



# **THAI NON-GLUTINOUS PADDY RICE PRICE ANALYSIS & INFLUENCING FACTORS**

**Data Science Immersive**

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Rice Market and Supply Chain  
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# 01. INTRODUCTION

Rice Market and Supply chain  
Objective of study  
Data Overview



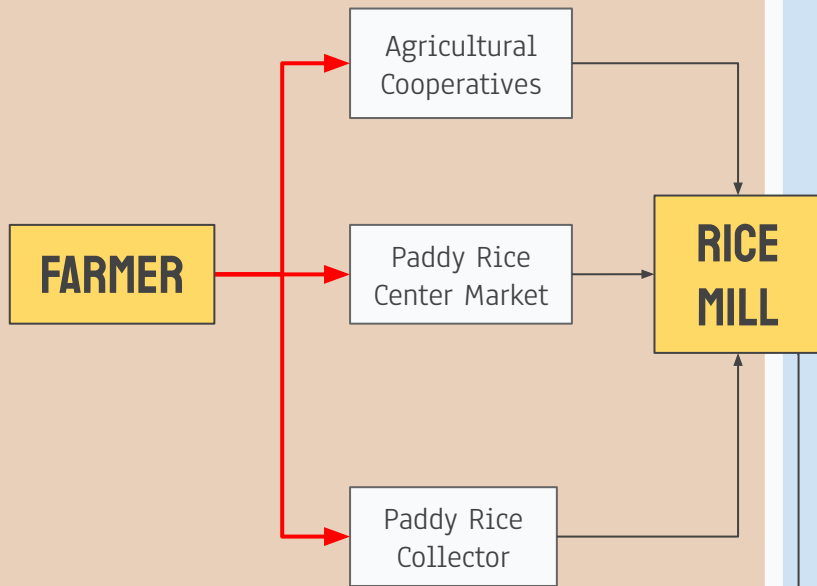
## POSITION OF THAILAND IN THE GLOBAL RICE MARKET



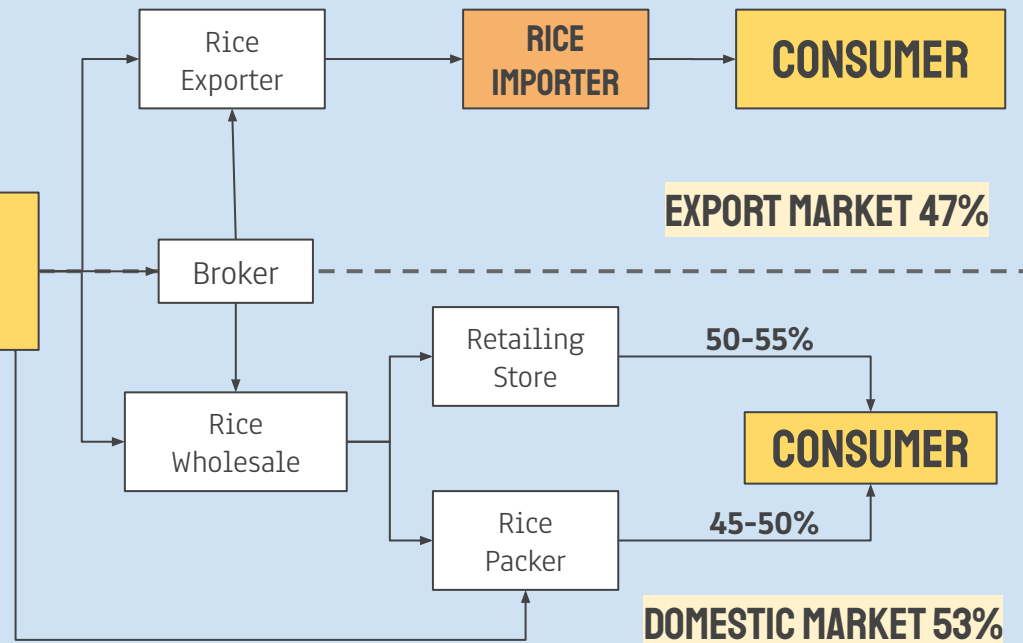
**Thailand** is the **6th highest rice producer** and **2nd largest rice exporter** in the world.

