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# THE ANATOMY OF A CRYPTOCURRENCY PUMP-AND-DUMP SCHEME

Original Paper by Jiahya Xu and Benjamin Livshits

Included in the Proceedings of the 28th USENIX Security Symposium

# Agenda

KEY TOPICS DISCUSSED IN THIS PRESENTATION

- Background Information On Pump-and-Dump Schemes
- Analyzing Pump-and-Dump Schemes
- Predicting Pump-And-Dump Schemes



# What Is A Pump-and-Dump?

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A pump-and-dump is a manipulative scheme aimed at creating a coordinated, intentional, short-term increase in the demand for stocks or cryptocurrency (crypto) leading to a price hike.

# Pump-and-Dump Actors



## Pump Organizer

- Individual or group
- Coordinates and plans pump-and-dump
- Ultimate beneficiaries



## Pump Participant

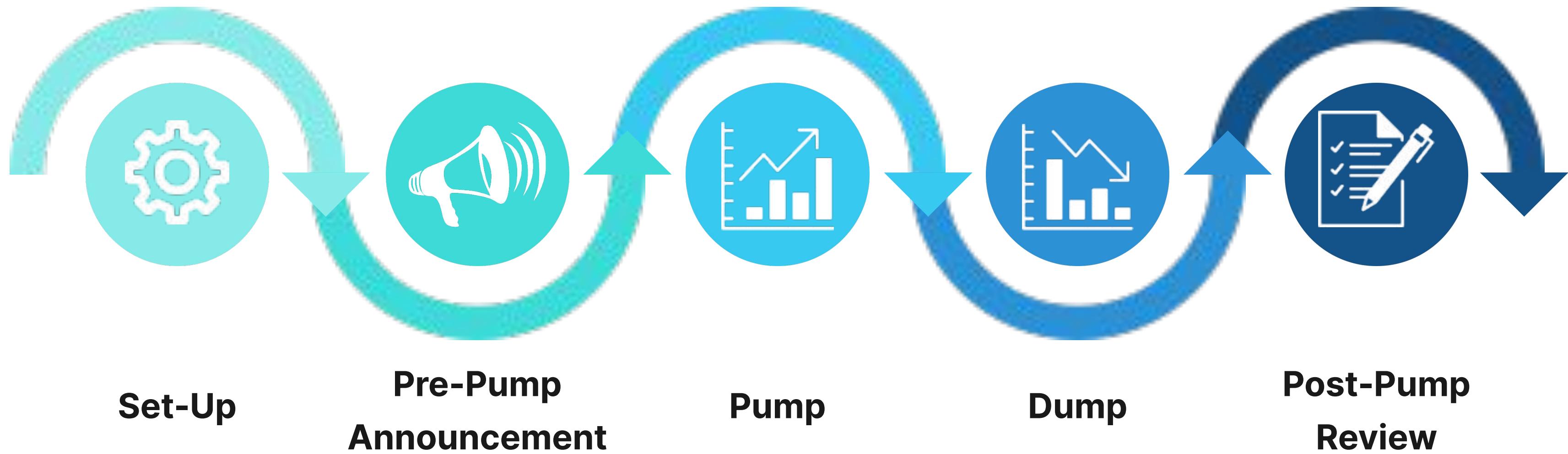
- Cryptocurrency traders
- Collectively & immediately buy coins once instructed
- Victims of pump-and-dump schemes



## Target Exchange

- platform/exchange where pump-and-dump events takes place
- can also act as organizer

# Pump-and-Dump Process



# Case Study

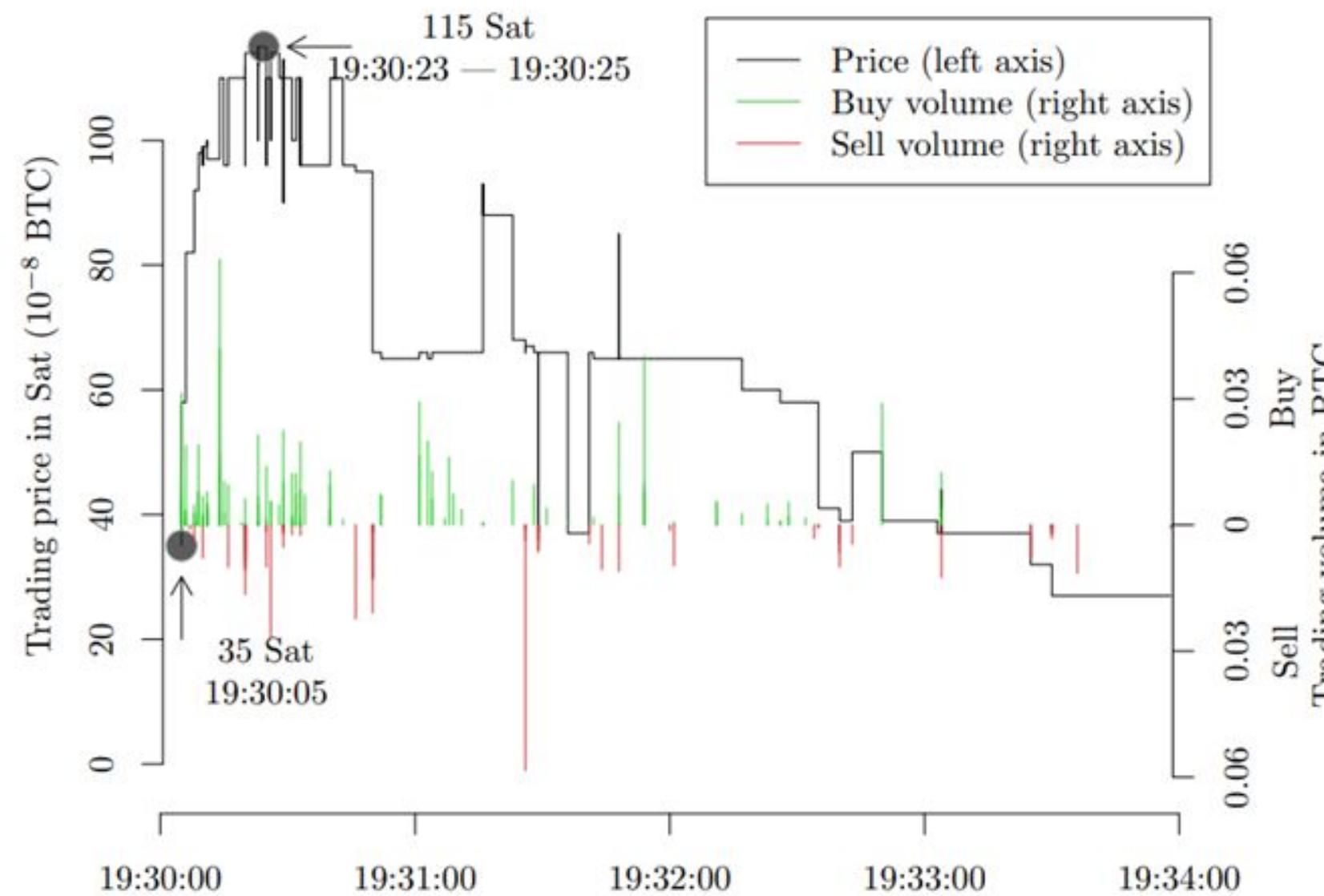


Figure 1: Tick-by-tick movement of the BVB/ BTC market during the first four minutes after the coin announcement

