

Stock Market Data to Predict Exchange Rates

Helen Pan



Agenda

1

Introduction

2

Data Exploration

3

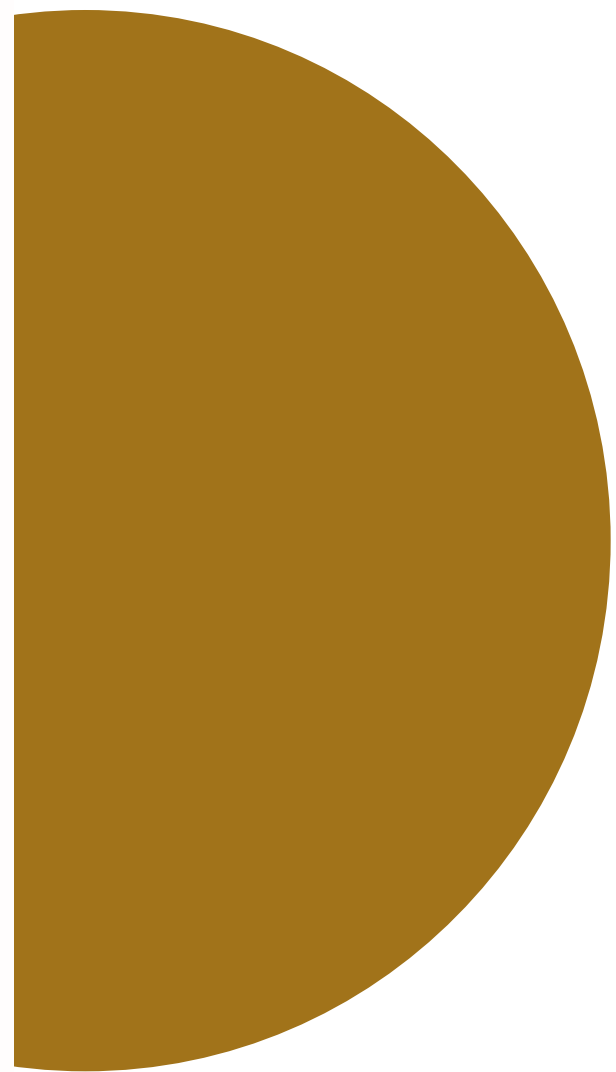
Models

4

Insights

5

Conclusion



INTRODUCTION



The Foreign Exchange (FX) Market

Largest market in the world

> \$5 trillion traded daily

Traded in pairs

Value relative to each other

Spot Price (Exchange Rate)

USD/ILS

Base Currency

Quoted Currency

Higher spot price:

