Detecting Anomalous Financial Transactions

Using big data to help FinCEN fight financial fraud and money laundering

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Agenda

1 **BUSINESS UNDERSTANDING**

The high cost of money laundering

2 **DATA UNDERSTANDING**

A model is only as good as the data

3 **THE MODELS**

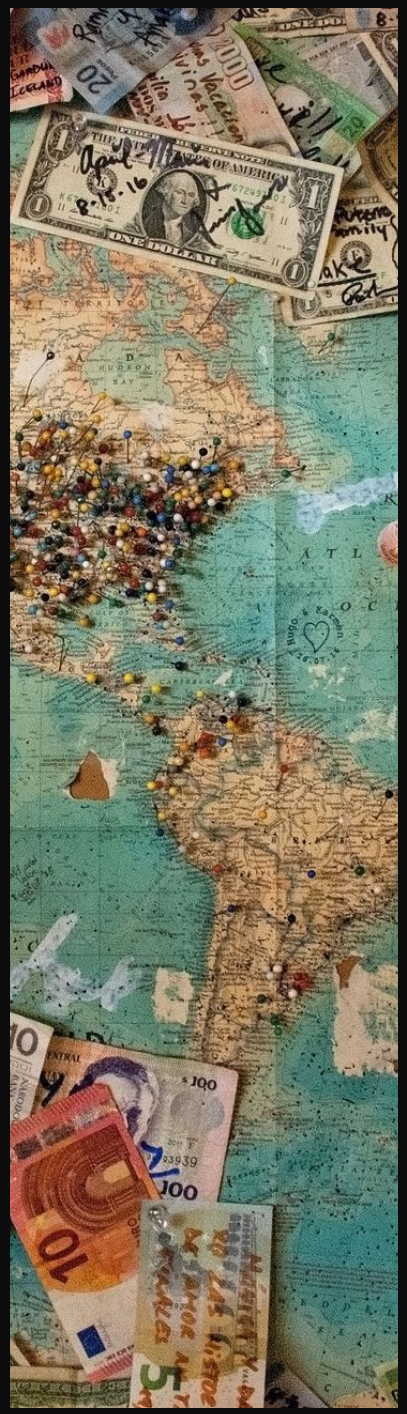
Can we reliably spot anomalous transactions?

4 **ANALYSIS & INFERENCES**

What have we learned?

5 **CONCLUSION & RECOMMENDATIONS**

What are the takeaways?



Business Understanding

"THE ESTIMATED AMOUNT OF MONEY LAUNDERED GLOBALLY IN ONE YEAR IS 2% - 5% OF GLOBAL GDP, OR $800 BILLION - $2 TRILLION USD" **— UNITED NATIONS OFFICE ON DRUGS AND CRIME**

THEFT AND MAJOR CRIMES

- From stolen pandemic aid to drug dealing and racketeering - criminals go to great lengths to hide the source of their cash

SANCTIONS DIVERSION

- Sanctioned organizations and nation-states will attempt to skirt restrictions through clandestine operations

TERRORIST FINANCING

- Terrorist organizations require capital to carry out their activities

HARMS INDUSTRY AND CONSUMERS

- Banks can suffer reputational damage and face regulatory scrutiny, and costs often pass on to consumers

