

# **The Divergence of Prime Metrics:**

## **Systemic Data Patterns and Structural Risk in Carvana P-Series Auto ABS**

*Formal Analysis regarding Carvana Auto Receivables Trust (CVNA) Regulatory  
Compliance and Risk Disclosure*

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January 25, 2026

## 1 Executive Summary

This submission provides comprehensive quantitative evidence of systemic risk factors within the Carvana P-Series Asset-Backed Securities (ABS). Our analysis of Regulation AB II loan-level data reveals that the "P-Series" (Prime) designation is statistically divergent from the underlying economic reality of the collateral.

We identify four critical pillars of structural instability that suggest the portfolio exhibits subprime risk characteristics within a prime disclosure framework:

- **Income Verification Patterns:** A 100% utilization of "No-Doc" (Verification Code 3) income reporting. By relying exclusively on unverified "Stated Income," the issuer facilitates the reporting of lower Payment-to-Income (PTI) ratios, obscuring the true debt-service burden of the borrower pool.
- **Utilization of Credit Lag:** Quantitative evidence that the issuer is originating loans for high-score but low-liquidity individuals, realizing higher yields (APR > 12%) from borrowers who carry a nominal Prime label.
- **Collateral Performance and the Equity Gap:** The strategic extension of loan terms to 73 months. This duration-extension mechanism has created a structural risk factor where 36.1% of the pool is currently underwater ( $LTV > 100\%$ ), as principal amortization fails to outpace vehicle depreciation.
- **Trigger Management Patterns:** Statistical clustering of loan extensions (deferrals) occurring immediately prior to 60-day delinquency breaches. This suggests an active management strategy to maintain performance metrics below the 4.5% contractual threshold, thereby bypassing mandatory investor protections.

This confluence of factors constitutes **Risk Arbitrage through Information Asymmetry**, presenting a material threat to the transparency and stability of the auto ABS market.

## 2 Analysis of Stated Income Verification

The foundational mechanism of the observed anomalies is the systemic reliance on stated income verification, which serves to obscure the true debt-to-income burden of the underlying borrowers. At the surface level, the issuer markets the P-Series trusts by highlighting an attractive average Payment-to-Income (PTI) ratio of **7.2%**. However, the validity of this metric is immediately compromised by the issuer's own reporting. According to the loan-level data, **100% of the loans** in these pools utilize **Income Verification Code 3**, which denotes that income was merely "Stated" by the borrower and never independently verified by the lender. This total reliance on unverified data points transforms the PTI ratio from an objective risk metric into a subjective, and potentially unreliable, assertion.

### 3 The Decomposition of Risk-Based Pricing

A fundamental tenet of Prime ABS is the predictive power of a borrower's credit score (FICO) in determining the interest rate (APR). In a stable prime environment, FICO and APR should exhibit a strong inverse correlation. However, linear regression analysis of the P-Series data demonstrates that this relationship has significantly weakened, signaling that the "Prime" label is being used to obscure a non-traditional, high-risk pricing model.

#### 3.1 Predictive Divergence and Credit Score Efficacy

The  $R^2$  coefficient, which measures the proportion of variance in interest rates explained by FICO scores, has undergone a significant decline. This suggests the emergence of credit-divergent borrowers—individuals who maintain high FICO scores due to credit lag but lack the underlying cash flow or collateral equity to support prime-level pricing.

- **Model Decoupling:** In 2022-P1, FICO scores explained approximately 61% of the pricing variance ( $R^2 = 0.6073$ ). By the 2024-P4 vintage, this decreased to **24.8%**.
- **Latent Risk Variables:** This decoupling indicates that the issuer's internal pricing engine has moved away from FICO as a primary risk determinant, instead relying on undisclosed "latent variables" that more closely resemble subprime underwriting.