USD more valuable in relation to the Shekel

Introduction

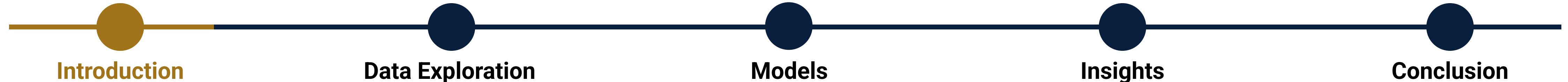
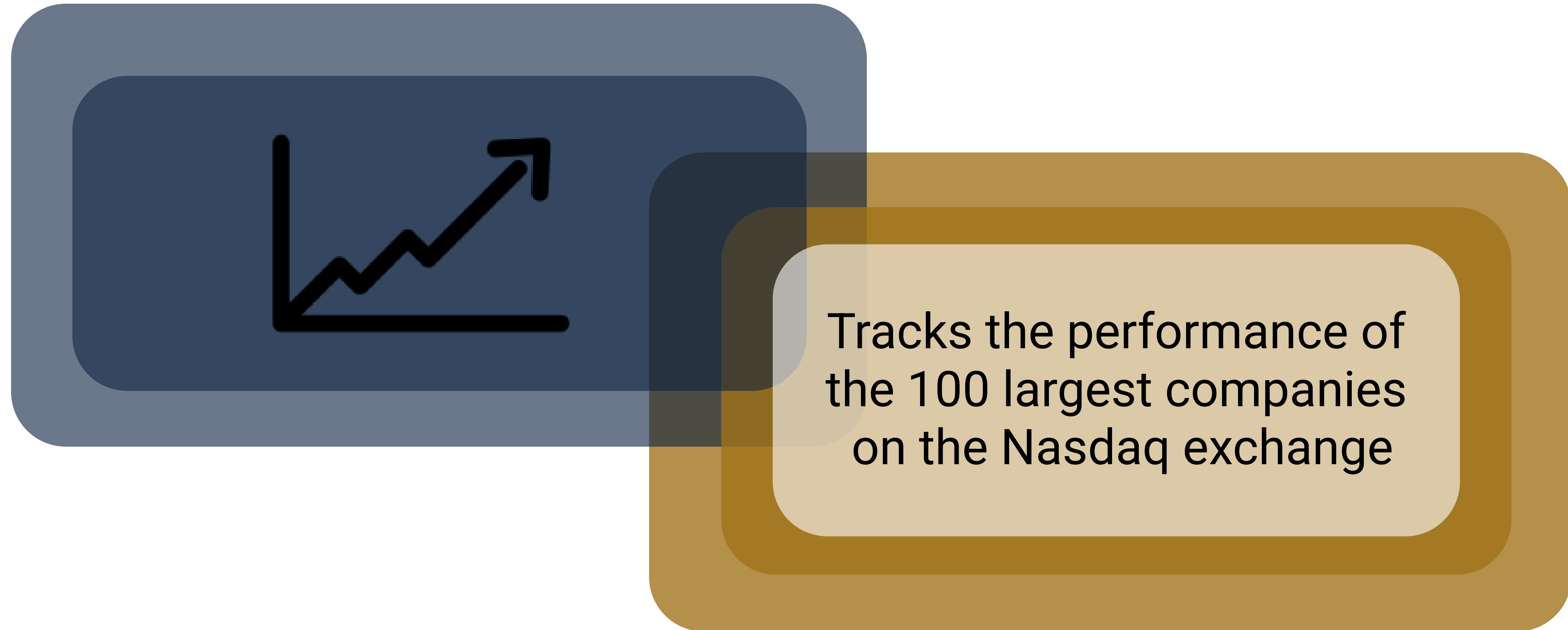
Data Exploration

Models

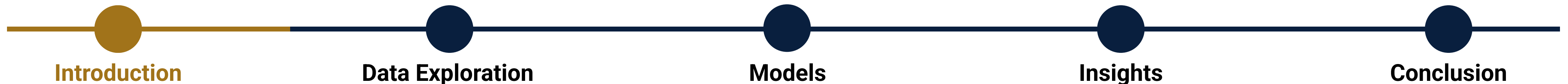
Insights

Conclusion

General Background— The QQQ



Topic Motivation



Purpose

1

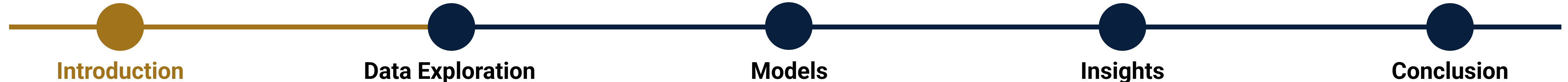
Discover if there is a correlation between USD/ILS and QQQ

