Metrics Report

Igor Reis

October 2025

Actionable Tool Proposal

Objective

The goal is to design a personal finance monitoring function to Pierre that applies the analytical framework developed in the notebook to track spending behavior, detect irregularities, and deliver proactive alerts. This tool transforms static analyses into a dynamic system capable of identifying deviations in user spending and promoting better financial awareness.

System Logic and Flow

1. **Data Ingestion**
   The system periodically imports transaction data (from a CSV file or banking API), with each record containing `date`, `category`, `amount`, `payment data`, `transaction description`, `merchant`, among other information.

2. **Metric Computation**
   For each category, Pierre computes two volatility metrics and applies anomaly detection rules using only historical (causal) data:

   - **Causal Coefficient of Variation (CV_t)** → captures relative volatility across months.
   - **Robust Coefficient of Variation (CV_t^R)** → uses the median and MAD for stability under noisy data.
   - **Adaptive Outlier Detection** → flags transactions with extreme z-scores or values above the upper IQR fence.

3. **Alert Generation**
   Pierre evaluates three alert conditions:

   - **Total spending alert:** current month's total exceeds the historical mean by more than 30%.
   - **Volatility alert:** any category with $CV > 0.7$ is flagged as highly variable.
   - **Anomaly alert:** one or more non-reversed outliers detected within the current month.

4. **User Notification**
   Alerts are summarized into clear messages:

   - "Your total spending in August 2025 increased by 35% compared to the previous average."
   - "Category *Travel* remains highly volatile (CV = 1.25)."
   - "Three anomalous transactions detected in *Electronics*; please review your recent purchases."

5. **Visualization and History**
   A dashboard that can display different figures:

   - Monthly net cash trend ($\sum$ amount)
   - Category-level CV trends
   - Highlighted anomalous transactions with date, description, and amount.

Configurable Parameters

Parameter	Description	Default
`baseline_threshold`	Percentage deviation for global spending alert	30%
`cv_limit`	CV threshold for volatility warning	0.7
`min_months`	Minimum history for CV computation	3
`ignore_zeros`	Ignore zero-spending months	True
`refresh_frequency`	Frequency of data updates	Monthly

Outcome

This proposal integrates statistical monitoring with user-facing communication. By combining the Causal and Robust CV metrics with outlier detection, Pierre can:

- Identify spending surges early,
- Highlight categories with unstable behavior,
- Provide timely feedback to enhance financial stability.

The system thus evolves into a continuous, adaptive alert framework that transforms quantitative indicators into actionable financial insights.