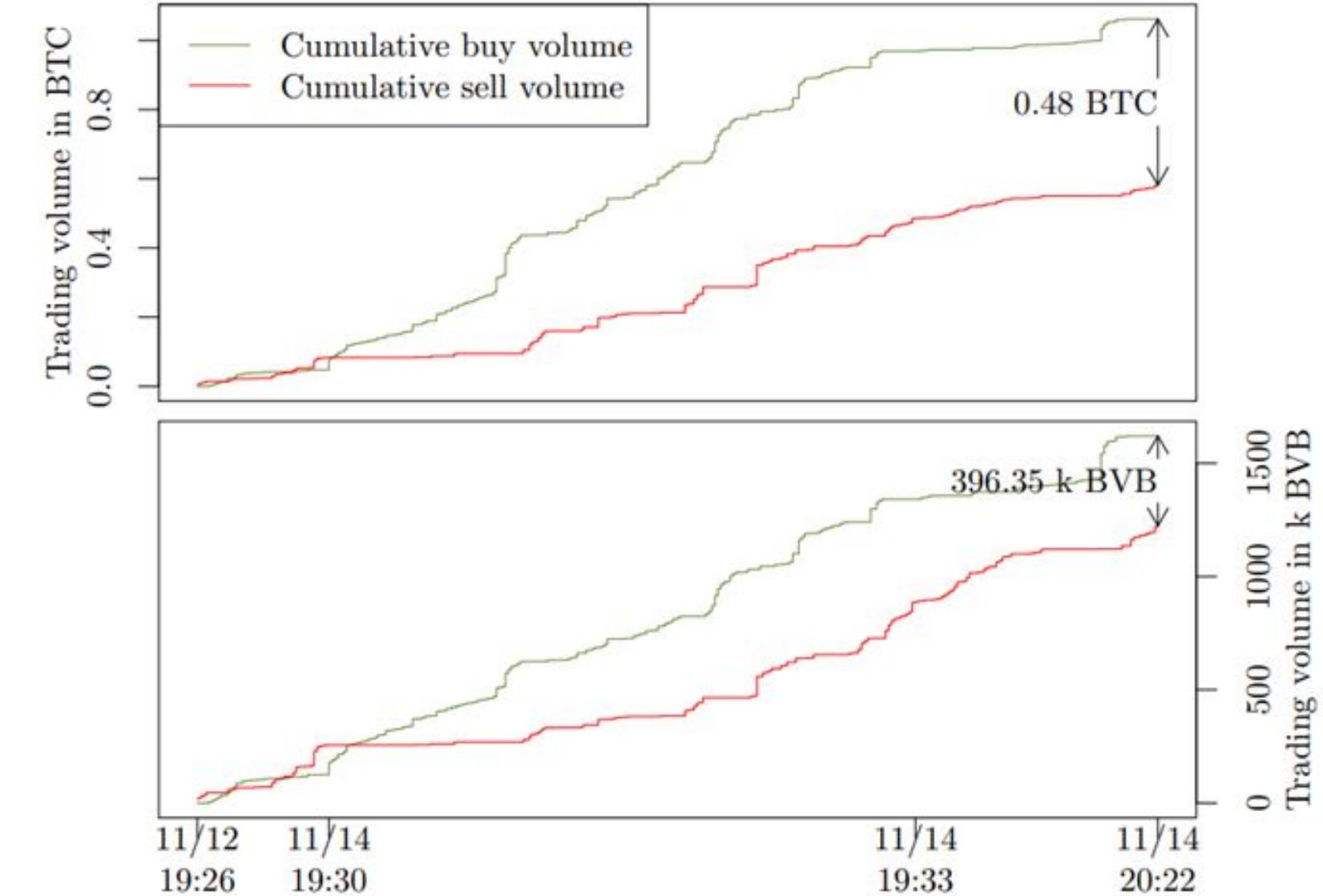
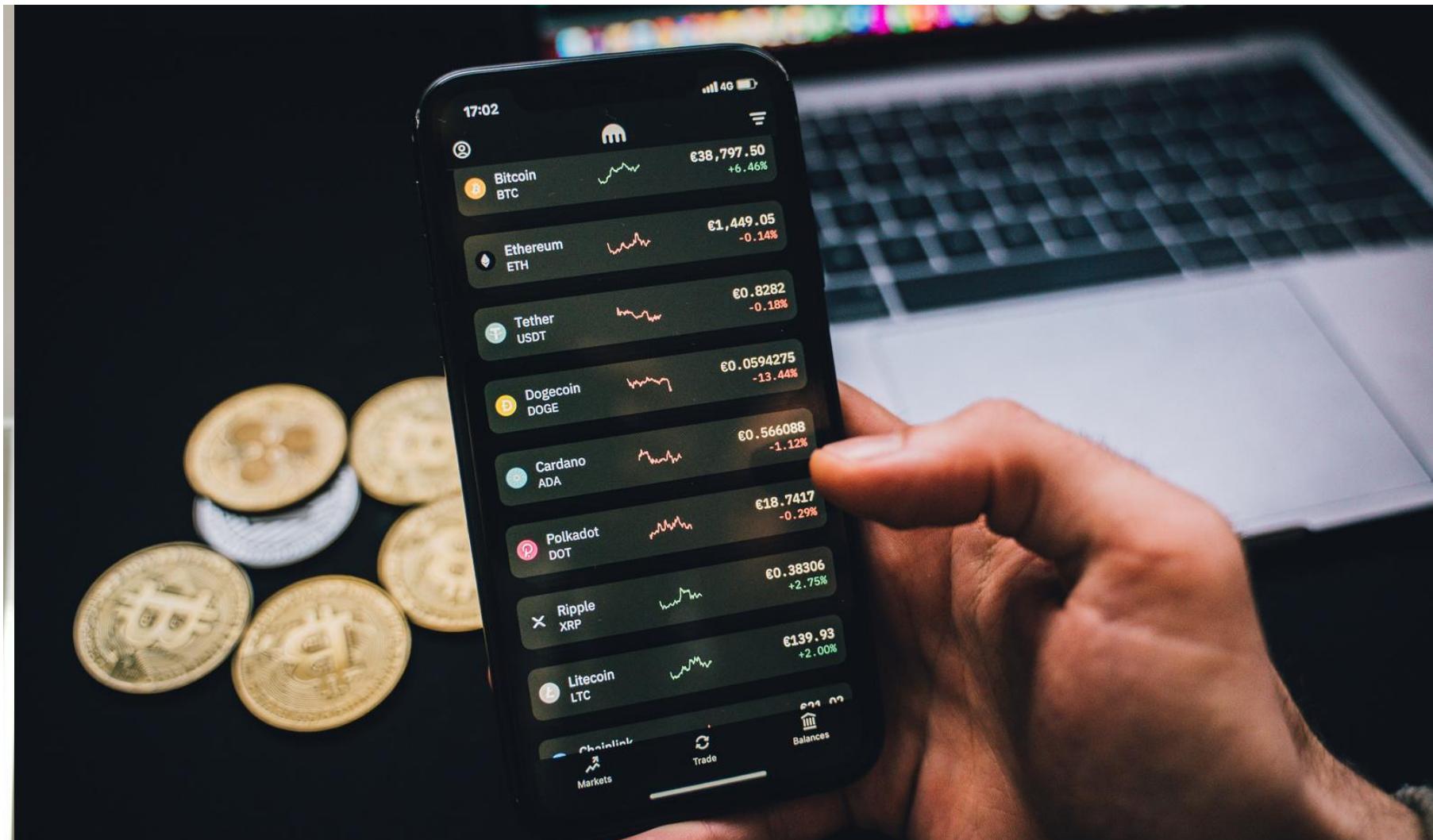


