research objectives and questions

This paper addresses the following research questions:

- **RQ1:** Which alternative-data scoring architectures are most suitable for SME credit in North Macedonia, given "thin-file" constraints and data availability?
- **RQ2:** What governance, risk, and compliance controls are necessary to ensure that alternative-data underwriting improves inclusion without undermining consumer protection and stability?
- **RQ3:** What proportionate regulatory approach can align domestic supervision with international standards (EBA/IMF/World Bank/BIS) while supporting innovation?

2. Materials and Methods

2.1 Research design

The paper applies a structured, standards-grounded analytical method combining: (i) policy and supervisory document analysis; (ii) comparative evidence synthesis on alternative-data scoring; and (iii) a control-mapping approach that translates regulatory expectations into operational requirements for lenders and supervisors.

2.2 Source corpus and analytical anchors

The framework is anchored in widely used, high-authority sources:

- **EBA Guidelines on loan origination and monitoring** (lifecycle governance for credit standards) (EBA, 2020).
- **World Bank credit scoring guidance** (data expansion, model risks, fairness and privacy constraints) (World Bank Group, 2019a).
- **IMF supervisory approaches for fintech regulation** (technology-neutral vs bespoke regulation; test-and-learn models) (IMF, 2023b).
- **BIS research on privacy regulation and fintech lending** (interaction of data rules, lending models, and market outcomes) (Bank for International Settlements [BIS], 2023).
- **North Macedonia regulator strategy document (2023–2027)** (local policy intent and regulatory modernization priorities) (MAPAS, 2023).

2.3 Model taxonomy for SME alternative-data scoring

Alternative-data scoring approaches are classified into four model families:

1. **Augmented traditional scorecards**: logistic regression/WOE models enriched with alternative variables (high interpretability).
2. **Tree-based ML models**: random forests/gradient boosting (higher accuracy; moderate explainability).
3. **Deep learning / representation models**: higher capacity; typically lower transparency; higher governance burden.
4. **Hybrid cash-flow underwriting**: transaction-based and invoice/receivables analytics combined with limited bureau and financial-statement data.

2.4 Control-mapping method

Controls are mapped across six domains:

- **Data governance** (lawful processing, lineage, quality, retention)
- **Model development** (validation, bias testing, documentation)
- **Decision transparency** (reason codes, adverse-action explanations)
- **Operational risk** (cybersecurity, third-party risk, resilience)
- **Portfolio monitoring** (drift, back-testing, stress sensitivity)
- **Consumer/SME protection** (complaints, contestability, proportionality)

2.5 Limitations

The paper proposes an implementable framework but does not use confidential bank loan-level datasets. It is designed to be used as a blueprint for supervisory pilots, industry sandboxes, or structured surveys.

3. Results

3.0 Overview

The synthesis indicates that alternative data is most valuable for SMEs with incomplete formal credit histories, but the value depends on (i) data reliability and stability, (ii) model governance maturity, and (iii) the supervisory perimeter and enforcement capacity.

3.1 Alternative-data scoring performance and risk

Alternative data improves credit assessment through two principal channels: (a) **information broadening** (new variables for thin-file firms), and (b) **timeliness** (high-frequency signals that react faster than annual statements). World Bank guidance emphasizes that innovations can improve accuracy and inclusion but also create privacy, fairness, interpretability, and bias risks—especially when models learn historical inequities (World Bank Group, 2019a). Empirical and conceptual literature likewise highlights that alternative data and AI may reallocate credit access, with distributional consequences that require governance guardrails (Truong, 2024).

For North Macedonia, practical alternative-data candidates for SME credit include: (i) **transaction account and POS flows** (banking data), (ii) **invoice and receivables** (supply-chain evidence), (iii) **utility and telecom payment regularity** (behavioral stability proxies), and (iv) **e-commerce sales history** where relevant. From a prudential perspective, the key is ensuring that each variable category is (1) legally collectable, (2) materially predictive, and (3) stable under stress.

A central risk is **proxy discrimination**—variables that correlate with protected characteristics or socioeconomic status, producing disparate impacts. A related risk is **model drift**: if macro conditions shift (e.g., inflation, demand shocks), alternative-data patterns may change faster than model update cycles, generating hidden deterioration. IMF research on fintech and stability underscores that fintech can enhance efficiency and transparency but can also amplify vulnerabilities (cyber risk, contagion channels, and correlated risk-taking) if not governed (IMF, 2023a).

Operational conclusion: the preferred architecture for early-stage scaling in North Macedonia is typically an **interpretable augmented scorecard** or **tree-based model with robust explainability**, embedded within a strong governance envelope, rather than opaque deep learning.

3.1.1 Regulatory implications and supervisory alignment

The regulatory design problem is to enable innovation while ensuring prudential soundness and fair treatment. The EBA Guidelines on loan origination and monitoring require robust creditworthiness assessment, governance, data quality, and lifecycle monitoring—standards that become harder, not easier, under AI-driven underwriting because the data perimeter expands and the model risk surface grows (EBA, 2020).