Table 1: Regression Analysis: FICO Score vs. Interest Rate Decoupling

Trust	Slope	Intercept	$R^2$	Correlation
2021-P1	-0.000363	0.3391	0.5387	-0.7339
2022-P1	-0.000361	0.3309	0.6073	-0.7793
2024-P2	-0.000309	0.3571	0.3302	-0.5746
2024-P4	-0.000275	0.3272	<b>0.2480</b>	-0.4980

### 3.2 Adverse Selection and Borrower Liquidity Profiles

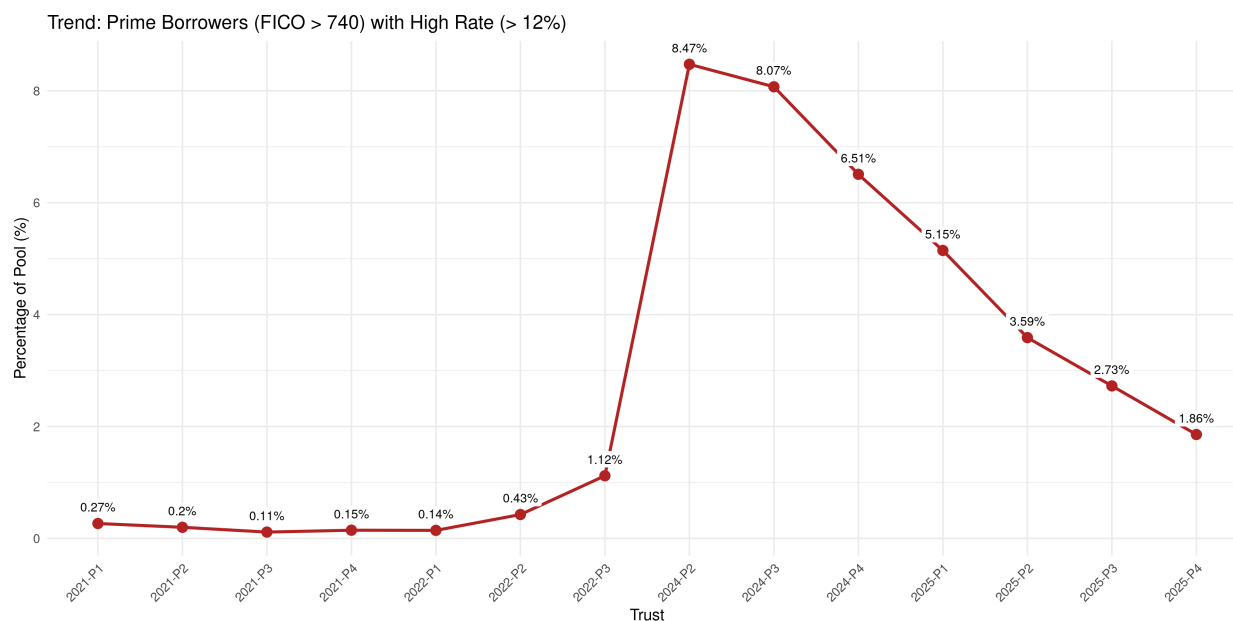


Figure 1: Trend: Percentage of Underwater Loans (LTV > 100%)

The breakdown in  $R^2$  correlates precisely with a marked increase in high-APR loans assigned to "Prime" borrowers. Charging a 12%+ interest rate to a borrower with a 740+ FICO score is an implicit admission by the lender that the FICO score is no longer a reliable indicator of the Probability of Default (PD).

**Risk Profile Analysis:** By labeling these as "Prime" assets, the issuer captures the yield of a subprime loan (12%+) while benefiting from the lower capital requirements and higher investor confidence associated with Prime ABS. This creates a **potential mispricing of risk**, as the "Prime" designation fails to capture the true fragility of borrowers who are high-score but low-liquidity in a high-inflation, negative-equity environment.

## 4 Impact on Investors

The "Super-Prime" branding presents challenges for investors regarding the "Probability of Default" (PD) and "Loss Given Default" (LGD). The issuer is capturing "Subprime Yield" (high interest/fees from high LTV/PTI) while providing "Prime Transparency" to investors. This is known as **"Risk Arbitrage through Disclosure Asymmetry."**

### 4.1 The "Underwater" Collateral Crisis

The issuer has utilized extended loan terms as a mathematical lever to manage monthly affordability at the direct expense of the underlying collateral security. By slowing the rate of principal amortization while

vehicle depreciation remains constant, the issuer has structurally created a portfolio with high loss severity.