2

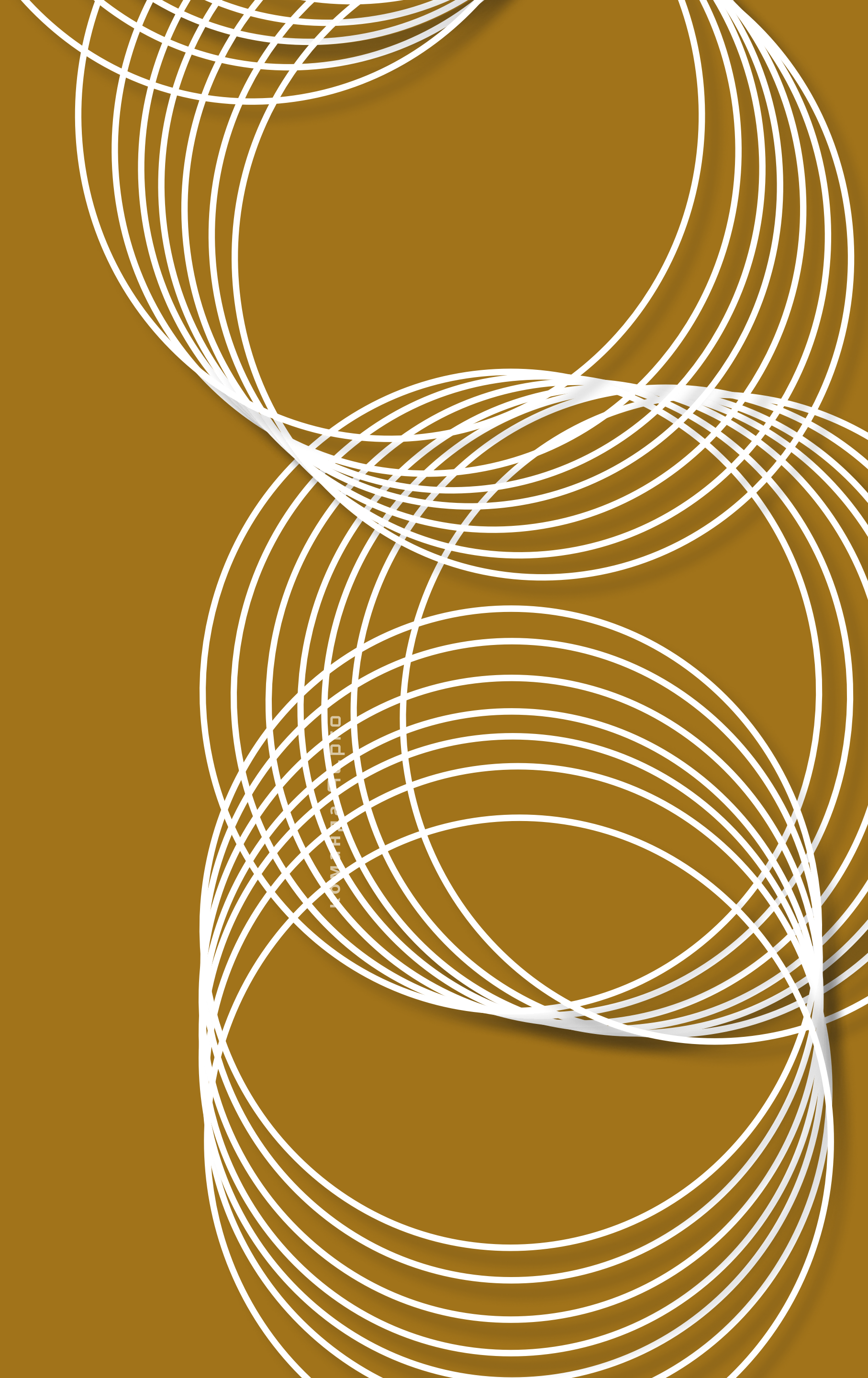
Create model(s) that can utilize QQQ data to predict USD/ILS prices