A proportionate regulatory approach for North Macedonia should include:

1. **Licensing clarity and perimeter definition**: identify when alternative lenders fall under banking, consumer credit, or payment-services regimes; avoid regulatory arbitrage. Local policy documents indicate active modernization; a coherent perimeter is necessary for credibility (MAPAS, 2023).
2. **Data protection alignment**: since EU-linked value chains increasingly require GDPR-style controls, lawful basis, purpose limitation, minimization, and data subject rights should be operationalized for credit scoring datasets (European Union, 2016).
3. **Transparency and contestability**: require meaningful "reason codes" for denials/limits, model documentation proportional to risk, and accessible complaint/appeal channels.
4. **Fairness governance**: mandate periodic disparate-impact testing and monitoring; restrict high-risk variable classes unless strong necessity and non-discrimination evidence is shown.
5. **Third-party and outsourcing control**: if a lender uses a scoring vendor, the vendor must be within an auditable governance chain, with clear accountability, model change logs, and incident reporting.

IMF guidance on supervisory approaches recommends technology-neutral regulation where products are traditional, but "test-and-learn" or bespoke approaches where new risks emerge. This supports a **supervised sandbox** model for alternative-data scoring—time-boxed pilots with reporting, governance testing, and staged scaling (IMF, 2023b).

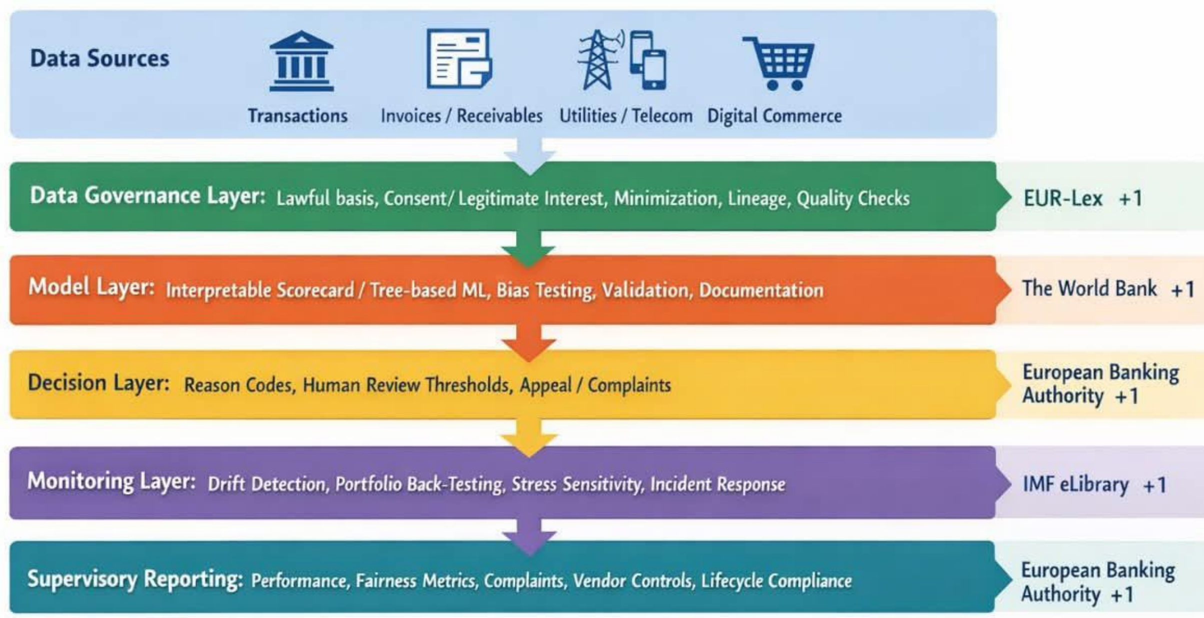

Figure 1. Alternative-data credit scoring governance model for SME lending (North Macedonia context)

Data sources (transactions, invoices/receivables, utilities/telecom, digital commerce)
→ Data governance layer (lawful basis, consent/legitimate interest, minimization, lineage, quality checks) (European Union, 2016)
→ Model layer (interpretable scorecard / tree-based ML; bias testing; validation; documentation) (World Bank Group, 2019a)
→ Decision layer (reason codes; human review thresholds; appeal/complaints) (EBA, 2020)
→ Monitoring layer (drift detection; portfolio back-testing; stress sensitivity; incident response) (IMF, 2023a)
→ Supervisory reporting (performance, fairness metrics, complaints, vendor controls; lifecycle compliance) (EBA, 2020)

Table 1

Table 1. Regulatory-control matrix for alternative-data SME lending (proportionate implementation)

Domain	Minimum requirement	Enhanced requirement (scaling stage)	Primary rationale
Data governance	lawful basis; purpose limitation; data minimization; retention controls	lineage tooling; independent audits; formal data-quality KPIs	privacy, reliability (European Union, 2016)
Creditworthiness assessment	documented underwriting policy; validation of key predictors	ML governance; challenger models; macro-adjustments	prudential soundness (EBA, 2020)
Explainability	reason codes; adverse decision explanations	explainability testing; documentation of limitations	consumer/SME protection (Office of the Comptroller of the Currency et al., 2019)
Fairness	periodic bias testing; proxy-variable review	continuous monitoring; fairness thresholds; remediation playbooks	discrimination risk (World Bank Group, 2019a)
Outsourcing/vendor risk	contract audit rights; change notification	full model audit trail; incident SLAs; exit plans	accountability (IMF, 2023b)
Monitoring	performance tracking; default migration analysis	drift detection; stress testing; scenario analysis	stability and resilience (IMF, 2023a)