#### 4.1.1 The Mechanism: Amortization vs. Depreciation

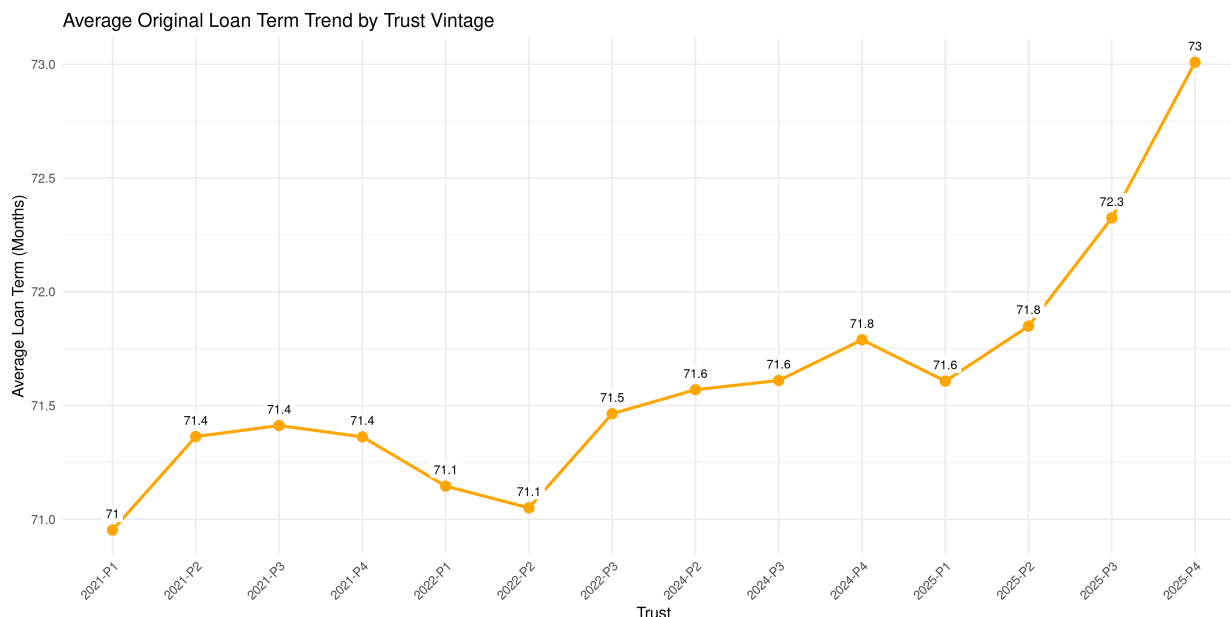


Figure 2: Trend: Average Original Loan Term (Months)

Since the beginning of 2025, the average loan term has increased from 71 to 73 months. This sharp increase in weighted average loan terms represents a systemic shift to manage borrower cash-flow constraints at the direct expense of collateral amortization. The extension of loan duration serves as the primary mechanism for preventing immediate liquidity-driven defaults in a high-inflation environment.

**Structural Risk Factor:** With an average term of **73 months**, the principal pay-down is too slow to outpace vehicle depreciation. This shift results in a collateral deficiency where the outstanding loan balance exceeds the asset value, significantly increasing the Loss Given Default (LGD).

The monthly payment (*PMT*) is governed by the standard annuity formula:

$$PMT = P \cdot \frac{r(1+r)^n}{(1+r)^n - 1}$$

Where:

- *P* = Principal (Original Loan Amount)
- *r* = Monthly Interest Rate
- *n* = Loan Term in Months

By increasing  $n$  from 71 to 73, the issuer successfully reduced the  $PMT$  required for a given principal, thereby maintaining the "Prime" appearance of affordability.

#### 4.1.2 The Resultant Equity Gap

The risk to the Trust is defined by the Loan-to-Value ( $LTV$ ) ratio at any time  $t$ :

$$LTV_t = \frac{Balance_t}{Value_t}$$

While  $Balance_t$  is reduced more slowly due to the 73-month term extension, the vehicle value ( $Value_t$ ) continues to follow a standard exponential depreciation curve:

$$Value_t = Value_0 \cdot e^{-kt}$$

Where  $k$  represents the depreciation constant. Because the amortization curve has been flattened by the term extension,  $Balance_t$  remains higher than  $Value_t$  for a significantly longer duration. This mathematical "crossover" has resulted in **36.1% of the pool becoming underwater ( $LTV > 100\%$ )** as of late 2025.