3

Gather insights from models into factors that impact USD/ILS prices



DATA EXPLORATION



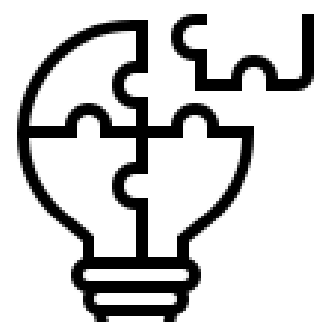
Dataset Introduction



Combines **USD/ILS** & **QQQ** datasets



Ranges from the years **2004 - 2017**



Includes **% change** & **up/down** columns

rows

3525

features

5

Introduction

Data Exploration

Models

Insights

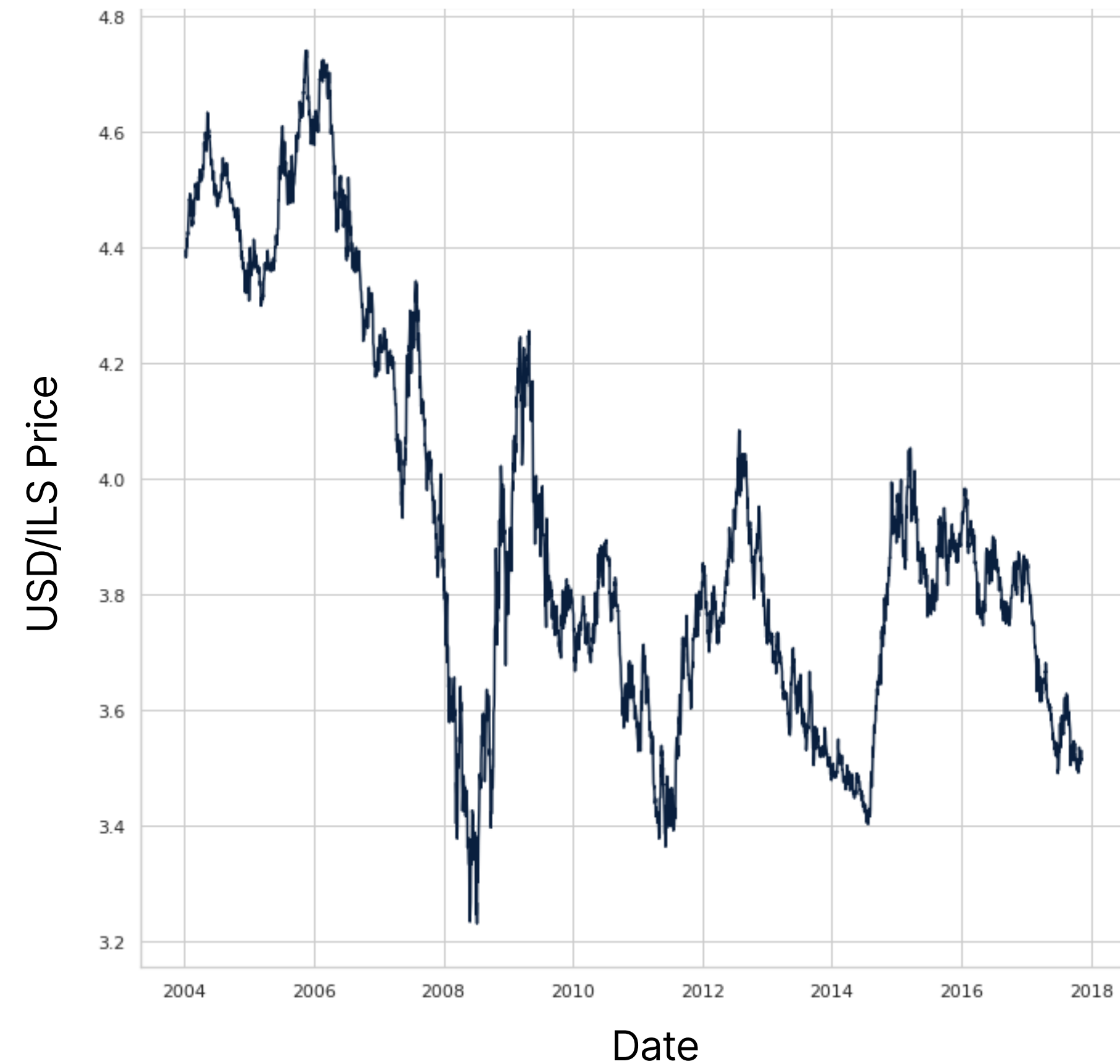
Conclusion

USD/ILS Price Chart

Observations

- No discernable trends
- Random fluctuations
- Prices range from 3.2-4.7
- Normally distributed