Data Understanding

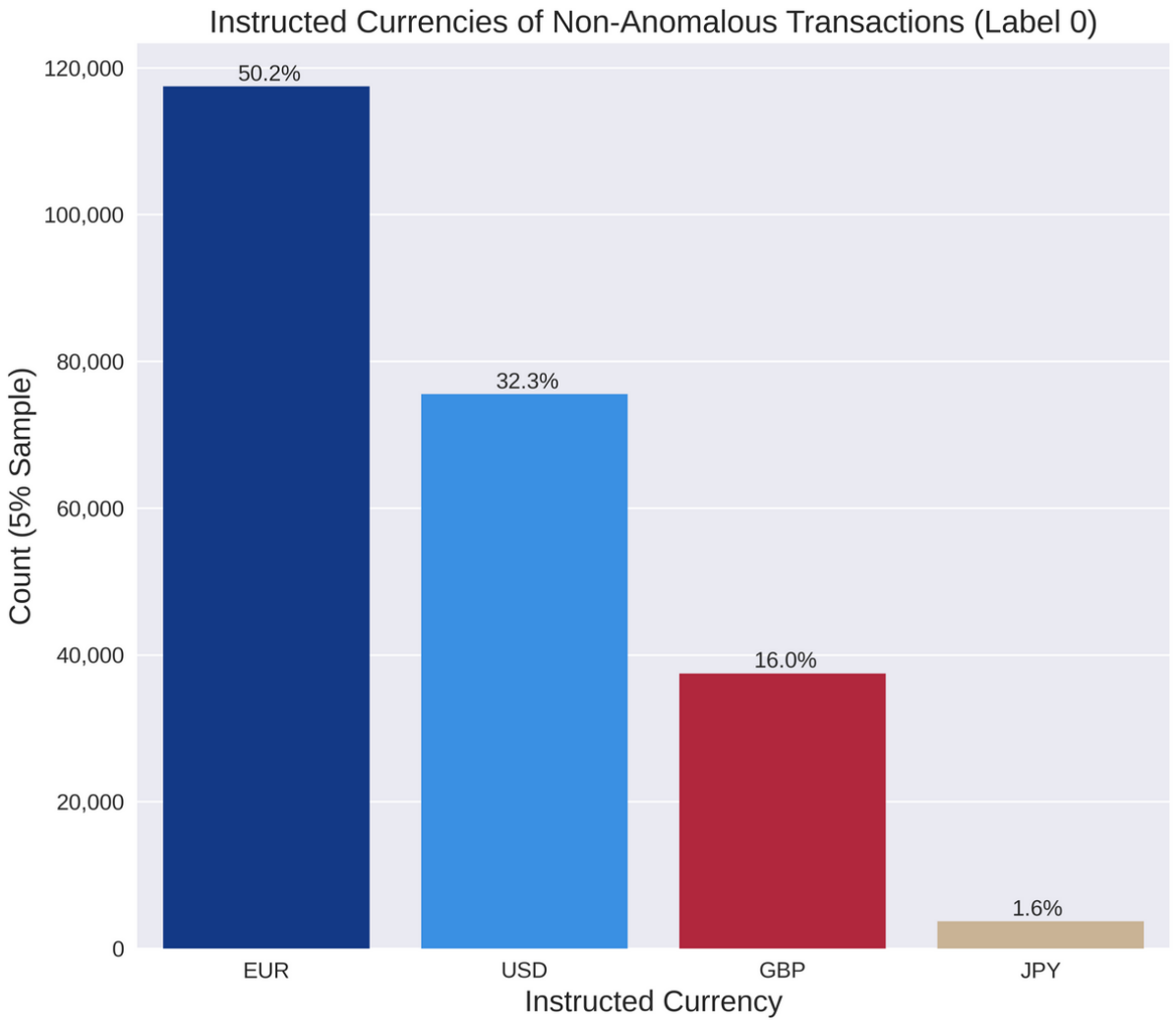
A collaboration between NIST and the NSF