Figure 2: Gap between buy volume and sell volume caused by the BVB pump-and-dump. The figure shows a timeline from 48 hours before up to 1 hour after the pump-and-dump.

# Pump-and-Dump

## Motivations &

## Examples



### Motivations

- Easy to set up
- Anonymity
- Little to no repercussions
- Significant Profits

### Examples

- Kim Kardashian
- Floyd Mayweather
- FaZe Clan

# Analyzing Pump-and-Dump Schemes

## Obtaining Pump-and-dump Events

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Focused On Telegram.  
Through PumpOlymp and the  
Telegram API.

## Obtaining Information On Features and Price Movement

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Includes: coin's hourly OHLC (open, high, low, close), volume, market cap data, coin listing status.  
Through APIs such as CryptoCompare, and page source scraping.

# Analyzing Pump-and-Dump Schemes

## Findings

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Smaller exchanges were the most popular for individual pump-and-dump activities.

All coins pumped had a market cap of below 100 BTC.

Anomalous returns signals are detected before the pump-and-dump admin's announcement.



# Predicting Pump-and-Dump Coins

Trying to prevent future victims and encourage regulators to use technology to detect abuse.

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Prediction done by machine learning models

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Organisers have specific selection criteria and behaviour that can be differentiated from normal market behaviour

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## **Papers that build machine learning models predict pump-and-dump coins:**

- The Anatomy of a Cryptocurrency Pump-and-Dump Scheme - Trains classifier and logistic models [1]
- Cryptocurrency Pump and Dump Schemes: Quantification and Detection - Trains binary classifier [2]
- Detecting cryptocurrency pump-and-dump frauds using market and social signals - Trains a neural network [3]



# The Models

Trains both a classification and logistic regressions model

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The classification model is a random forest model

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Logistic regression model is binomial generalized linear model

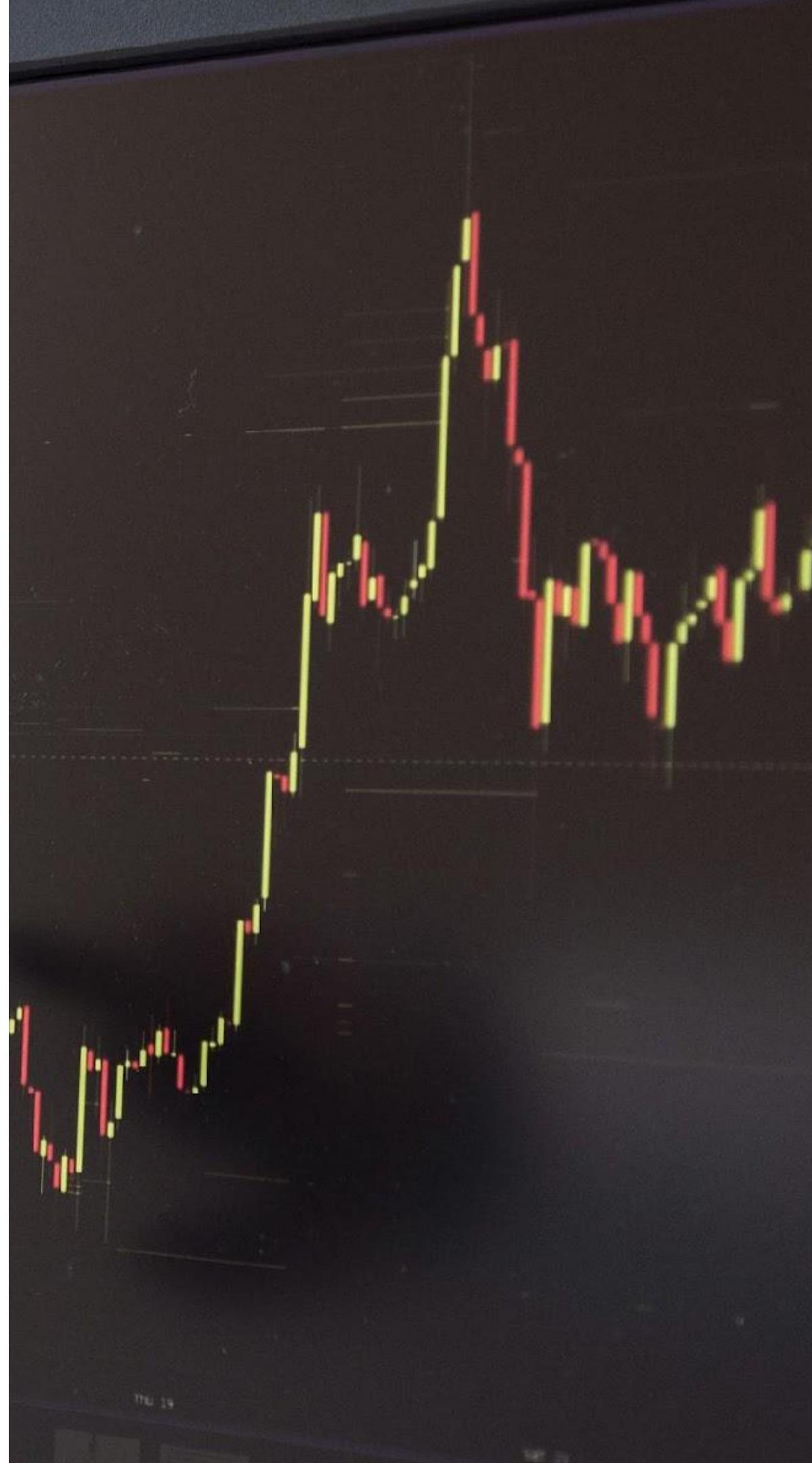
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RF model was selected due to its ability to handle large quantities of data and prevent overfitting but can be time-consuming to create