USD/ILS Price Chart



Introduction

Data Exploration

Models

Insights

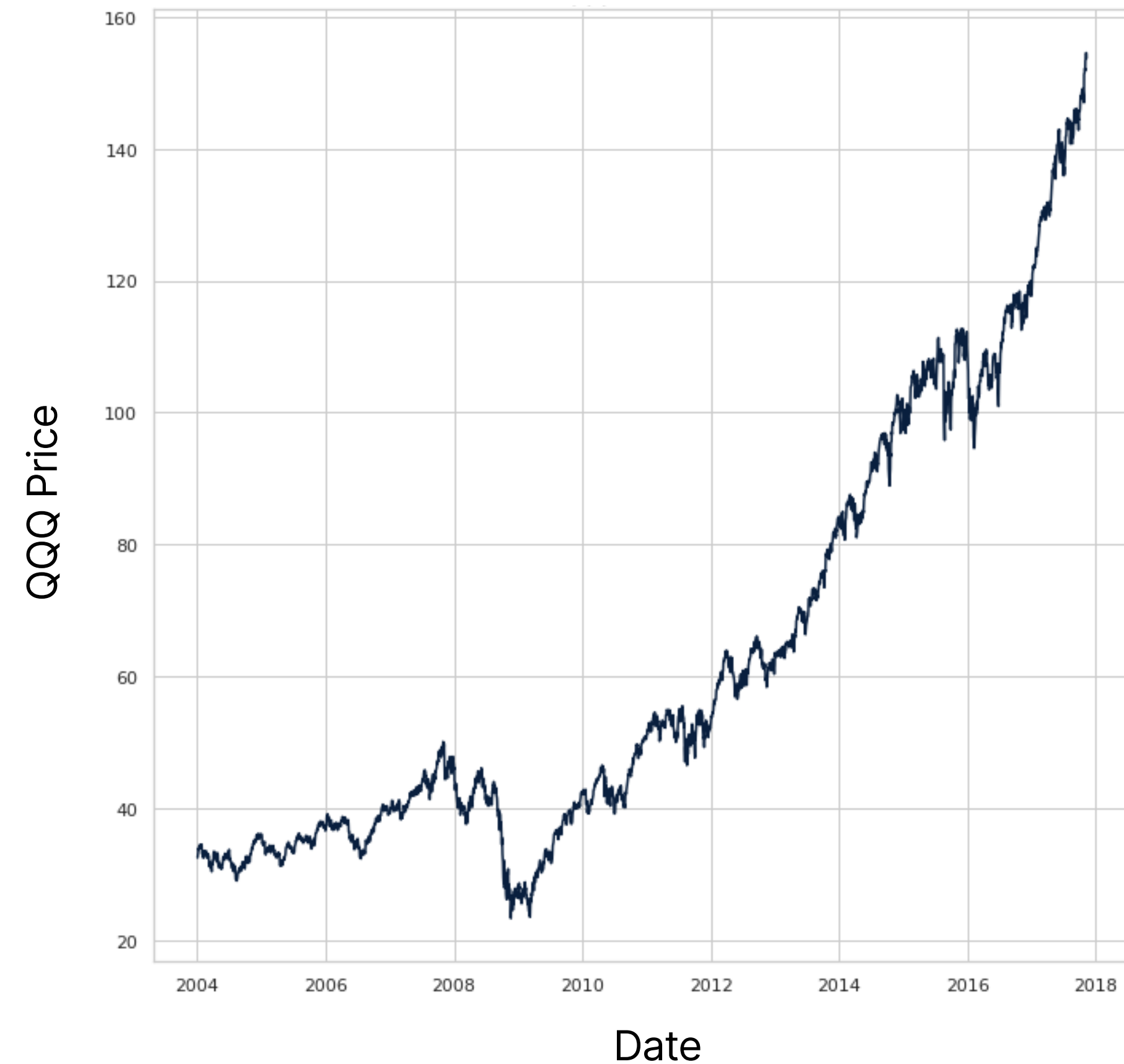
Conclusion

QQQ Price Chart

Observations

- **Generally upward trending as time passes**
- **Prices range from 22-158**
- **Normally distributed**