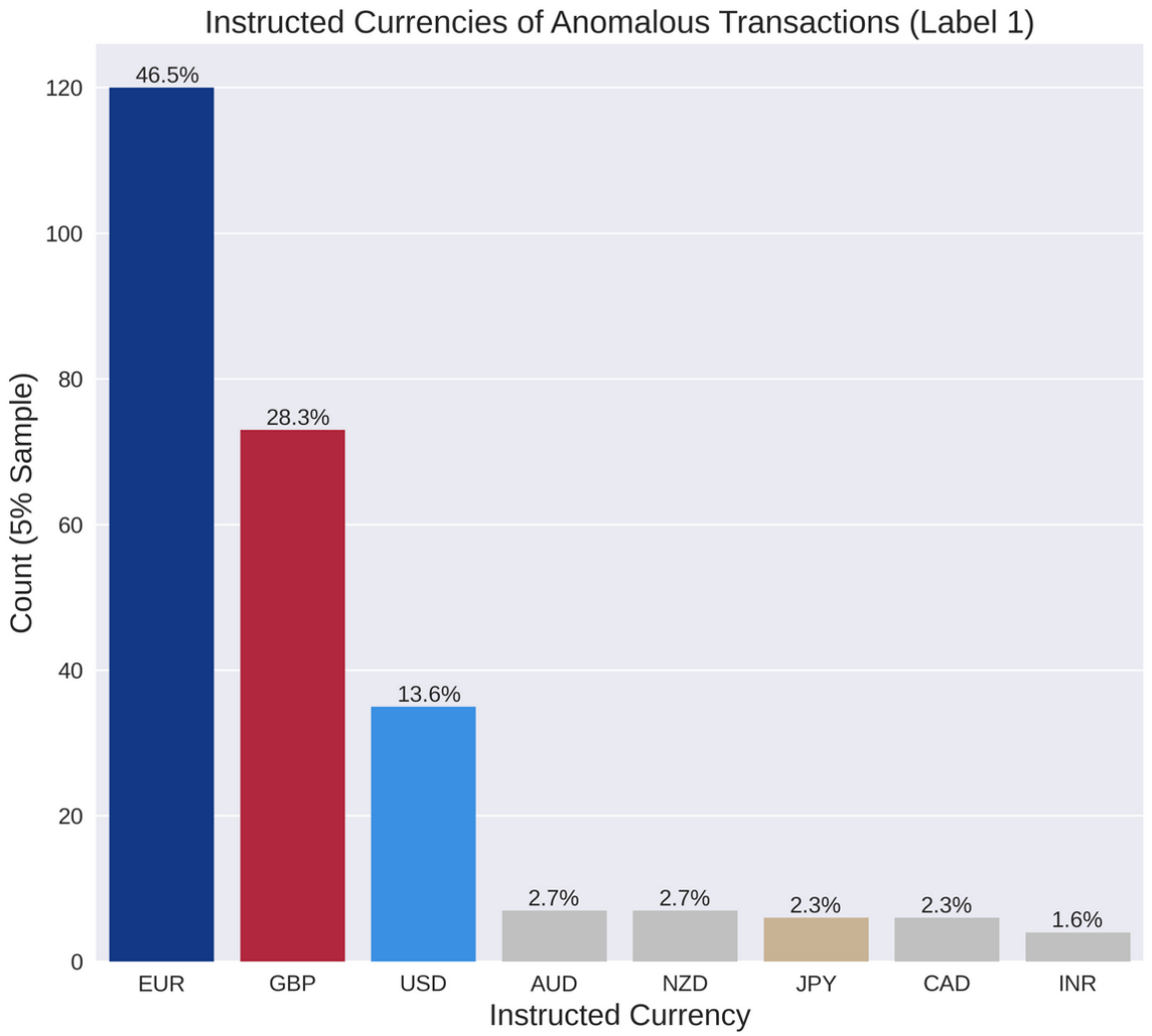
```
Transactions dataframe
----------------------
root
|-- MessageId: string
|-- Timestamp: timestamp
|-- UETR: string
|-- Sender: string
|-- Receiver: string
|-- TransactionReference: string
|-- OrderingAccount: string
|-- OrderingName: string
|-- OrderingStreet: string
|-- OrderingCountryCityZip: string
|-- BeneficiaryAccount: string
|-- BeneficiaryName: string
|-- BeneficiaryStreet: string
|-- BeneficiaryCountryCityZip: string
|-- SettlementDate: integer
|-- SettlementCurrency: string
|-- SettlementAmount: double
|-- InstructedCurrency: string
|-- InstructedAmount: double
|-- Label: integer
```

```
Target class distribution
-------------------------
+------------------+---------+----------+
|Label             |count    |percent   |
+------------------+---------+----------+
|Anomalous (1)     |4,900    |0.104%    |
|Non-anomalous (0) |4,686,825|99.895%   |
+------------------+---------+----------+
```

