Dynamic Credit Utilization Forecasting
-Predictive & Prescriptive Segmentation

Submitted by
Group 3

Conclusion And Recomendation

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Executive summary (what jumps out)

- The portfolio is dominated by **Moderate Users (4,475)** and **Revolvers (3,147)**; **Safe High Spenders are only 1,328**. Revolvers carry very high utilization (≈0.645) and almost never pay in full (≈0.009), which drives risk.
- Under the chosen stress (+200 bps, –15% full-pay behavior), **avg utilization rises from 0.474 → 0.570** and avg **risk_score ≈ 0.545**, with many Revolvers breaching 1× stressed utilization (over-limit behavior).
- The **prescription mix** skews conservative: **No change 60.8%**, **reductions 31.3%**, **upgrades 7.9%**; with current economics, net portfolio P&L is **negative (≈ –426,901)** because expected risk costs overwhelm incremental revenue. Focus upgrades on the safest sliver and contain exposure elsewhere.

Objective 1 — Segment customers into meaningful groups

What the data says

1. **Segments & behaviors.**
   - Moderate Users (4,475): avg_util ≈ 0.32, avg_full_pay ≈ 0.116.
   - Revolvers (3,147): avg_util ≈ 0.645 (very high), avg_full_pay ≈ 0.009 (almost none).
   - Safe High Spenders (1,328): avg_util ≈ 0.015, avg_full_pay ≈ 0.625 (very disciplined). This confirms clear, business-readable personas.

2. **Lifecycle profitability (0–12 months shown).**
   Among new customers, Moderate Users drive the largest revenue proxy (spend × 1.5%), but they also bring higher risk later—so they're valuable **only with guardrails**.
3. **Income bands are not strongly protective.**
   Utilization (~0.382–0.398) and full-pay (~0.142–0.158) look **surprisingly flat across income**—so policy should not rely on income alone.
4. **Cash-advance dependency hot-spots.**
   "East / Semi-Urban" and "West / Urban" appear as extreme outliers (very high cash-advance dependence), indicating either genuine behavior concentration **or** ratio inflation when purchases are near zero (division issue). Either way, these geos need attention.

What we recommend

- **Targeted growth:**
  - Keep **Safe High Spenders** engaged with richer limits and APR cuts (low loss risk, positive ROI).
  - For **Moderate Users**, split the herd: promote "low-risk moderates" (e.g., risk_score < 0.35) and hold/educate "higher-risk moderates."
- **Contain risk:**
  - **Revolvers:** keep/raise APR, freeze or reduce limits; offer installment plans / debt-restructuring to nudge better repayment behavior.
- **Geo/product playbooks:**
  - For cash-advance hot-spots, offer cheaper short-term credit alternatives and education; consider extra controls (e.g., cash-advance caps) until behavior improves.
- **Data hygiene:** cap or winsorize **CASH_ADVANCE / PURCHASES** to avoid exploding ratios from near-zero denominators; track a "capped dependency" metric for ops reporting.

🎯 Objective 2 — Forecast future credit utilization under stress

What the data says

1. **Stress settings used:** +200 bps APR, –15% full-pay behavior.
2. **Portfolio sensitivity:** avg utilization **0.474 → 0.570** under stress (+9.6 pp), avg risk_score ≈ **0.545**. The worst cases are Revolvers who jump well beyond 1× utilization (practically over-limit behavior).
3. **Where risk clusters:** elevated risk appears across multiple geos (e.g., East Rural/Semi-Urban; Central Urban; West Metro), so this isn't only a rural problem—**metros also show stress pockets**.

What we recommend

- **Early-warning watchlist:** auto-flag customers whose stressed utilization > 0.9 or risk_score > 0.7; feed this to collections/retention for proactive outreach.
- **Regional steering:** for high-risk geos, tighten underwriting (lower initial limits), add education, or deploy hardship/EMI offers early.
- **Scenario governance:** keep the stress parameter view as a single source of truth; run **mild / base / severe** scenarios in steering committees monthly.
- **If you add time-series later:** replace these SQL shocks with ML time-series forecasts of balance/repayment to get truer forward views.

🎯 Objective 3 — Recommend personalized credit strategies

What the data says

1. **Action mix is conservative by design.**
   No change 60.8%, **reductions 31.3%**, **upgrades 7.9%**, and avg risk aligns with this (reductions: ~0.829 risk; upgrades: ~0.323). This is sensible for a risk-heavy book.
2. **Business impact (current economics) is negative overall.**
   Only **Safe High Spenders** show positive net contribution; **Moderate Users** and **Revolvers** are deeply negative at current settings—total **net ≈ –426,901**.
3. **Upgrade pool is small (≈97 primary candidates).**
   These are mainly lower-risk moderates with mid utilization; great pilot group for growth with tight guardrails.
4. **APR ladder looks directionally fair.**
   APR cuts concentrate in **Safe High Spenders** across income bands; hikes concentrate in **Revolvers**—consistent with risk-based pricing principles.

What we recommend

- **Do upgrades, but only where math is clearly positive:**
  - Restrict to **risk_score ≤ 0.35** and **base utilization between ~0.20–0.60** with good payment behavior. Use the existing shortlist for the first pilot.
- **Tighten where losses dominate:**
  - **Revolvers:** default stance is reduce/freeze limit and raise APR; pair with structured installment offers to improve outcomes (and NPS).
  - **Moderate Users** with risk_score ≥ 0.6: hold limits steady, add nudges (autopay, statement reminders) before considering cuts.
- **Tune the economics to find the break-even:**
  - Sensitivity-test **interchange_rate**, **spend_elasticity**, **LGD**—your net P&L is currently negative; small tweaks (or better response targeting) may flip specific sub-pools to positive.
- **Operationalize with guardrails:**
  - For any upgrade, set **hard caps** (e.g., +10% limit) if stressed utilization would exceed 0.85; auto-cancel upgrades if risk_score rises >0.5 before issuance.
- **Measure and iterate:**
  - Define win metrics (incremental spend, delinquency, roll-rate) and run A/B pilots on the 97 candidates to validate elasticity and safety before scaling.

Final notes & next steps

- **Add ML for step-change lift:**
  - **Unsupervised**: K-means on the gold feature set to reveal finer micro-segments (beyond rules).
  - **Supervised**: response-to-upgrade model and default-risk model to move from rules → truly personalized limits/APR.
- **Governance:** keep the **stress_params** and **kpi_params** as the single source of truth; schedule monthly scenario and P&L reviews with Risk/Finance.