# THAILAND RICE PRODUCTION AND SUPPLY CHAIN

## PADDY RICE MARKET



## MILLED RICE MARKET







## OBJECTIVES OF STUDY

The purpose of this study is to:

- Observe the factors influencing Non-Glutinous Paddy rice price.
- Create models for forecasting Non-Glutinous Paddy price with different categories of features to **compare model efficiency and features importance.**

## DATA OVERVIEW

### DATAFRAME :

- Frequency : Monthly
- Period : January 2006 to October 2024
- Shape : 226 rows 48 columns

### Target :

**Non-glutinous Paddy Rice Price  
at farm gate**

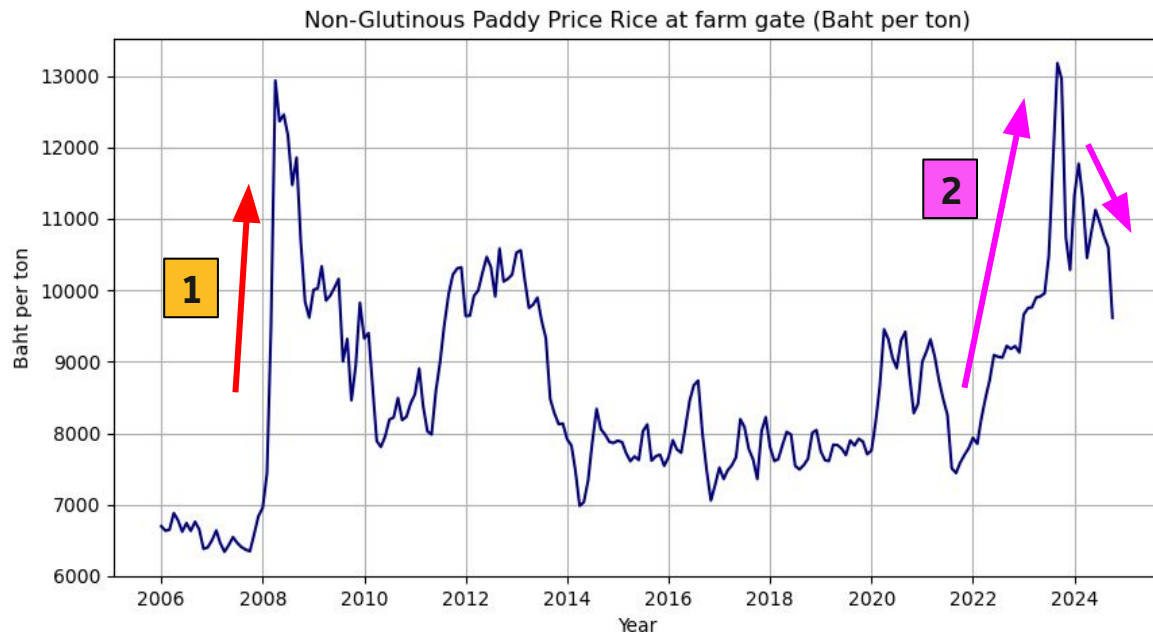
CATEGORIES	NUMBER OF FEATURES	FEATURES
Production Index	5	Agricultural, Crops, Paddy, Non-Glutinous and Thai Hom Mali Production index, shock events
Export and Finance indicator	13	Agricultural export value, Rice export value, Rice export amount Inflation, Policy rate, <b>NEER, REER</b> , Inflation, <b>CPI(rice)</b> , 4 shock events
Water and Fertilizer	29	Volume of water in 2 dams, Water level recorded at 21 water stations, and Local Retail price of 6 types of chemical fertilizers
All features	47	Contains all features from above

## 02. EXPLORATORY DATA ANALYSIS





# NON-GLUTINOUS PADDY RICE PRICE



## GLOBAL RICE PRICE SHOCK

### **1 THE 2008 GLOBAL FOOD CRISIS**

**January and May 2008**

caused by export bans from major producers like India and Vietnam.