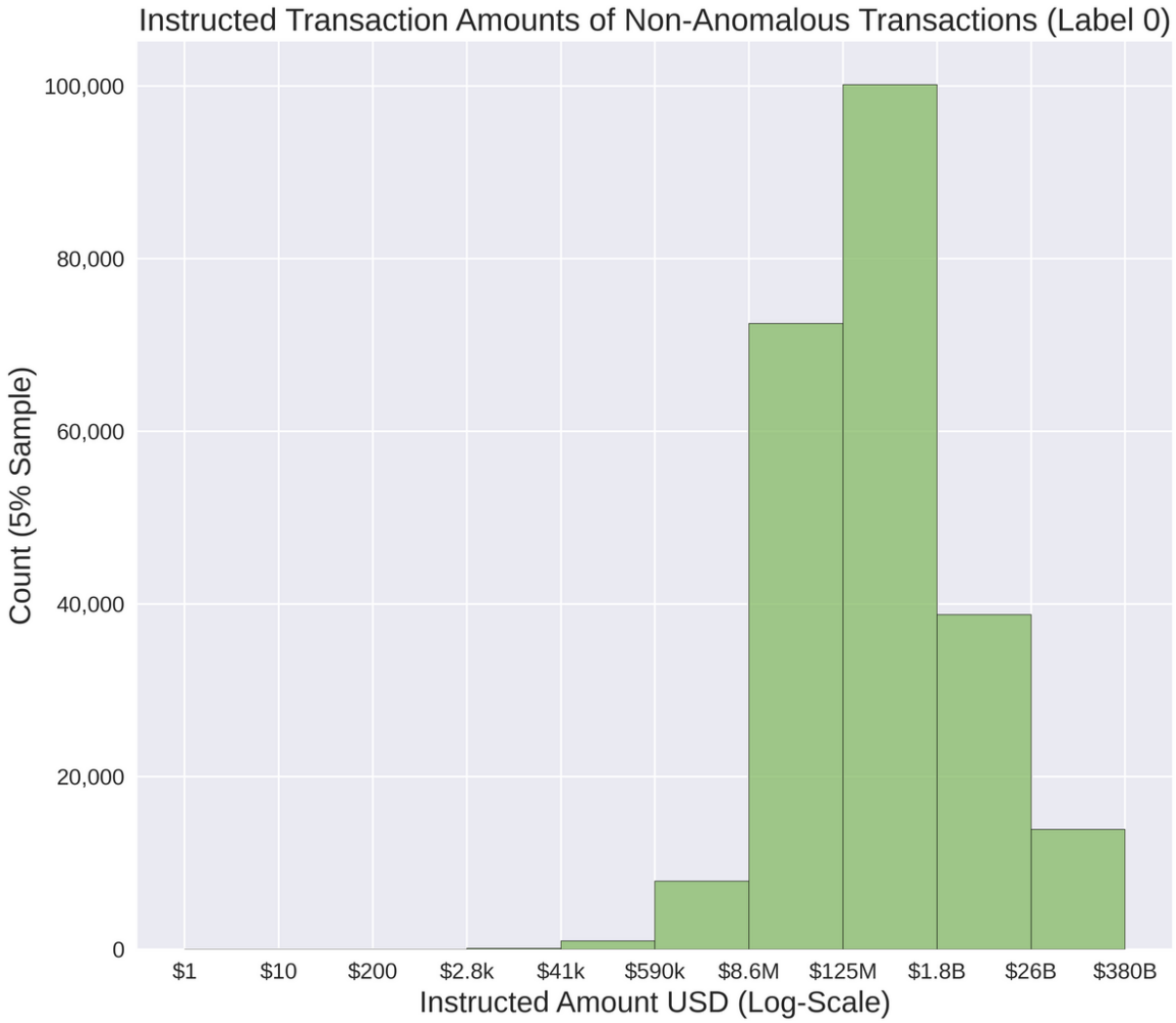
5.5M Transactions
530k Matching Accounts
91 Features