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GL model was selected due to high interoperability and efficient execution time but is prone to overfitting

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# The Data

All listed coins of Cryptopia at each pump-and-dump event from June 19 2018 to January 11 2019

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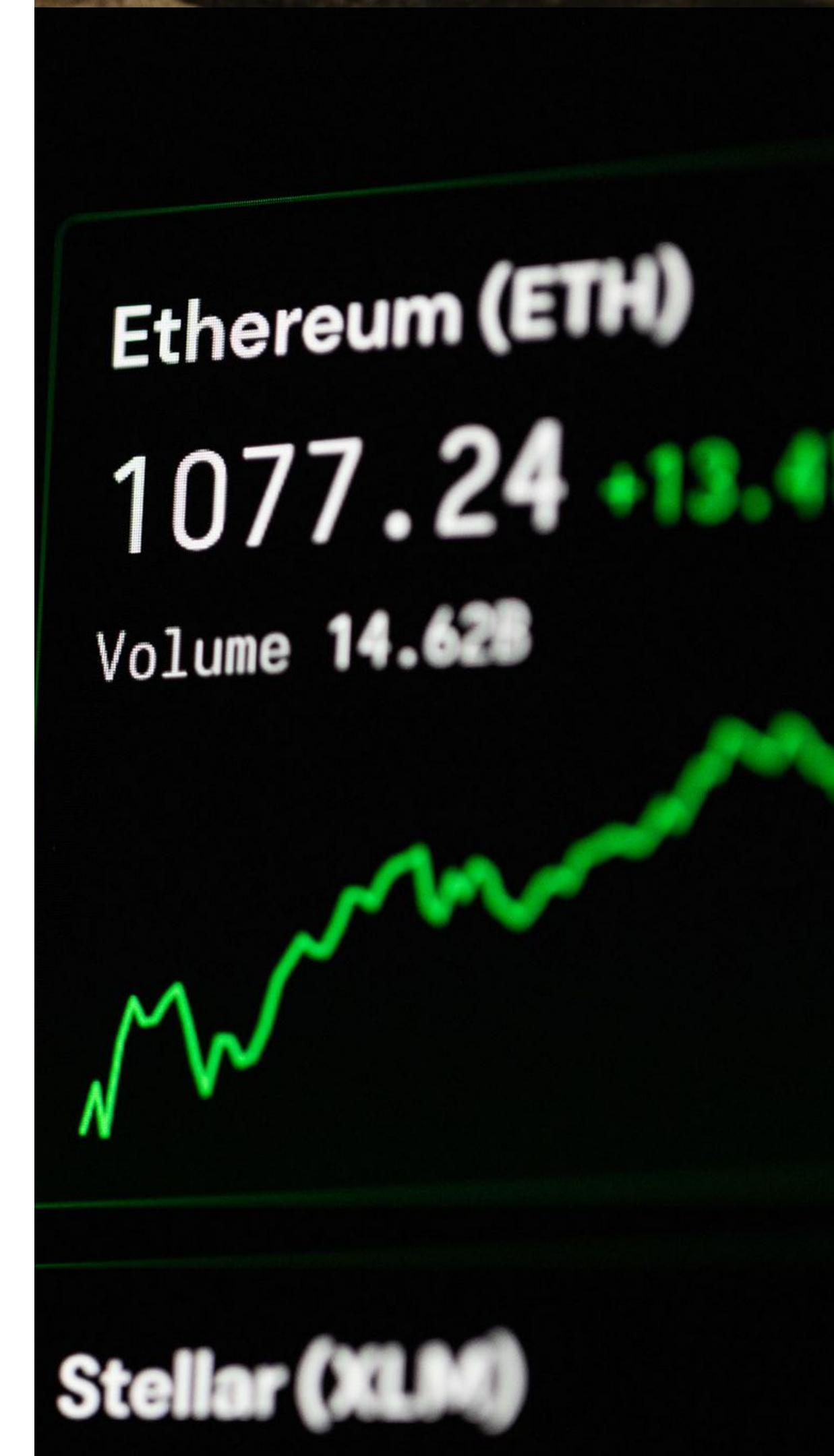
Total 53,208 observations with 280 being pumped coins

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Pumped coins are 0.3% of the dataset

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The heavy imbalance between non-pumped and pumped coins means that stratified sampling was used for the random forest model



# The Results

Coin market cap and last hour returns were the two most important features

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Short term movements were more relevant than long term movements

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Market movement and return features were more relevant

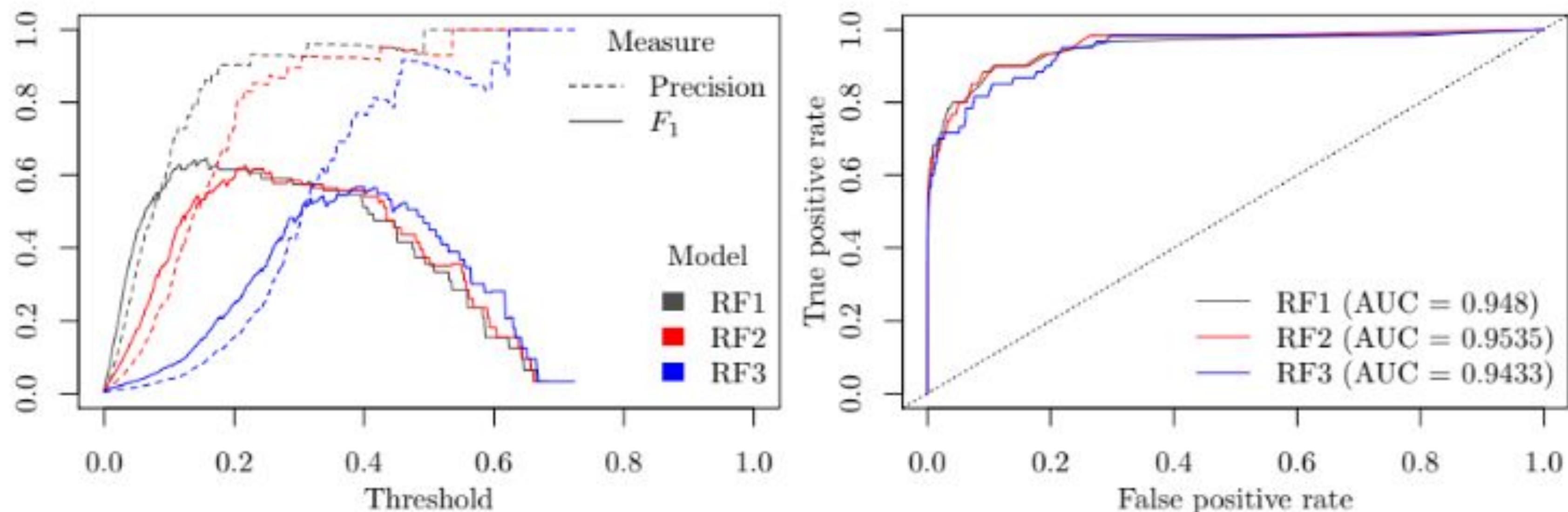
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Random forest model was the superior model