### **2 INDIAN EXPORT DUTY**

**↑ July 2022**

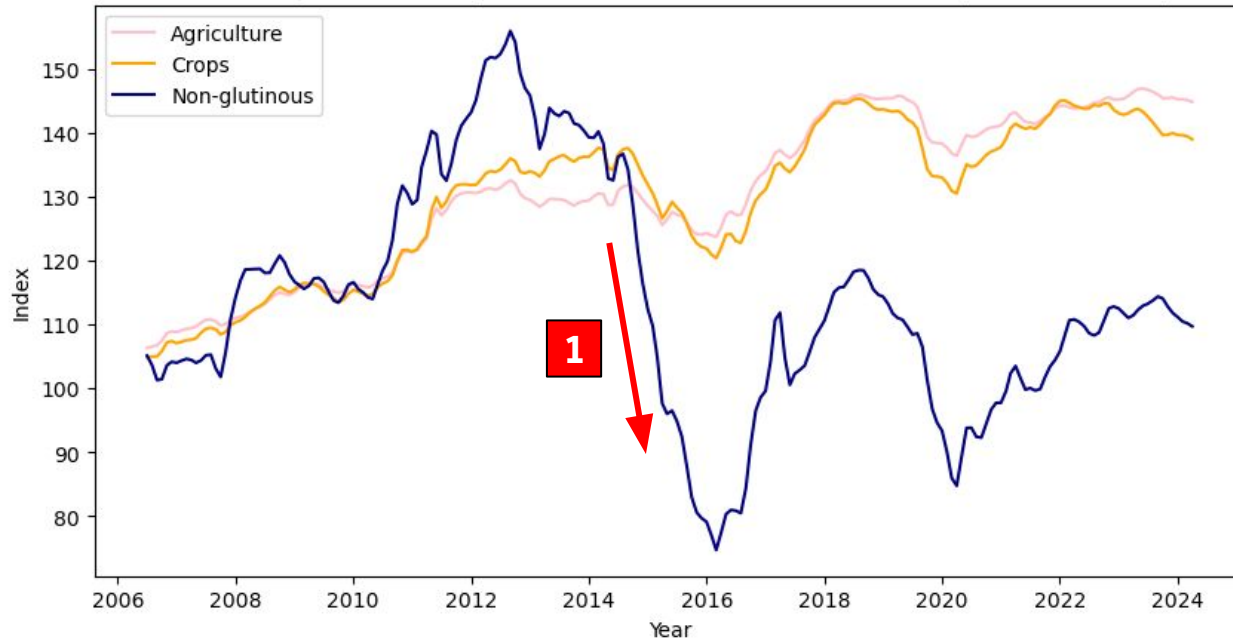
India lifts export restrictions.

**↓ September 2024**

India has removed several of its restrictions.

## PRODUCTION INDEX

Trend of Agriculture, Crops and Non-Glutinous Production Index (Base Year 2005)

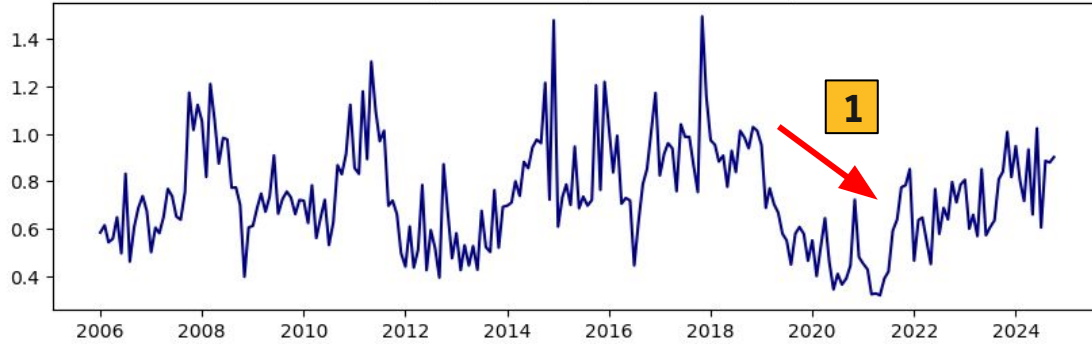


### 1 2014 DRAMATIC DROP OF NON-GLUTINOUS PRODUCTION

- **Cultivated area has decreased** because some farmers have changed to more profitable crops

## EXPORT AND FINANCE INDICATOR

Rice Export Amount (million metric ton)

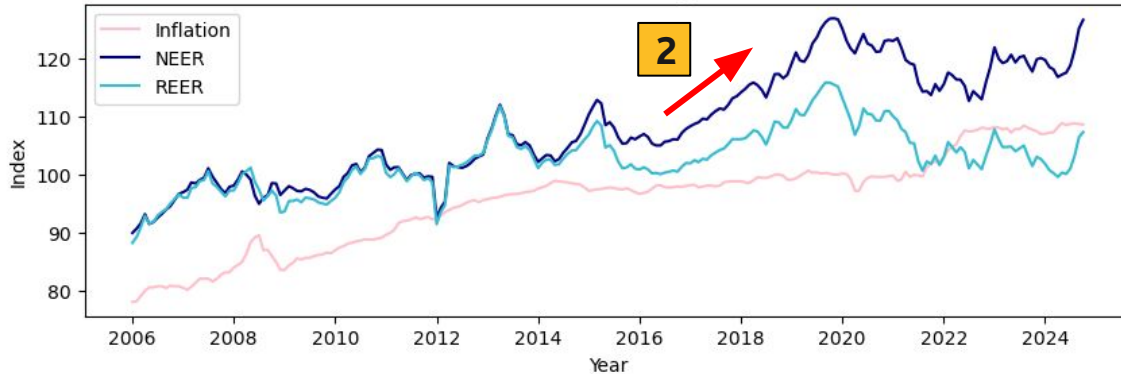


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### DECREASED DEMAND OF THAI WHITE RICE

2019, Thai Non-glutinous rice is hard rice, but consumers in foreign markets have begun to prefer softer rice.