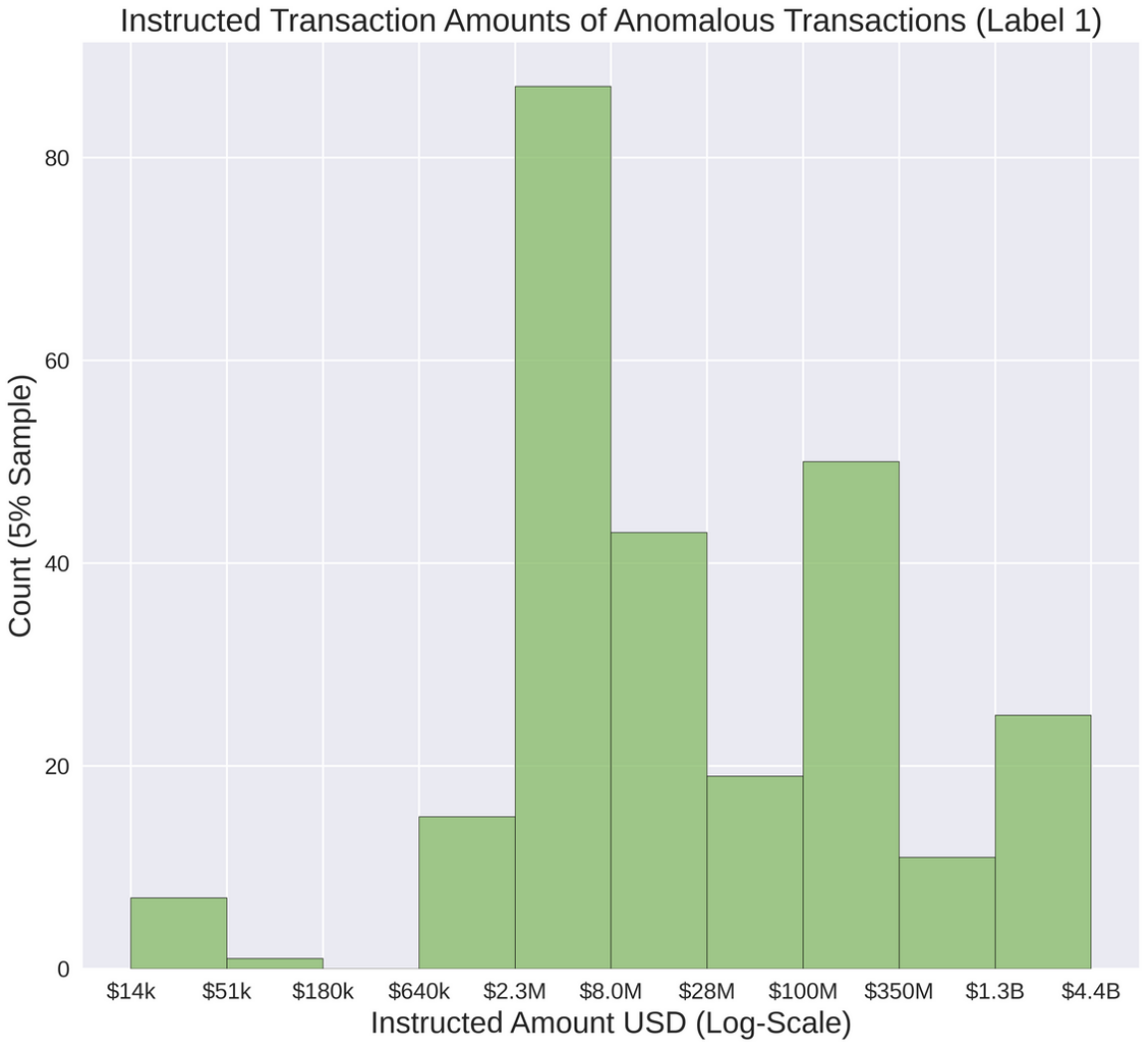
```
Bank accounts dataframe
-----------------------
root
|-- Bank: string
|-- Account: string
|-- Name: string
|-- Street: string
|-- CountryCityZip: string
|-- Flags: integer
```