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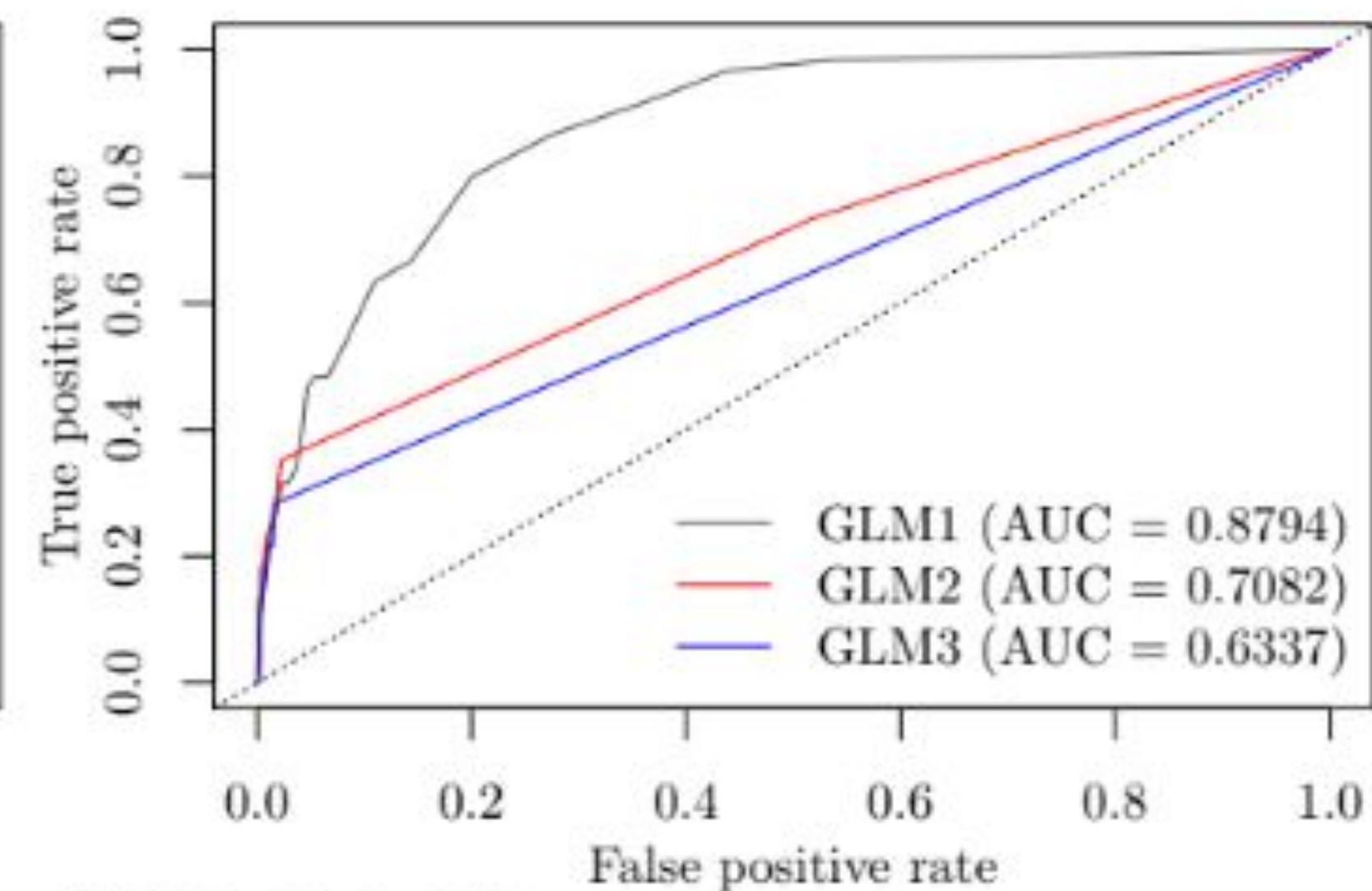
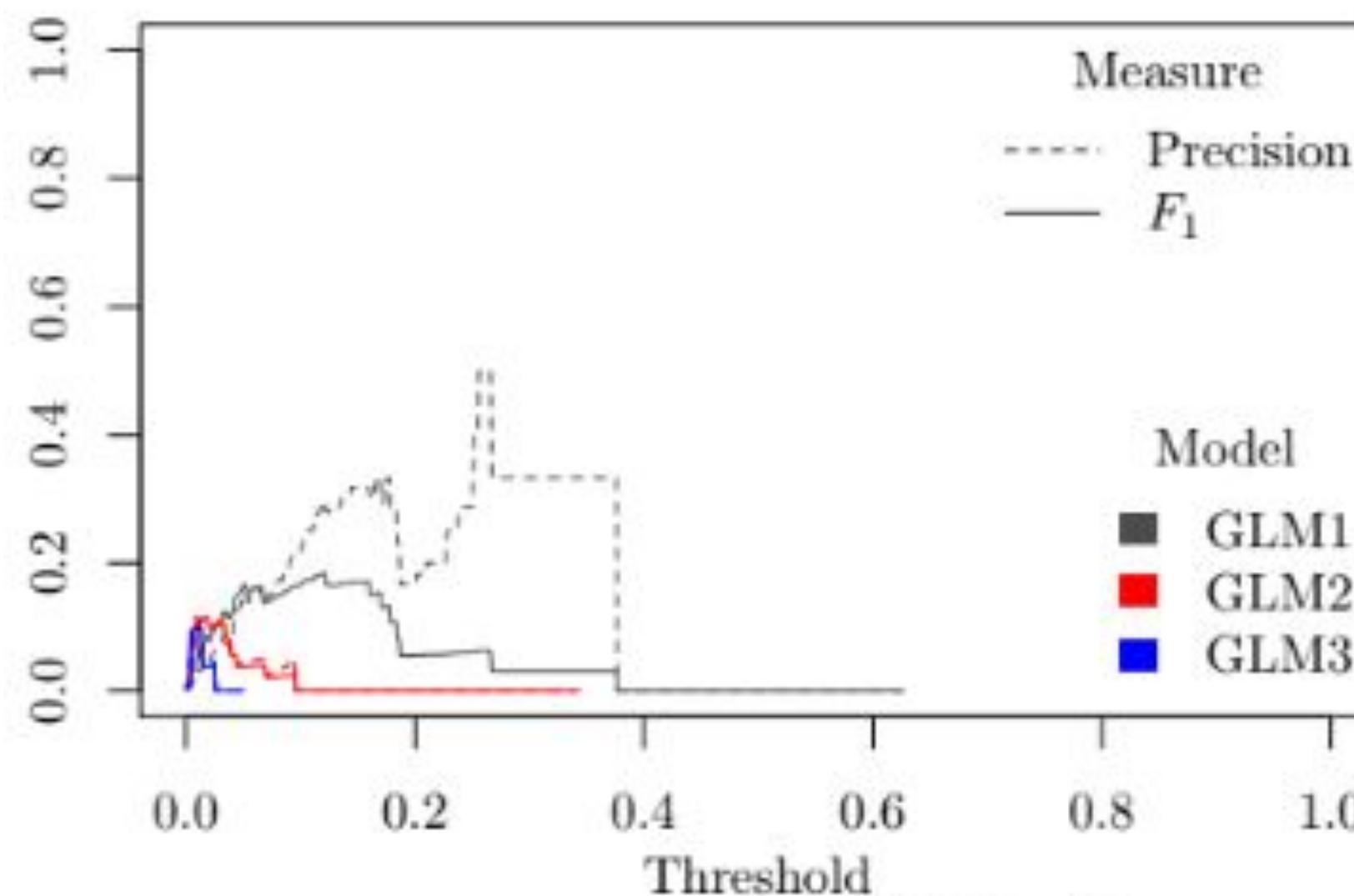