Inflation and Exchange rate



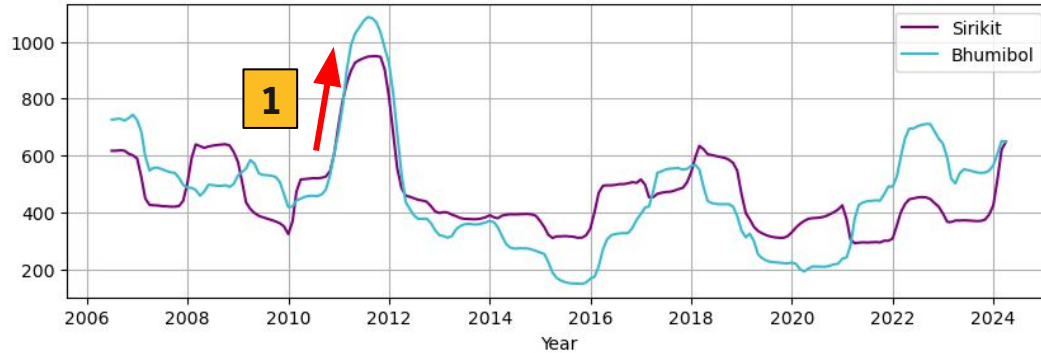
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### INCREASE IN NOMINAL EFFECTIVE EXCHANGE RATE

Refers to the **Thai Baht appreciation**. This reflects lower of country's real purchasing power and productivity.

# WATER AND FERTILIZER

Volume of water in Sirikit and Bhumibol dam (Million cubic meters)

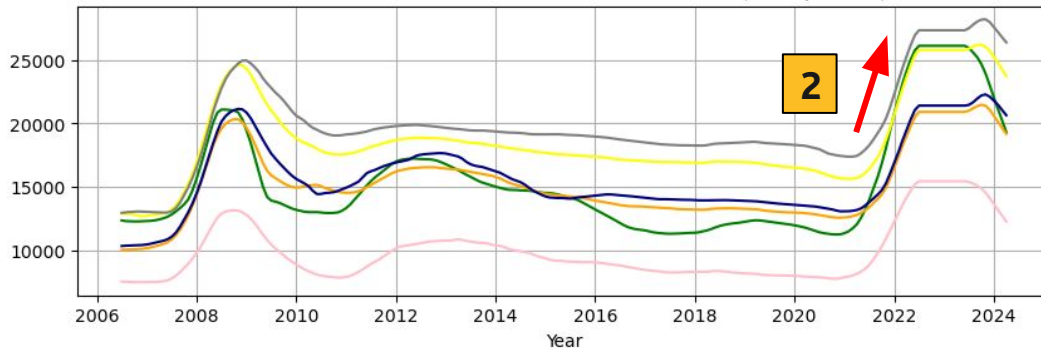


## 1 2011 THAILAND'S GREAT FLOOD

**July to November 2011**

Due to high and long seasonal rainfall since May 2011.

Trend of 6 Chemical Fertilizers Local Retail Price(Baht per ton)



