A Mini Project

Summary Report
on
Impact of COVID-19 on UPI Adaptation.

Submitted by

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Title

Evaluating the COVID-19 Impact on UPI Adoption in India: A Forecasting Approach Using NPCI Data.

Abstract

The COVID-19 pandemic significantly accelerated the evolution of India's digital payment landscape. This project examines the increase in UPI (Unified Payments Interface) transactions during and after the pandemic by utilizing time-series forecasting models to establish a counterfactual trend based on pre-pandemic data. Utilizing ARIMA and Prophet models on monthly UPI transaction data from NPCI, we estimate the expected growth trajectory in the absence of the pandemic and compare it against actual figures. This analysis aims to determine whether the observed surge represents a genuine deviation from historical trends. Our findings are intended to support existing claims about the pandemic's role in driving digital adoption and may inform future financial policy decisions.

The Research Process

1. Formulating the Research Problem : While several studies and reports recognize that more people used UPI during the COVID-19 pandemic, only a few have tried to measure this change with predictive models. The main research problem is to provide evidence based on forecasts to see if the rise in digital payments after COVID significantly differed from the expected trend before the pandemic. This project aims to fill that gap by going beyond correlation to examine the causal effect of the pandemic as a structural event.

2. Extensive Literature Survey : Existing research shows a strong connection between the pandemic and the growth of digital finance. However, it does not measure what the growth trend would have looked like without the pandemic.
A study by Chaudhari & Kumar (2021) found a significant 42% increase in digital payments during the fiscal year 2020-21 compared to 2019-20.

Important reports from the Reserve Bank of India (RBI) and NPCI track this rapid growth but do not offer predictions or comparisons to determine the pandemic's impact.
Global sources such as the World Economic Forum (WEF) have observed a similar digital shift worldwide, especially in online payments.

3. Developing the Research Hypothesis : To investigate the research problem, the following hypotheses will be tested:

- **Hypothesis 1 :**

  H0: There is no significant difference in the average monthly UPI transactions between the period before the pandemic and the period after it began.

  H1: There is a significant difference in the average monthly UPI transactions between the period before the pandemic and the period after it began.

- **Hypothesis 2 :**

  H0: The time series of UPI transactions does not show a structural change that aligns with the start of the COVID-19 pandemic.

  H1: The time series of UPI transactions shows a structural change that aligns with the start of the COVID-19 pandemic.

- **Hypothesis 3 :**

  H0: The growth trend in UPI transactions sped up and continued after the pandemic, differing from the trend predicted by a model based on pre-pandemic data.

  H1: The growth trend in UPI transactions sped up and continued after the pandemic, differing from the trend predicted by a model based on pre-pandemic data.

4. Preparing & Determining the Research Design : The study will use a quantitative, longitudinal research design to examine the impact of the pandemic on UPI transaction trends. The main focus is to conduct a time-series analysis on secondary data. This involves:

- Collecting and cleaning historical UPI data.
- Dividing the data into pre-pandemic, during-pandemic, and post-pandemic periods.
- Creating a forecasting model based on the pre-pandemic trend.
- Comparing the forecasted trend with the actual data from the during- and post-pandemic periods to measure the difference.
- Conducting statistical tests to confirm the hypotheses.

The specific design is a **counterfactual analysis** that uses time-series forecasting. We will use models like Holt-Winter exponential to project the expected growth of UPI transactions as if the pandemic had not happened. The data will be broken down to study its underlying trend, seasonal patterns, and residual components. This method lets us directly compare the "expected" and "actual" scenarios, offering a clear way to measure the pandemic's impact.

5. Collecting the Research Data : This study will be based on secondary data, focusing on historical monthly statistics for Unified Payments Interface (UPI) transactions.
The data includes two key metrics: **TRANSACTION VOLUME** (in millions) and **TRANSACTION VALUE** (in Crores).
All crucial data will be sourced from the public statistics portal of the National Payments Corporation of India (NPCI), which serves as the primary and most reliable source for this information. The collection and analysis of this pre-existing data will form the foundation of the project's findings.

6. Execution of the Project : The project will be executed over a six-week period, following the tentative timeline below:

Week	Task
Week 1	Data collection and pre-processing.
Week 2	Exploratory data analysis.
Week 3-4	Forecasting model development (Holt-Winter exponential).
Week 5-6	Result evaluation, interpretation, final report, dashboard creation, and presentation.

7. Analysis of Data : The data analysis will be conducted using Python with libraries such as pandas, matplotlib, and seaborn. The analysis plan includes:
Statistical Analysis: We will begin by using measures of central tendency, specifically the mean and median. The goal is to calculate the average number of UPI transactions in the period

leading up to the pandemic and contrast it with the averages during and after the pandemic. This will offer a great understanding of the shifts in transaction volume.

Time-Series Analysis: A forecasting model will be developed on the prepandemic data to establish a baseline trend. This forecast will then be compared against the actual data from the pandemic and post-pandemic periods.

8. Hypothesis Testing : To statistically validate the findings, the following tests will be performed:

- An independent two-sample t-test will be used to determine if there is a significant difference in the average transaction volumes and values before and after the pandemic **(Hypothesis 1)**.
- A Chow-like test using a dummy variable regression model will be conducted to confirm a structural break in the data series around the pandemic's onset **(Hypothesis 2)**.
- A t-test on the residuals from the pre-pandemic linear trend model will be used to see if the actual post-pandemic values are significantly higher than predicted, indicating accelerated growth **(Hypothesis 3)**.