# The Results



(a) Performance of RF Models.

# The Results



(b) Performance of GLM Models.

# The Results

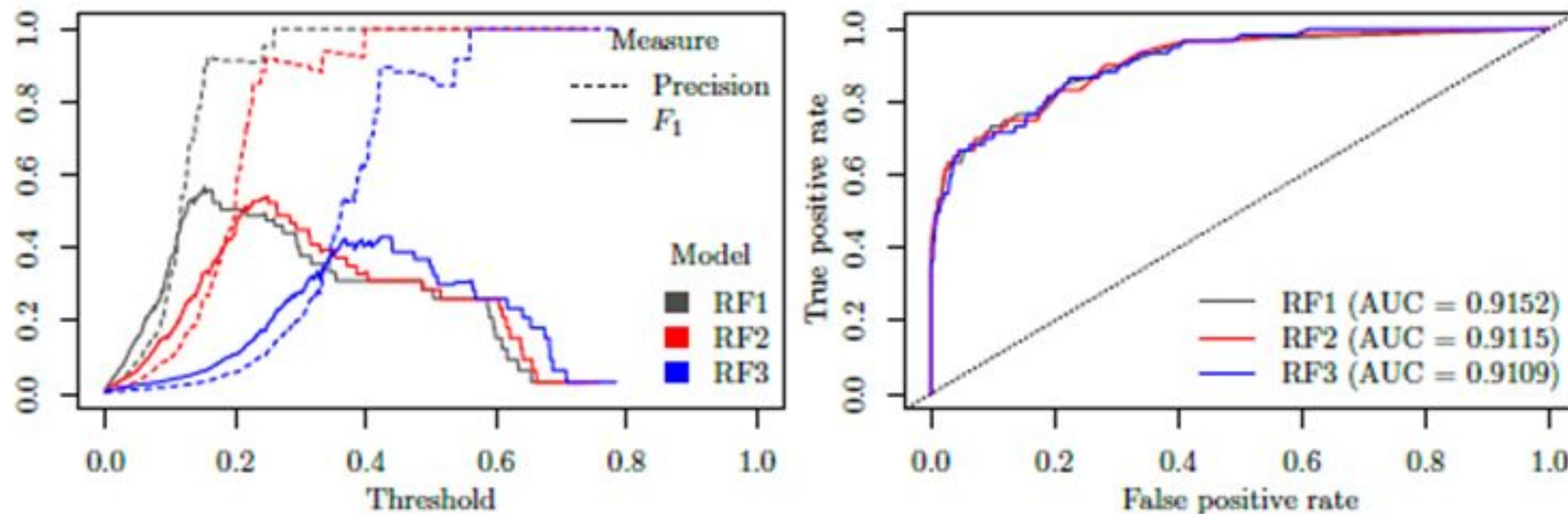


Figure 15: Performance of RF models on the validation sample measured by Precision,  $F_1$  (left) and ROC AUC (right) at different threshold levels.

# Potential Applications

## OF PUMP-AND-DUMP TRACKING

- Investing
- 1 hour before a scheduled pump the predicted coin is purchased
- Coin to be purchased is determined by comparing the coins' predicted pump likelihood to a predetermined threshold
- The number of coins purchased is  $k$  times the probability prediction
- Non-pumped coins give a return of 0
- Pumped coins give a return of half the total pump gains