## 2 SKYROCKETING FERTILIZER PRICES

**October 2021**

China restricted exports

**February 2022**

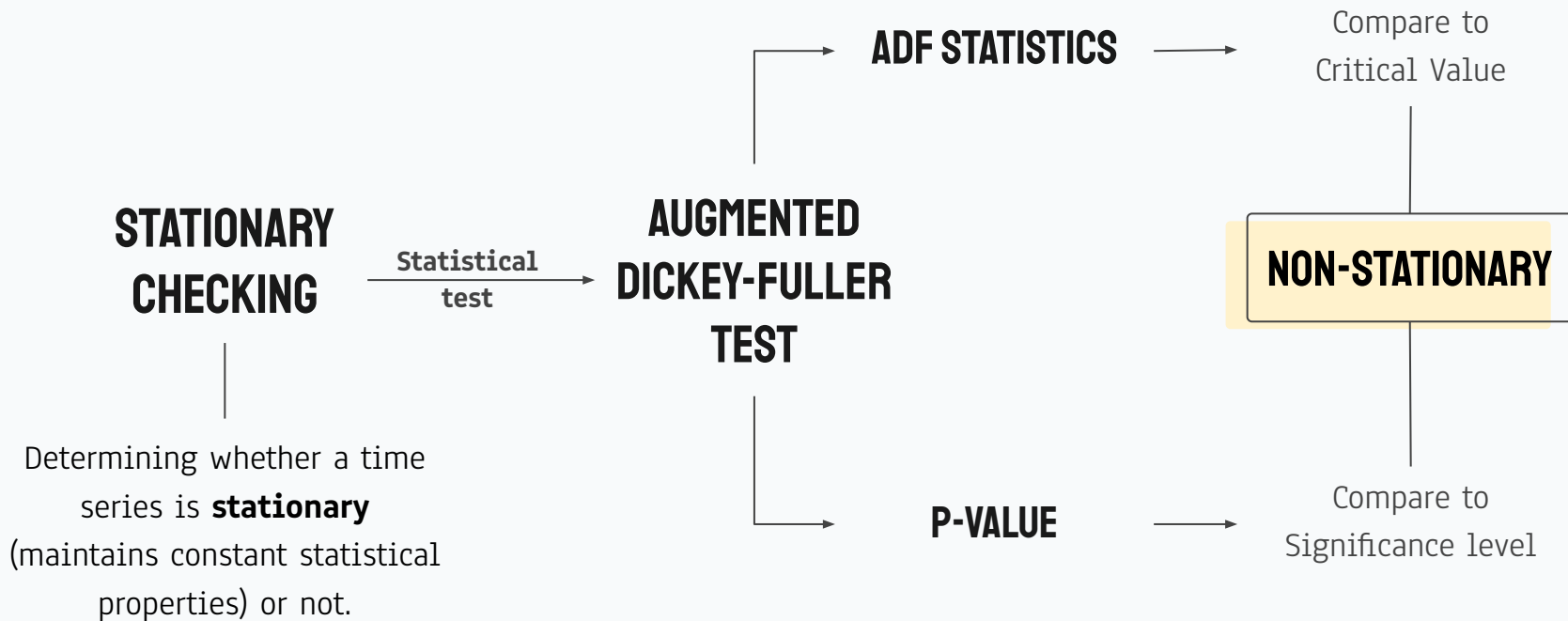
Russia and Ukraine War caused the increasing price of raw materials for chemical fertilizer production.

# 03. MODELS AND RESULT

Stationary Checking  
Models  
Model Evaluation  
Feature Importance



## STATIONARY CHECKING



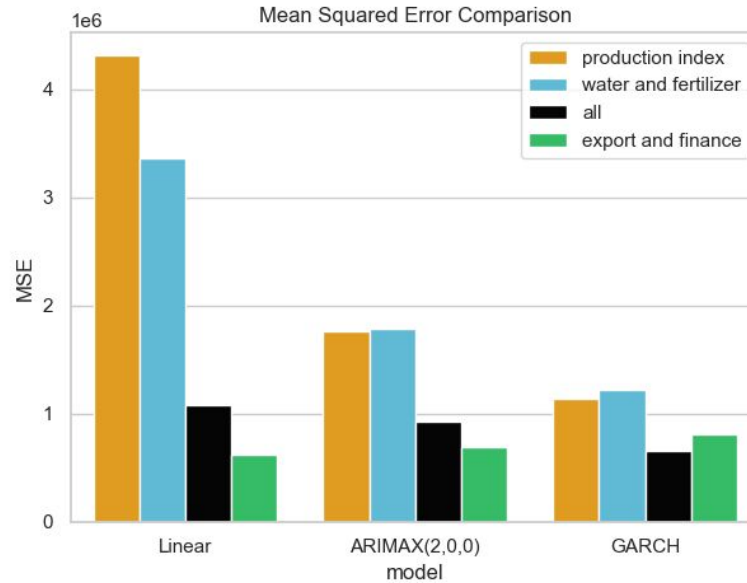




## MODELS

MODELS	PURPOSE & STRENGTH
<b>LINEAR REGRESSION</b>	<b>Simplest model.</b> Good for understanding simple linear relationships between variables.
<b>ARIMAX</b>	Suitable for <b>time-series forecasting that includes external variables</b> and requires modeling trends, seasonality, and correlations.
<b>GARCH</b>	<b>Estimates the variance (volatility) of a time series</b> , which is then added to the target forecast value from ARIMAX.