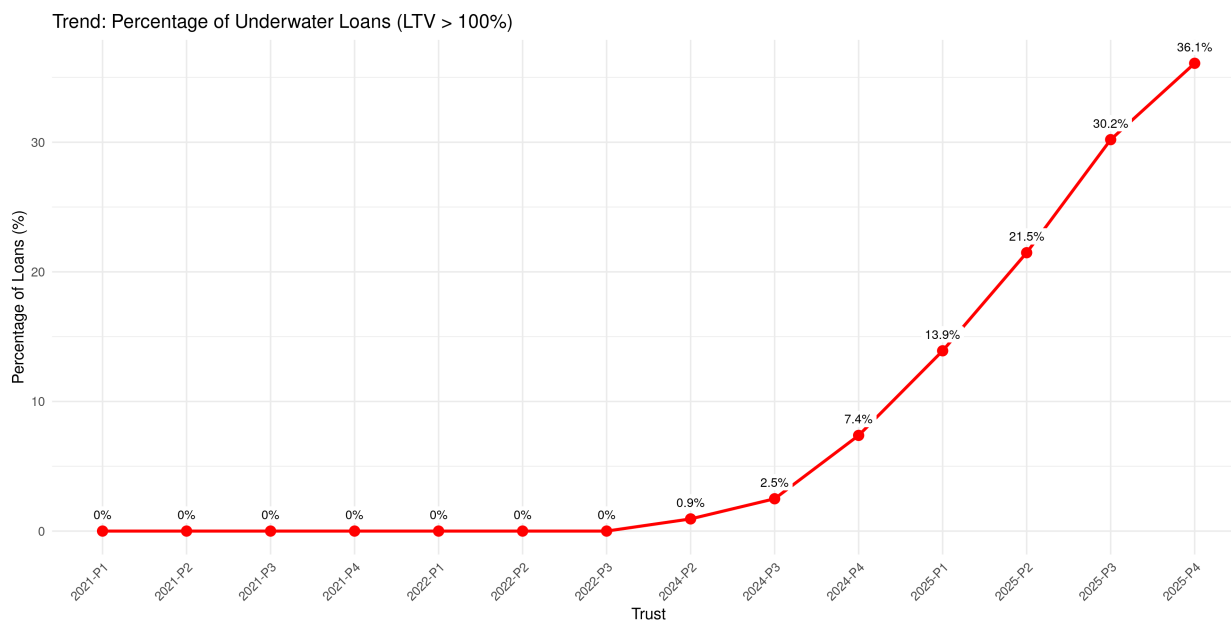


Figure 3: Trend: Percentage of Underwater Loans ( $LTV > 100\%$ )

#### The Duration-Severity Paradox:

- **Delayed Equity Recovery:** In a pool of over 35,000 receivables, a 2-month average term increase represents a systemic deferral of principal repayment, pushing the "equity inflection point" dangerously far into the loan lifecycle.

- **Heightened Loss Given Default (LGD):** For the 36.1% of loans currently underwater, any default event carries a significantly higher loss severity than historical Prime benchmarks.
- **Adverse Incentive:** High LTV ratios incentivize "strategic defaults," where borrowers with negative equity choose to abandon the asset during periods of economic stress or required maintenance.