# Potential Applications OF PUMP-AND-DUMP TRACKING

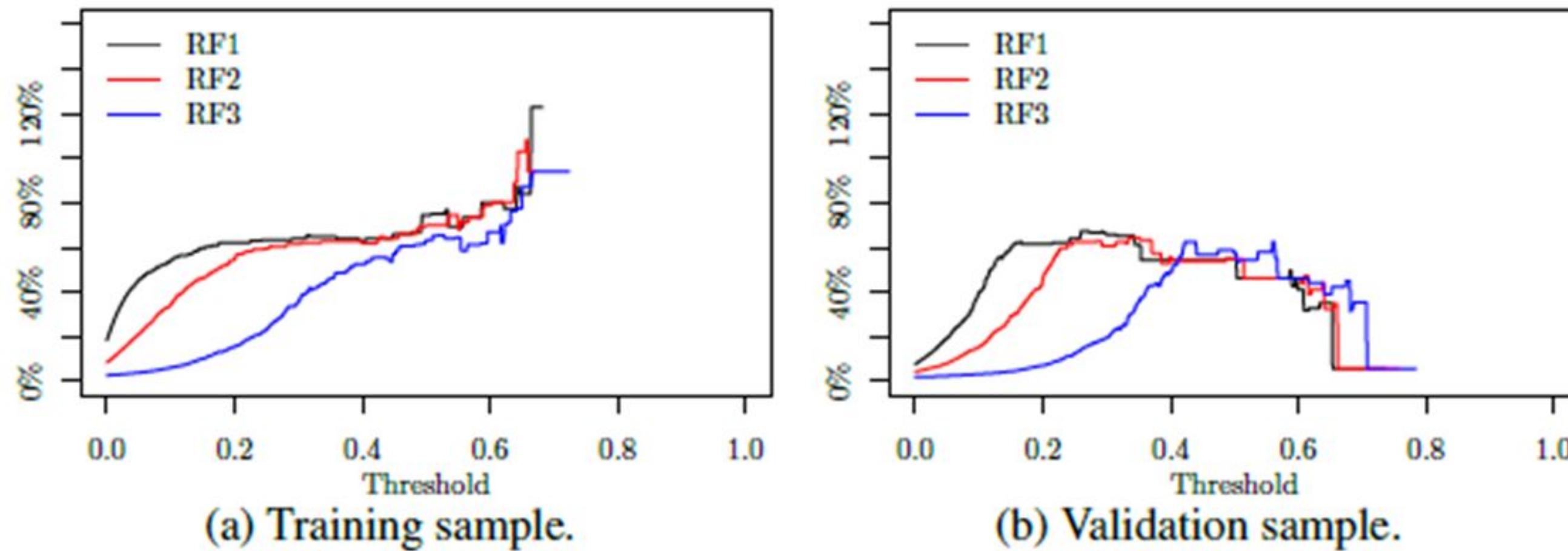
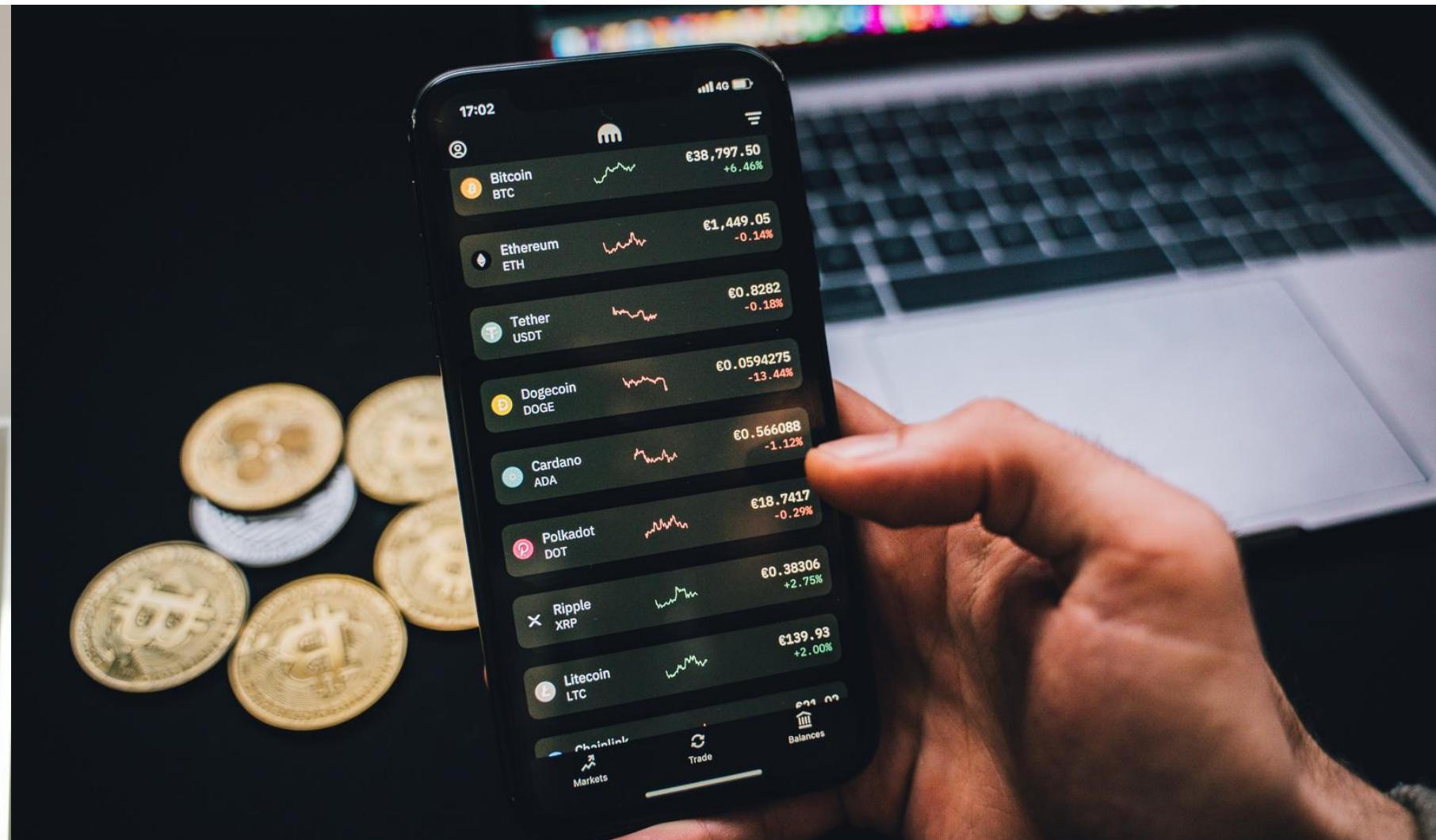
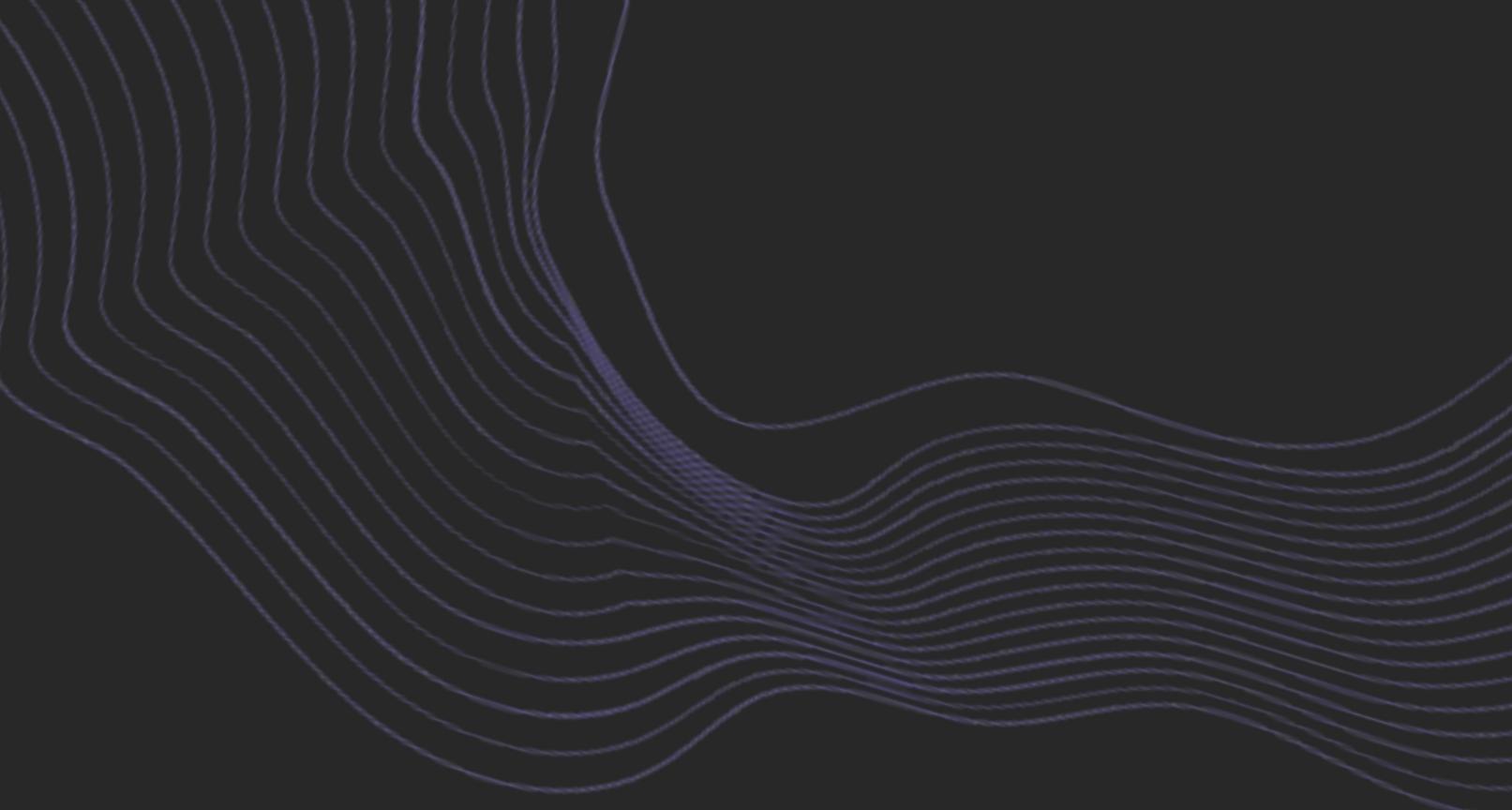