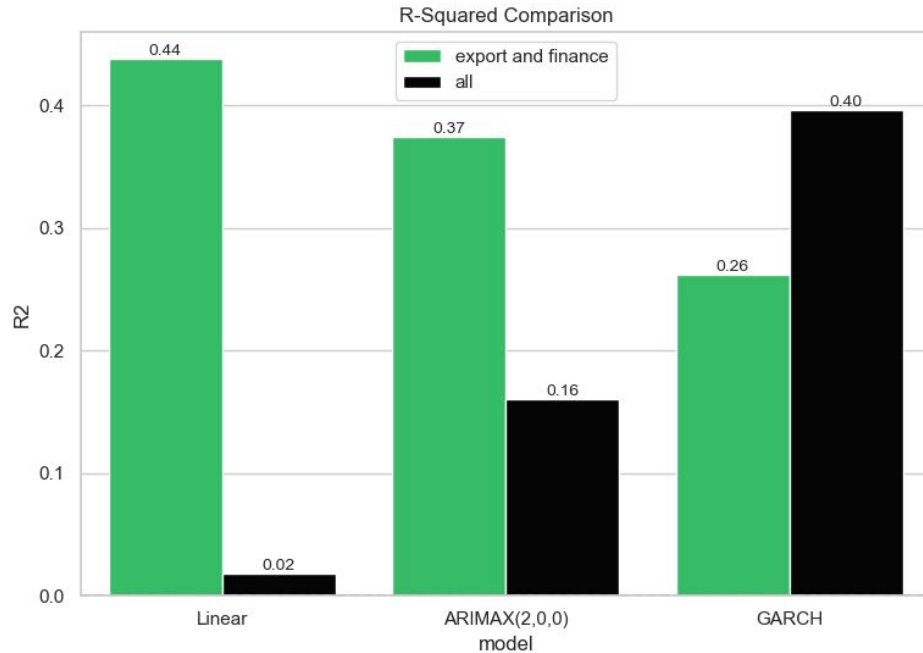
## RESULTS : MODEL EVALUATION



**Errors mostly decrease as the model becomes more complex :** Linear > ARIMAX > GARCH

**The Top 2 Lowest MSE and RMSE :** All features and Export and Finance

## RESULTS : COMPARE R-SQUARED BETWEEN EXPORT AND FINANCE WITH ALL FEATURES



### What is R-squared ?

Indicates how well the features predict the variation in the target value. Range from 0 - 1.

#### All Features

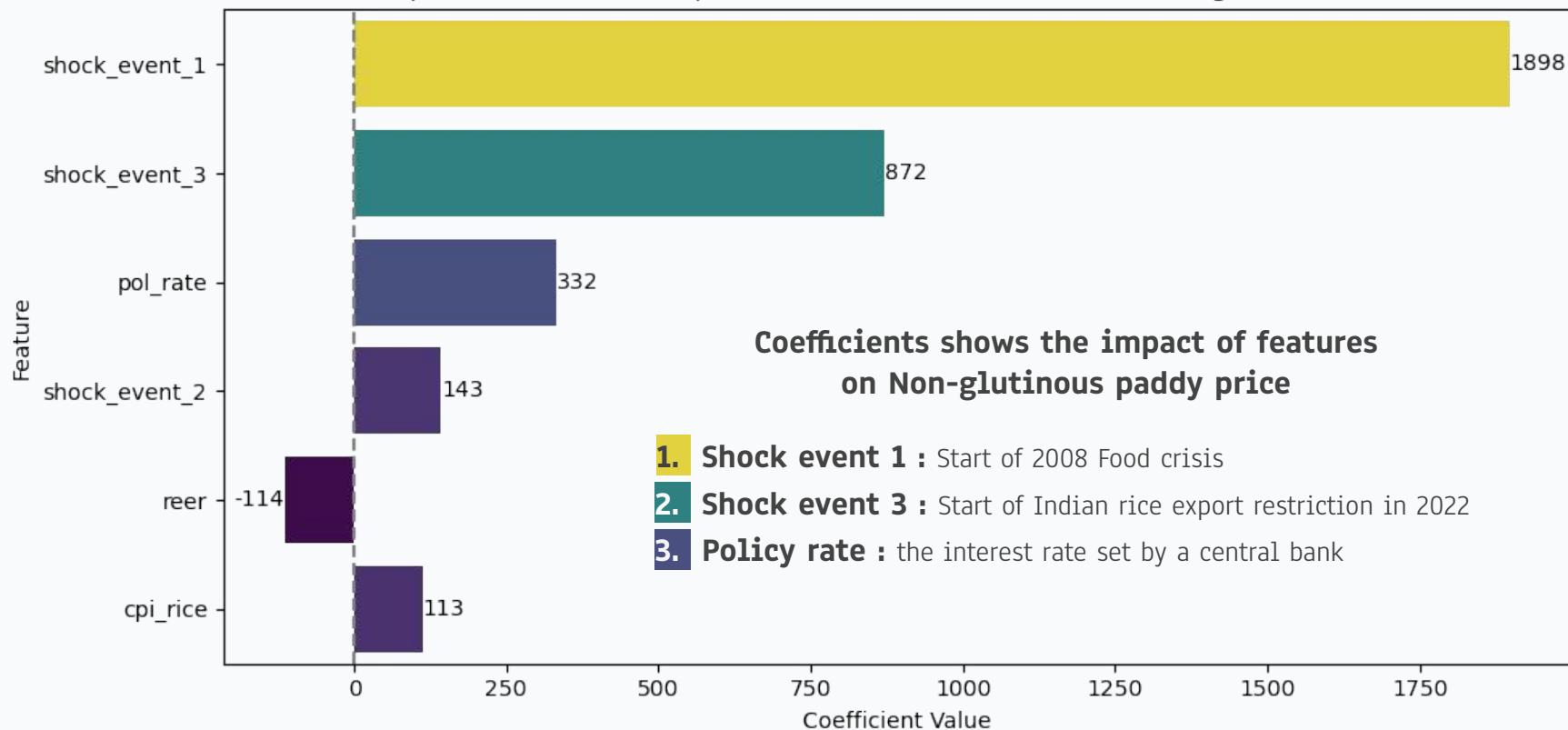
- The Best Model: Garch Model
- R-squared = 0.40