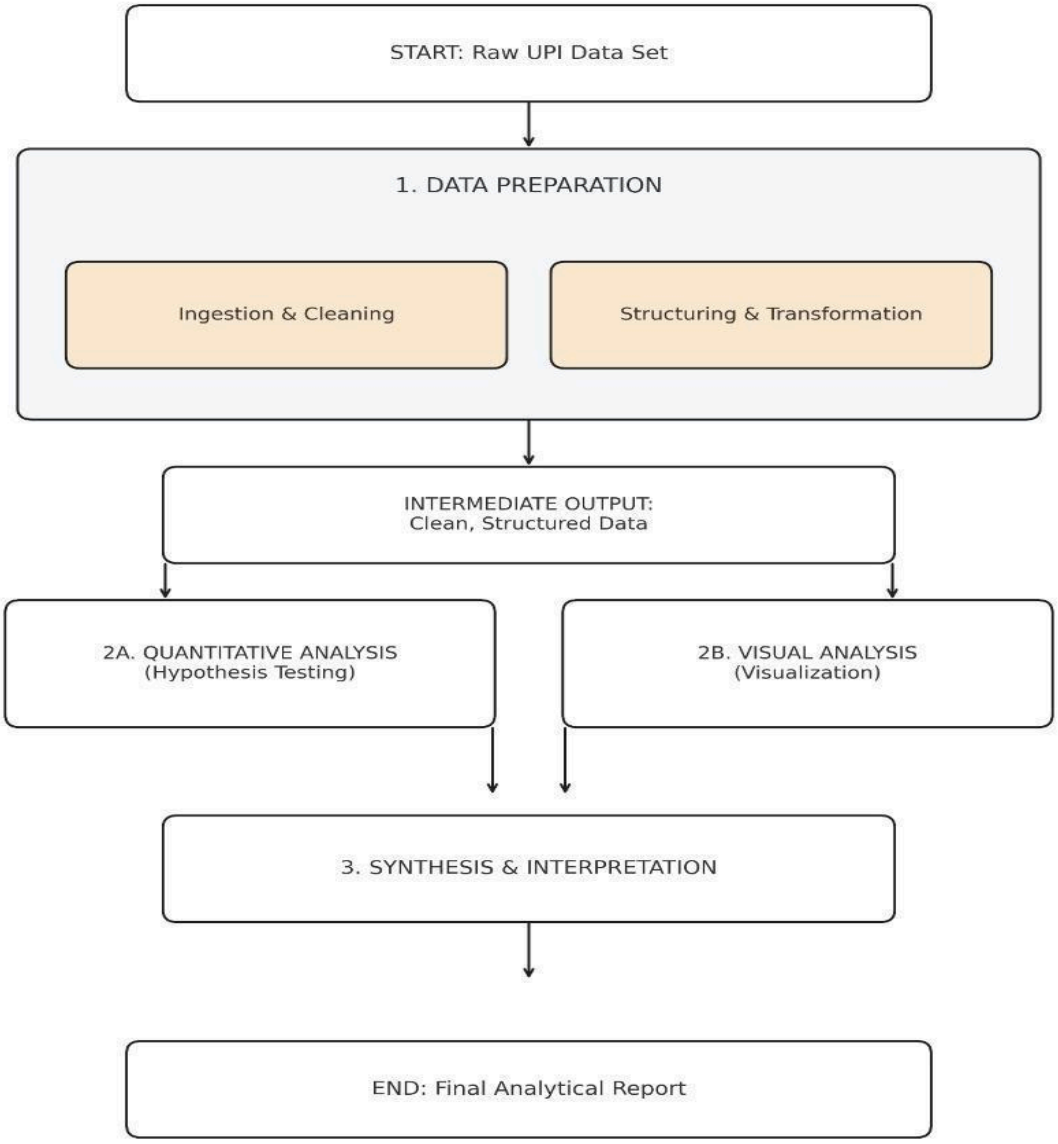
9. Generalization and Interpretation :

The expected outcomes of this project are:

- Visual and statistical validation of the pandemic's accelerating effect on UPI usage.
- Clear evidence of a divergence between the actual UPI growth and the historical, pre-pandemic growth pattern.
- Valuable insights into the long-term structural changes in India's digital finance ecosystem, which can inform policymakers and financial institutions.

10. Preparing the Report or Presentation of the Result :

The final results and interpretations will be compiled into an analytical report. The report will feature clear data visualizations, including time-series plots comparing actual vs forecasted trends, to effectively communicate the findings. For presentation, a dashboard may be created using Tableau or Power BI to allow for interactive exploration of the data.


START: Raw UPI Data Set
1. DATA PREPARATION
Ingestion & Cleaning
Structuring & Transformation
INTERMEDIATE OUTPUT:
Clean, Structured Data
2A. QUANTITATIVE ANALYSIS
(Hypothesis Testing)
2B. VISUAL ANALYSIS
(Visualization)
3. SYNTHESIS & INTERPRETATION
END: Final Analytical Report