Figure 16: Investment return using different models at different threshold levels.

# Pump-and-Dump Schemes Conclusion

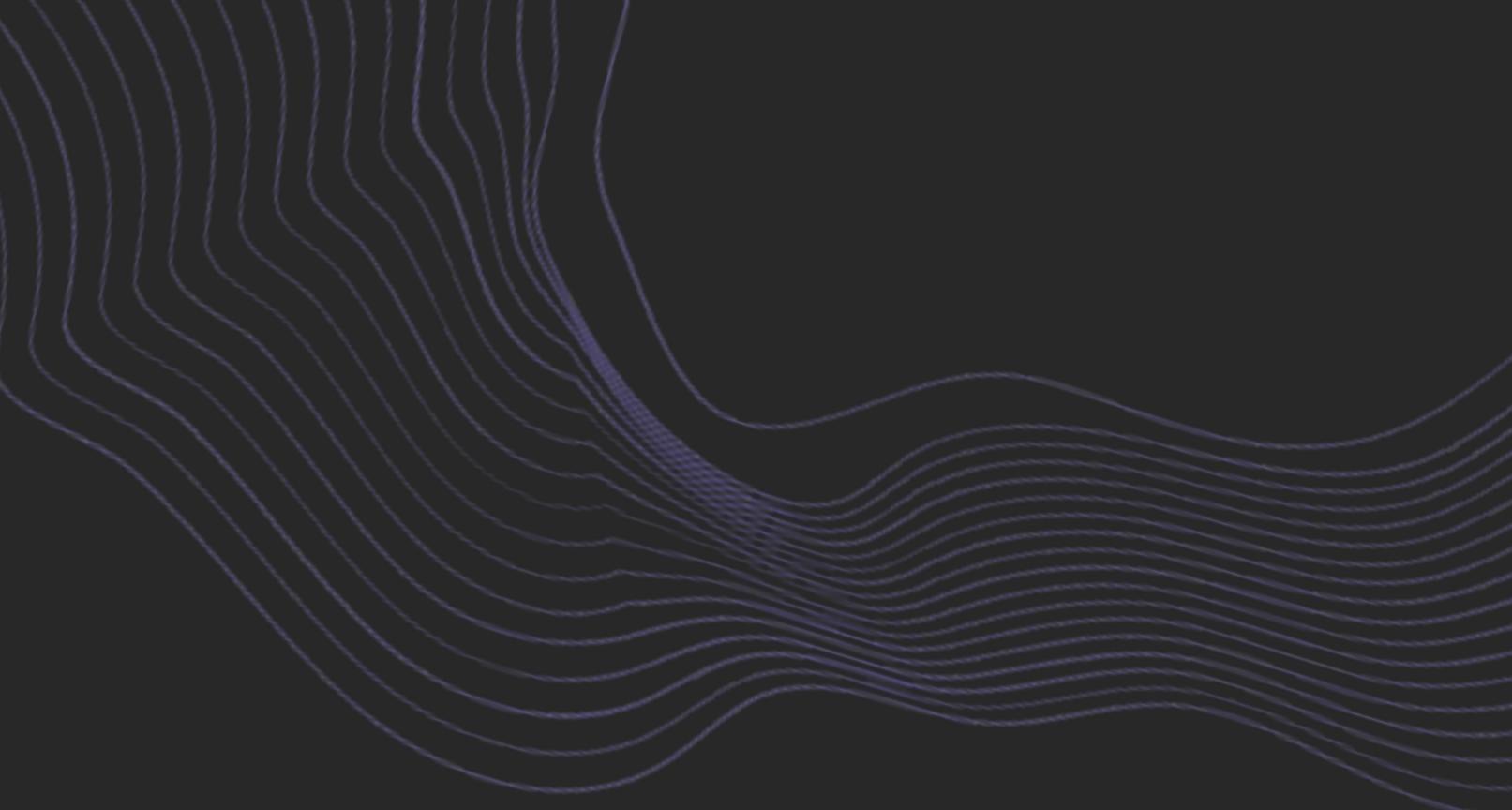




Thank you For Listening!

Do you have any  
questions?

# References

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- [1] J. Xu and B. Livshits, "The Anatomy of a Cryptocurrency Pump-and-Dump Scheme," in *USENIX Security 19*, 2019.
  - [2] F. Victor and T. Hagemann, "Cryptocurrency Pump and Dump Schemes: Quantification and Detection," *2019 International Conference on Data Mining Workshops (ICDMW)*, 2019, pp. 244-251, doi: 10.1109/ICDMW.2019.00045.
  - [3] Nghiêm, Huy & Murić, Goran & Morstatter, Fred & Ferrara, Emilio. (2021). Detecting Cryptocurrency Pump-and-Dump Frauds using Market and Social Signals. *Expert Systems with Applications*. 182. 115284. 10.1016/j.eswa.2021.115284.