#### EXPORT AND FINANCE

- The Best Model: Linear Regression Model
- R-squared = 0.44

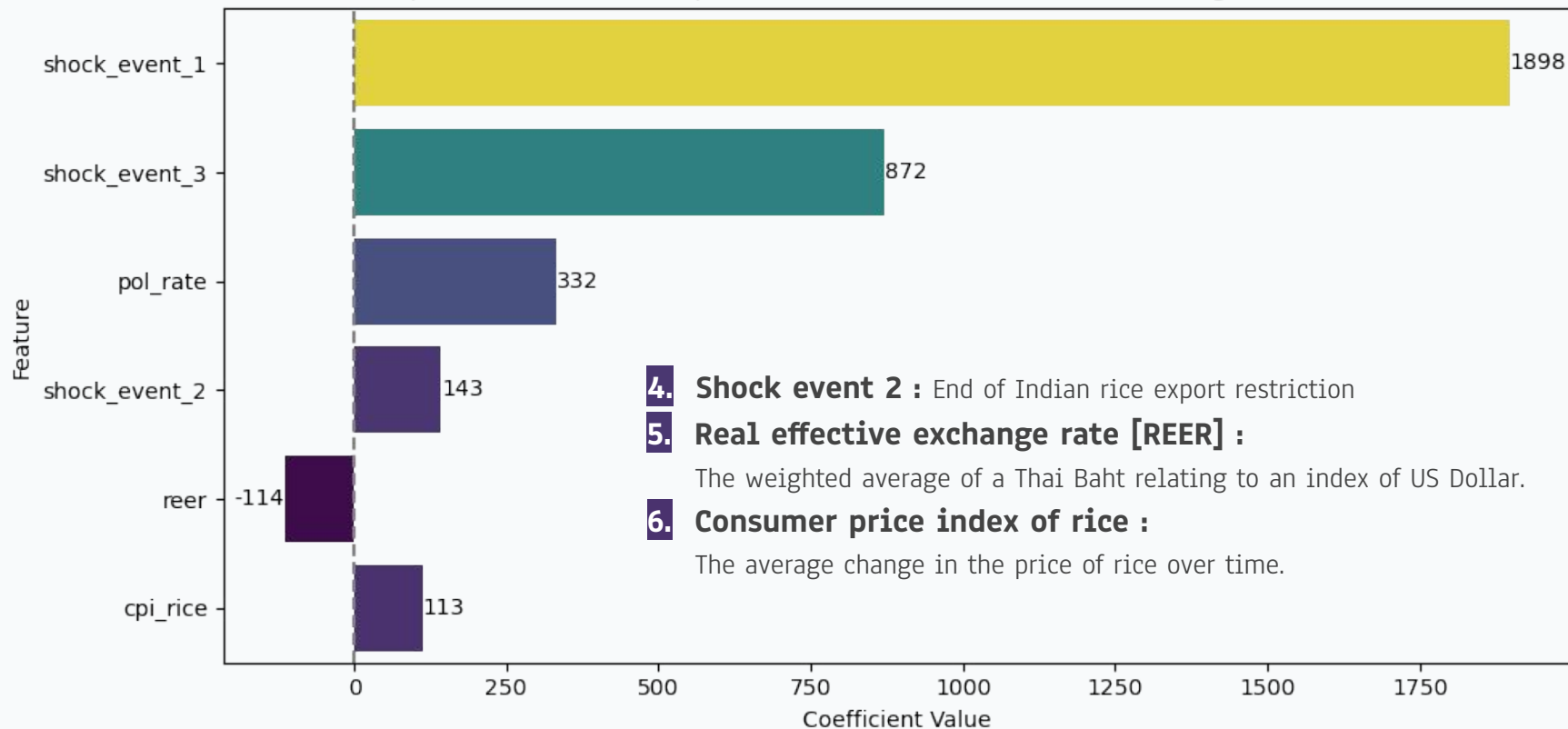
## FEATURE IMPORTANCE : LINEAR MODEL WITH EXPORT AND FINANCE CATEGORIES

Top 6 Coefficients of Export and Finance Features of Linear Regression Model



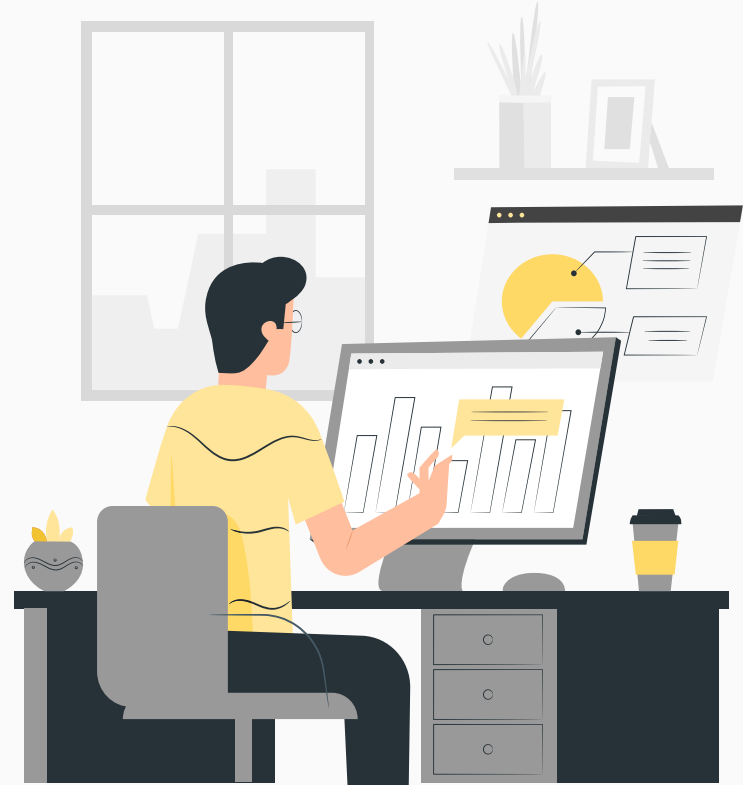
## FEATURE IMPORTANCE : LINEAR MODEL WITH EXPORT AND FINANCE CATEGORIES

Top 6 Coefficients of Export and Finance Features of Linear Regression Model



# 04. CONCLUSIONS

Summary, Implications  
Limitations, Recommendation







## SUMMARY

- **The Linear Regression Model using Export and Finance features** results the **best forecast** among the combination of model and feature categories (Highest R-squared)
- **Feature importance :**  
International **shock event features**, 2008 Food crisis and India export restriction, have strong influence to Non-Glutinous Paddy Price



## IMPLICATION OF STUDY

- **Farmers :**
  - Better planning of minimize risks of price volatility
- **Government Agencies & Policy Makers :**
  - Design and implement effective price stabilization policies
  - Facilitate targeted subsidies and support programs
- **Traders and Exporters :**
  - Forecast price trends to plan procurement and inventory management and improve competitiveness



## FUTURE RESEARCH

### Future research

- Considering Competitors data (Indian and Vietnam)
  - Export value and Amount
  - Inflation rate
  - Food Security index
- Considering Government Policy
  - Paddy Price Insurance



# Thank you

— PLEASE FEEL FREE TO ASK ME ANY QUESTIONS —