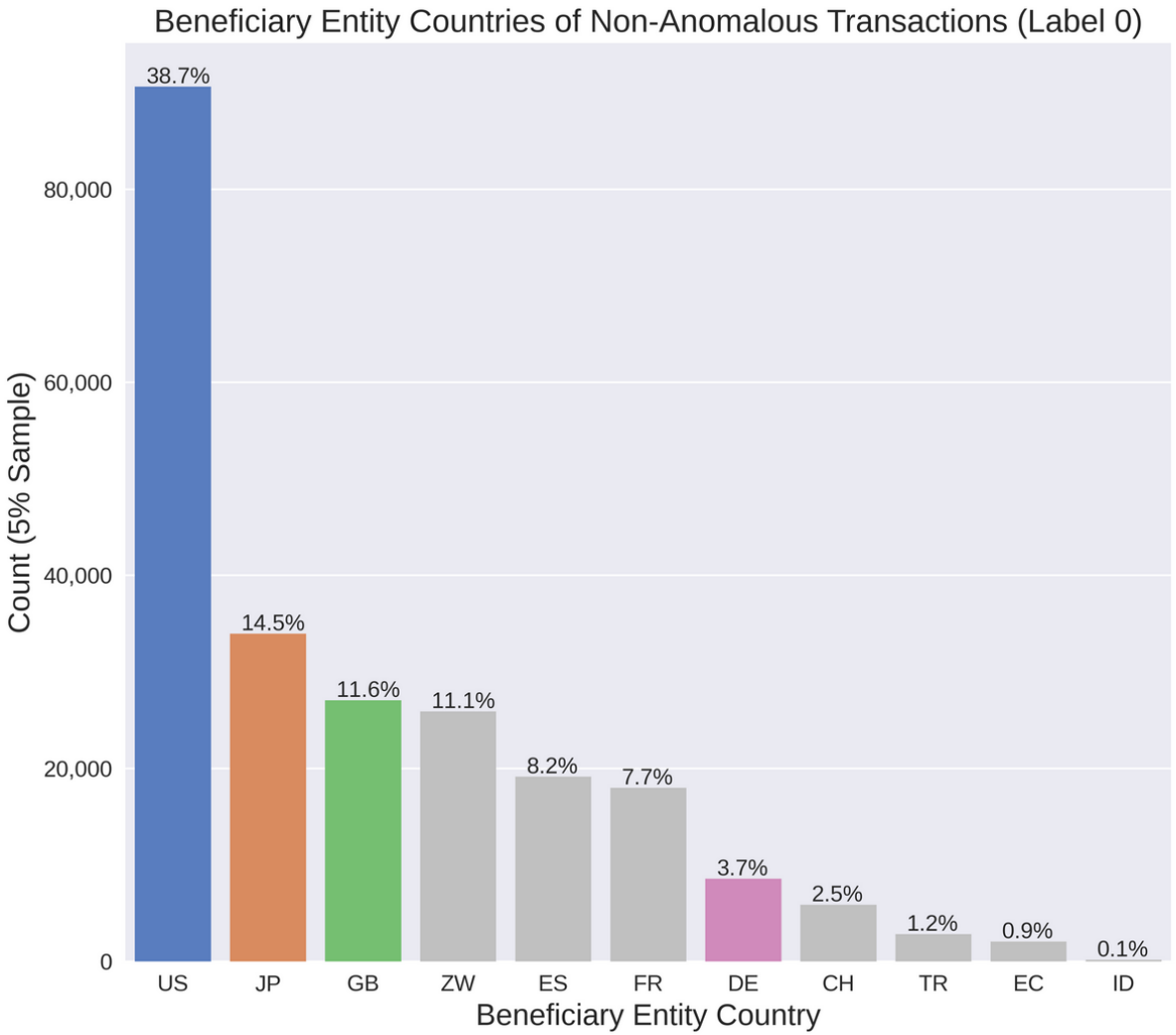


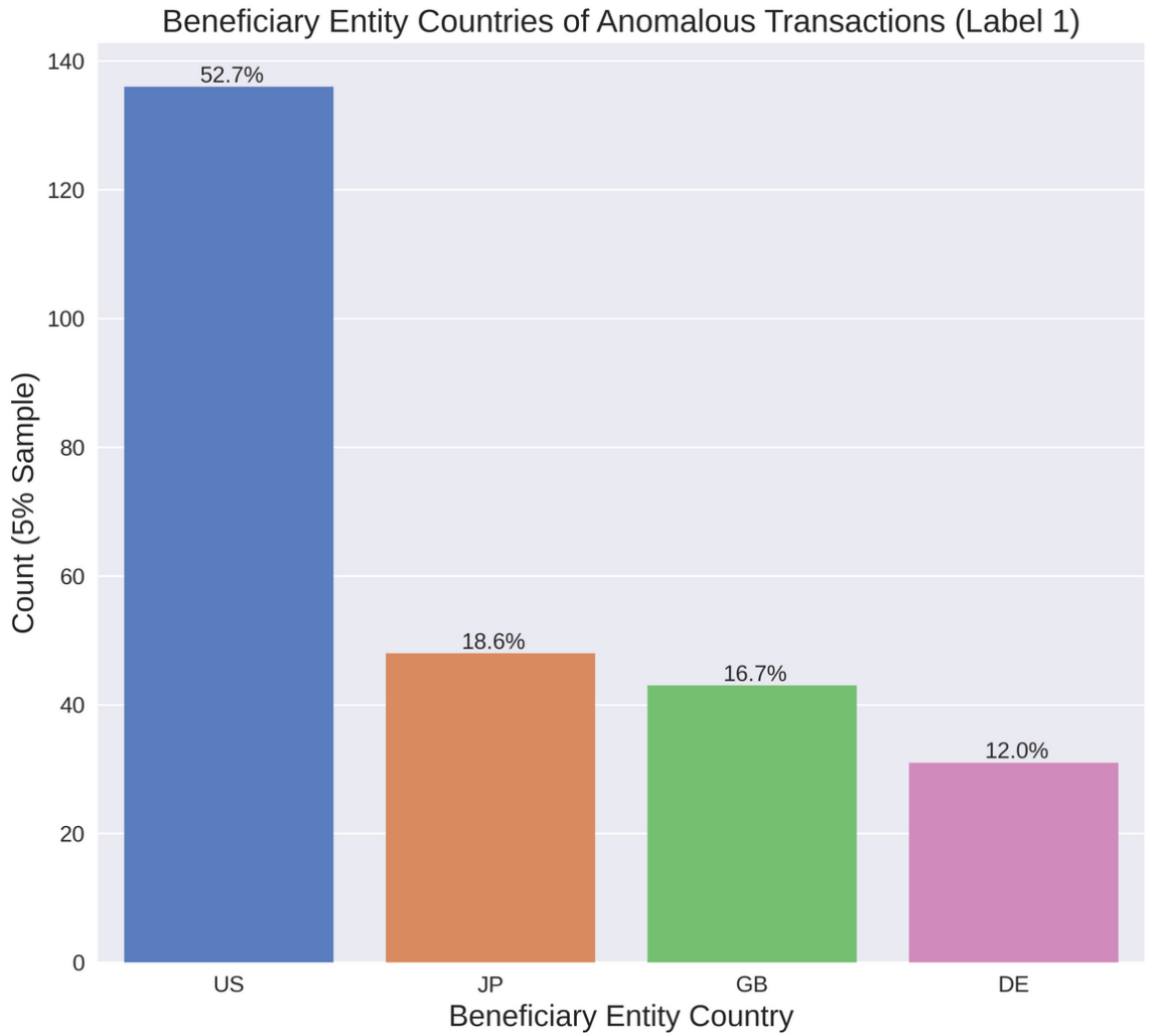
INSTRUCTED TRANSACTION CURRENCIES





INSTRUCTED TRANSACTION AMOUNTS (LOG-SCALE USD)