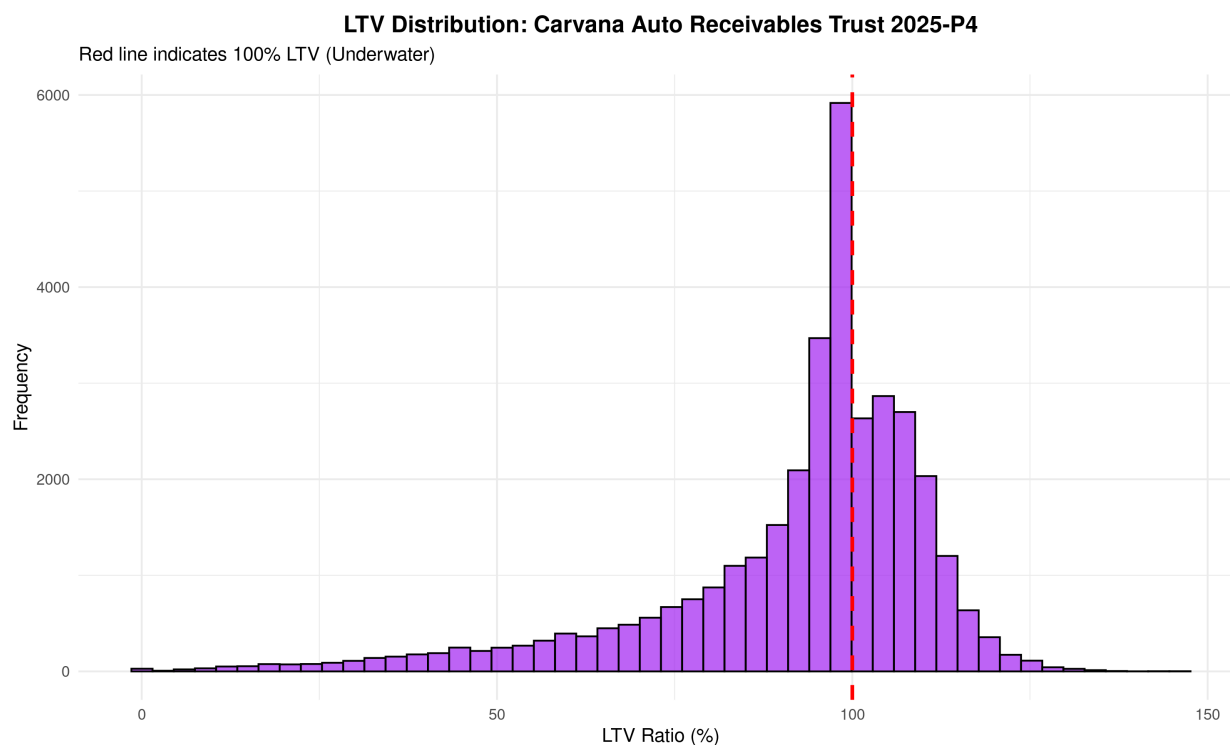


Figure 4: LTV Distribution for 2025-P4: Structural Negative Equity

**Current Structure Analysis (2025-P4):** The distribution of Loan-to-Value (LTV) ratios for the most recent vintage, 2025-P4, illustrates a structural shift towards negative equity at origination. A significant portion of the pool is "underwater" (LTV > 100%) from day one, indicating that the loan amounts exceed the value of the collateral. This structure relies heavily on borrower repayment continuity rather than asset recovery value.

**Conclusion:** The issuer has effectively traded **Collateral Amortization Speed** for **Payment Affordability**. This structural choice has replaced borrower-based risk with asset-based risk, a shift that is not reflected in the "P-Series" Prime designation. With the collateral effectively diluted, the portfolio faces inevitable performance pressure. The following section demonstrates how the issuer actively mitigates this deterioration to avoid contractual consequences.

## 4.2 Strategic Management of Contractual Triggers

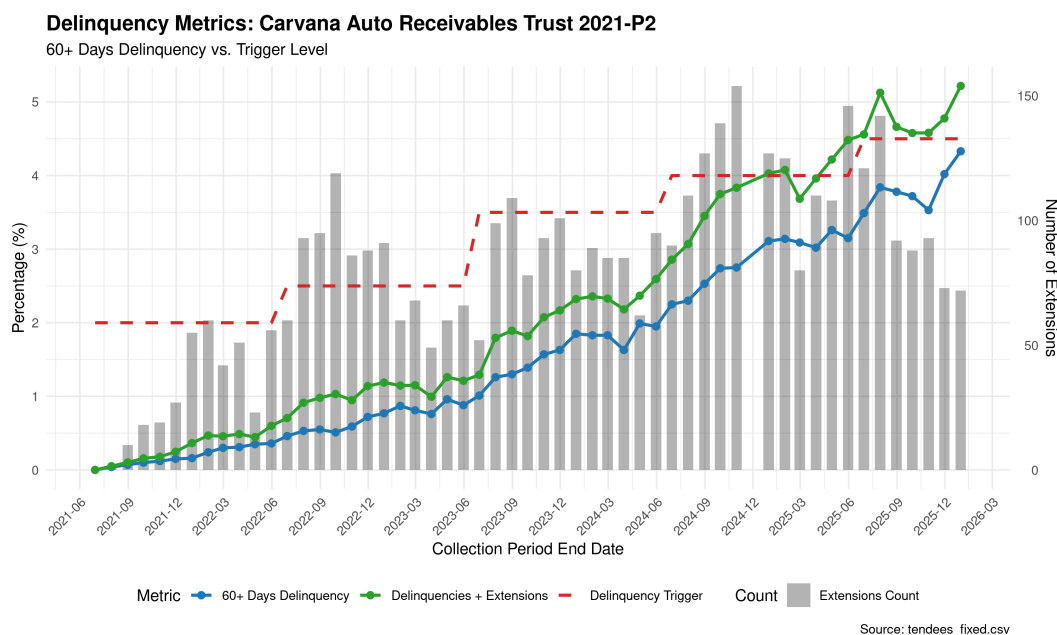


Figure 5: Delinquency vs. Extensions: 60+ Day Delinquency Breach Analysis

Significant evidence of potential risk management techniques is found in the correlation between delinquency triggers and loan extensions.