4. Discussion

4.1 Managerial implications for lenders and SMEs

For lenders, the principal managerial shift is from static underwriting toward **continuous, data-driven credit management**. Alternative-data scoring can improve early warning signals and price risk more accurately, but only if governance is treated as a core production capability. The World Bank warns that lack of oversight can harm consumers and businesses, especially in markets with weaker supervisory capacity (World Bank Group, 2019a).

For SMEs, alternative data can reduce collateral dependence when cash-flow evidence is available. However, SMEs may face new obligations: providing structured digital records, consenting to data access, and maintaining reliable payment behavior that becomes “visible” to models. This can be positive for formalization but raises fairness concerns if digital traces systematically differ across sectors or regions.

4.2 Policy implications: proportionality and staged adoption

A proportionate approach is essential to avoid excluding smaller firms or driving lending into unregulated channels. The recommended policy configuration for North Macedonia is:

- **Stage 1 (pilot/sandbox)**: allow limited-scale alternative-data models with strict reporting and governance testing (IMF, 2023b).
- **Stage 2 (scaling)**: require standardized documentation, bias testing, and third-party audit rights; align underwriting lifecycle with EBA expectations (EBA, 2020).
- **Stage 3 (maturity)**: implement continuous monitoring, drift detection, and resilience frameworks; embed privacy-by-design and accountability structures consistent with GDPR principles and EU-adjacent requirements (European Union, 2016).

4.3 Financial stability and market structure considerations

IMF work emphasizes fintech's dual nature: it can diversify and improve access, but it can also introduce cyber and contagion channels and amplify correlated risk-taking (IMF, 2023a). For North Macedonia, where banking remains central, supervisors should ensure that fintech underwriting does not create "model monocultures" (many lenders using similar vendor models) that behave similarly in stress, increasing systemic procyclicality.

5. Conclusions

FinTech and alternative-data scoring can materially improve SME credit access in North Macedonia by reducing information asymmetry and enabling underwriting for thin-file firms. Yet the benefits are conditional on strong governance and regulatory clarity. The evidence base and international guidance converge on a practical rule: innovation must be accompanied by controls for privacy, fairness, explainability, vendor accountability, and model monitoring (World Bank Group, 2019a; EBA, 2020).

This paper provides a standards-based governance framework and a proportionate regulatory matrix that can be implemented through sandbox pilots and staged scaling. The recommended strategy is to align credit lifecycle practices with EBA expectations, adopt World Bank guidance on credit scoring risks, and implement IMF-recommended supervisory learning loops (EBA, 2020; World Bank Group, 2019a).

Patents

No patents are claimed in this study. The manuscript proposes governance frameworks, control matrices, and policy design recommendations based on publicly available standards and regulatory guidance. Potential patentable outputs could arise only from subsequent proprietary implementation (e.g., unique feature engineering pipelines, explainability modules, or drift-detection systems integrated into lending platforms). Such implementations would require distinct novelty claims and are beyond the scope of this academic work.

Supplementary Materials

Supplementary materials may include: (i) an SME alternative-data inventory template; (ii) a model documentation "card" for underwriting systems (data sources, validation, fairness tests, monitoring plan); (iii) a supervisory reporting template aligned with EBA lifecycle expectations; and (iv) a sample SME consent and transparency notice designed to operationalize GDPR-style principles (purpose limitation, minimization, retention, rights) in credit assessment.

Author Contributions

Etem Iseni: conceptualization; methodology; regulatory and literature review; development of governance framework; design of Figure 1 and Table 1; drafting, revision, and final approval of the manuscript.

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Institutional Review Board Statement

Not applicable. The study uses publicly available sources and does not involve human subjects or sensitive personal datasets.

Informed Consent Statement

Not applicable.

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Conflicts of Interest

The author declares no conflicts of interest.

Appendix A

Pilot (sandbox) evaluation checklist for alternative-data SME credit scoring

1. Define model purpose and target SME segment; document assumptions.
2. Inventory data sources; verify lawful basis, minimization, retention rules (European Union, 2016).
3. Validate predictive variables; test for proxy discrimination; document mitigations (World Bank Group, 2019a).
4. Require reason codes and decision explainability; test appeal workflow (Office of the Comptroller of the Currency et al., 2019).
5. Establish drift metrics; define recalibration triggers; perform stress sensitivity review (IMF, 2023a).

Appendix B

Model risk governance "minimum viable controls" for SME lending

- Independent validation before production; periodic revalidation.
- Change control with versioning and sign-offs (vendor or in-house).
- Monitoring dashboard for approval rates, default rates, and drift indicators.
- Disparate-impact checks and remediation plans.
- Outsourcing contracts granting audit rights, incident notification, and exit options (EBA, 2020).

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