BENEFICIARY ENTITY COUNTRIES

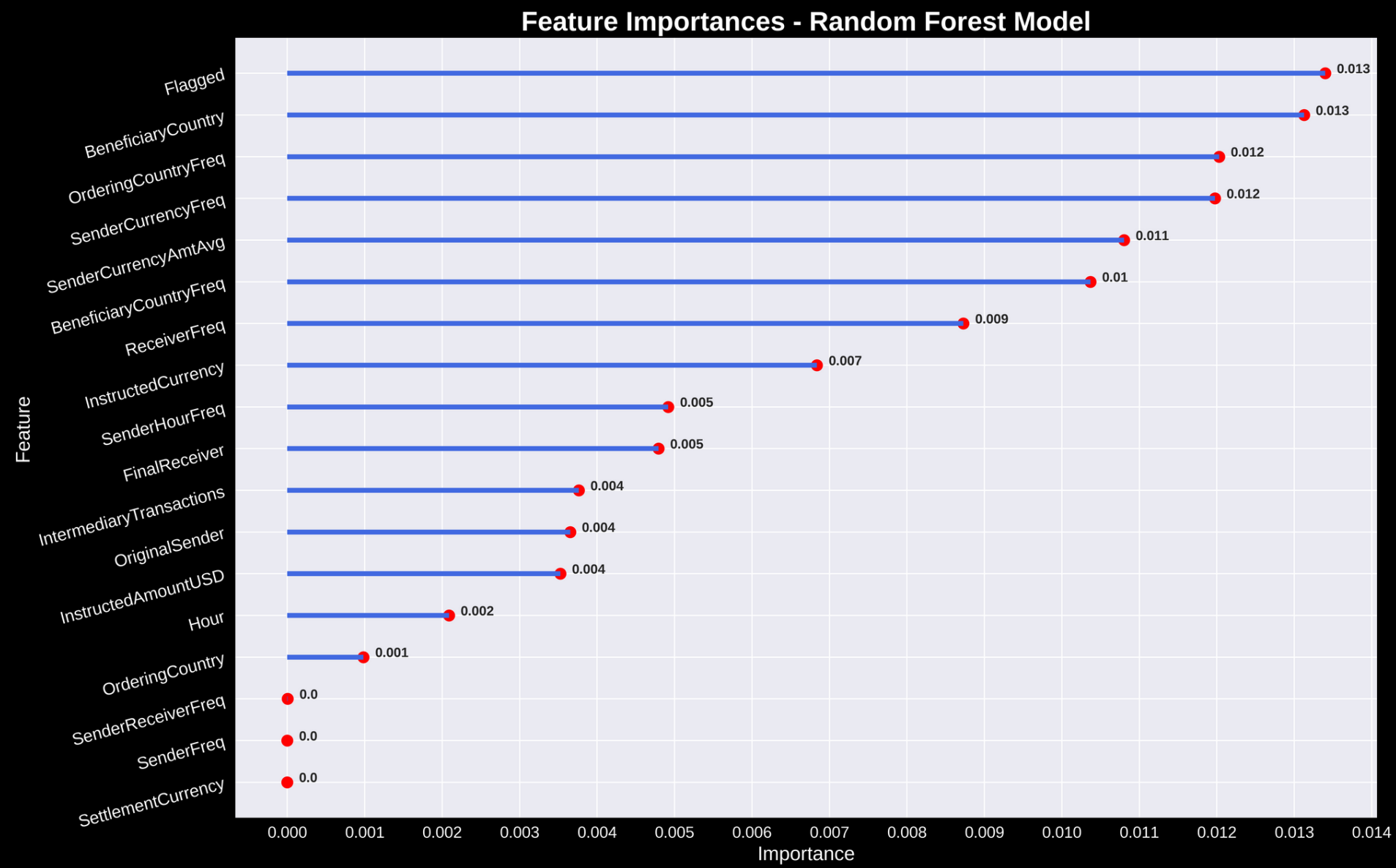
Modeling Results

As measured by test data F1 scores

CONFUSION MATRIX

TRUE	0 PREDICTED	1 PREDICTED
0	704,325	22
1	451	310

Analysis



Conclusion & Recommendations

IT'S A TRADE OFF

Catching more anomalous transactions = more false positives

USE MODEL TO FOCUS RESOURCES

Knowing where to look is half the battle

OBTAIN MORE POSITIVE CLASS OBSERVATIONS

Models could be improved with more data

Thank you

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