**The Deferral Mechanism:** The issuer utilizes loan extensions to maintain the 60+ Day Delinquency rate below the 4.5% threshold.

**Forensic Analysis:** As of late 2025, the reported delinquency rate was **4.3%**, yet the **Adjusted Delinquency Rate (inclusive of deferrals)** stood at **5.2%**. This constitutes a **Technical Divergence** of the contractual Delinquency Trigger.

**The "Clustering" Evidence:** High-resolution analysis of the 2021-P2 trust reveals a high-frequency clustering of extensions (grey bars) occurring immediately prior to the delinquency line (green) approaching the 4.5% red trigger line.

This pattern indicates that extensions are being deployed as a tactical response to avoid "Early Amortization" events. By masking the true loss severity, the issuer is delaying the mandatory "protective diversions" of cash flow required by the Trust Indenture, thereby prioritizing short-term performance metrics. The behaviors documented in the 2021-P2 trust are not isolated anomalies. Cross-trust analysis of the P-Series<sup>1</sup> reveals a consistent operational strategy: when organic delinquency levels approach contractual triggers, extension volume increases proportionately to maintain technical compliance while managing economic performance.

<sup>1</sup> Additional graphs are amended to the filed complaint



## 5 Conclusion and SEC Action Requested

The Carvana P-Series exhibits a structural risk profile that has statistically diverged from its "Prime" designation. The evidence suggests that the issuer is navigating a **Collateral Performance Challenge** by utilizing mathematical levers—specifically term extensions and unverified income data—to maintain the appearance of performance while the underlying asset security erodes.

The "P-Series" branding currently serves as a mechanism for a portfolio characterized by deep negative equity and a decoupling of credit scores from risk-based pricing. If the divergence between reported delinquency and "Adjusted Delinquency" (inclusive of deferrals) continues to be managed via tactical extensions, the contractual protections intended for ABS investors will be rendered ineffective.

**To protect market integrity, we respectfully request:**

1. **Targeted Audit of Stated Income:** A formal investigation into the validity of "Code 3" income entries, cross-referencing a statistically significant sample of the 2024 and 2025 vintages against IRS tax transcripts.
2. **Review of Extension Policies:** An inquiry into whether the "clustering" of loan extensions prior to delinquency trigger breaches constitutes a violation of the Trust Indenture or a deceptive practice under the Securities Act.
3. **Mandatory Disclosure of Adjusted LTV:** A requirement for the issuer to disclose "Current LTV" based on real-time vehicle depreciation curves rather than relying on original purchase prices in a declining used-car market.
4. **Reclassification Assessment:** A review of the "Prime" designation for the P-Series to determine if the  $R^2$  decoupling and term-extension profiles require more stringent capital reserve requirements.

## 6 Apendix

### 6.1 Data Sources

- All data used in this report was sourced from 10-D and ABS-EE filings EDGAR. All statistics, figures, and tables were generated by analyzing data submitted by Carvana to the SEC.
- An LLM was used to parse delinquency and extension data from over 400 10-D filings. The raw data created by the LLM was manually audited for accuracy and modified in a few places where the LLM misread the tables in the filings. Both the raw data and modified data files are included with this submission.
- All scripts used to pull data from EDGAR, to process the data, and to generate the figures and tables in this report are included in the submission.

## 6.2 Data Hygiene

The quantitative findings in this report are derived from a granular analysis of Reg AB II loan-level data. To ensure the statistical relevance of risk metrics, the following data hygiene protocol was implemented in R:

- **Active Receivables Isolation:** The dataset was filtered to exclude liquidated and paid-off loans. Specifically, any record where the `reportingPeriodBeginningLoanBalanceAmount` was less than or equal to \$0.01 was removed.
- **Rationale for Filtering:** This exclusion is necessary to prevent "Survival Bias" from diluting point-in-time risk assessments. Including zero-balance loans would artificially lower the **Weighted Average LTV** and **Delinquency Percentages**, as these loans no longer contribute to the pool's exposure to loss.
- **Statistical Integrity:** By restricting the scope to active receivables, the resulting  $R^2$  values and PTI trends reflect the **live economic reality** of the portfolio's current interest-bearing assets.