QQQ Price Chart



Introduction

Data Exploration

Models

Insights

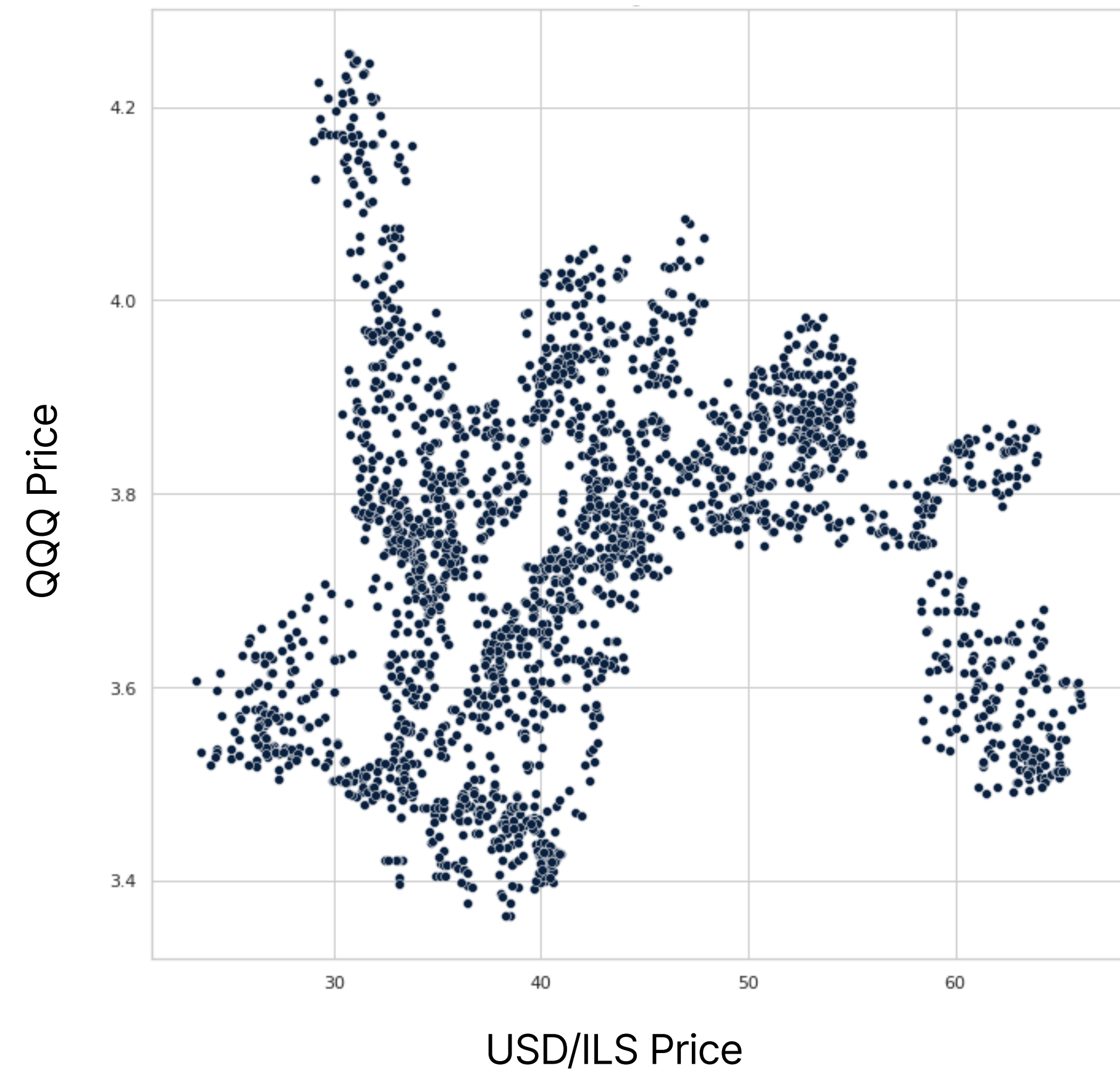
Conclusion

Why % Change Columns?

Observations

- **QQQ increases as time passes, USD/ILS does not**
- **Much larger range in QQQ prices than in USD/ILS**

QQQ Against USD/ILS



Introduction

Data Exploration

Models

Insights

Conclusion

Methodology

1

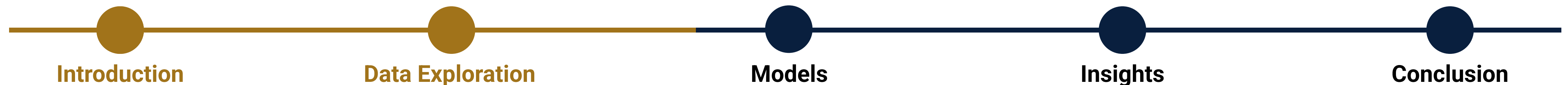
Duplicate the price column of both USD/ILS and QQQ

2

Shift the duplicated columns 1 row down

3

$\% \text{ change} = ((\text{original price} - \text{shifted price}) / \text{original price}) * 100$

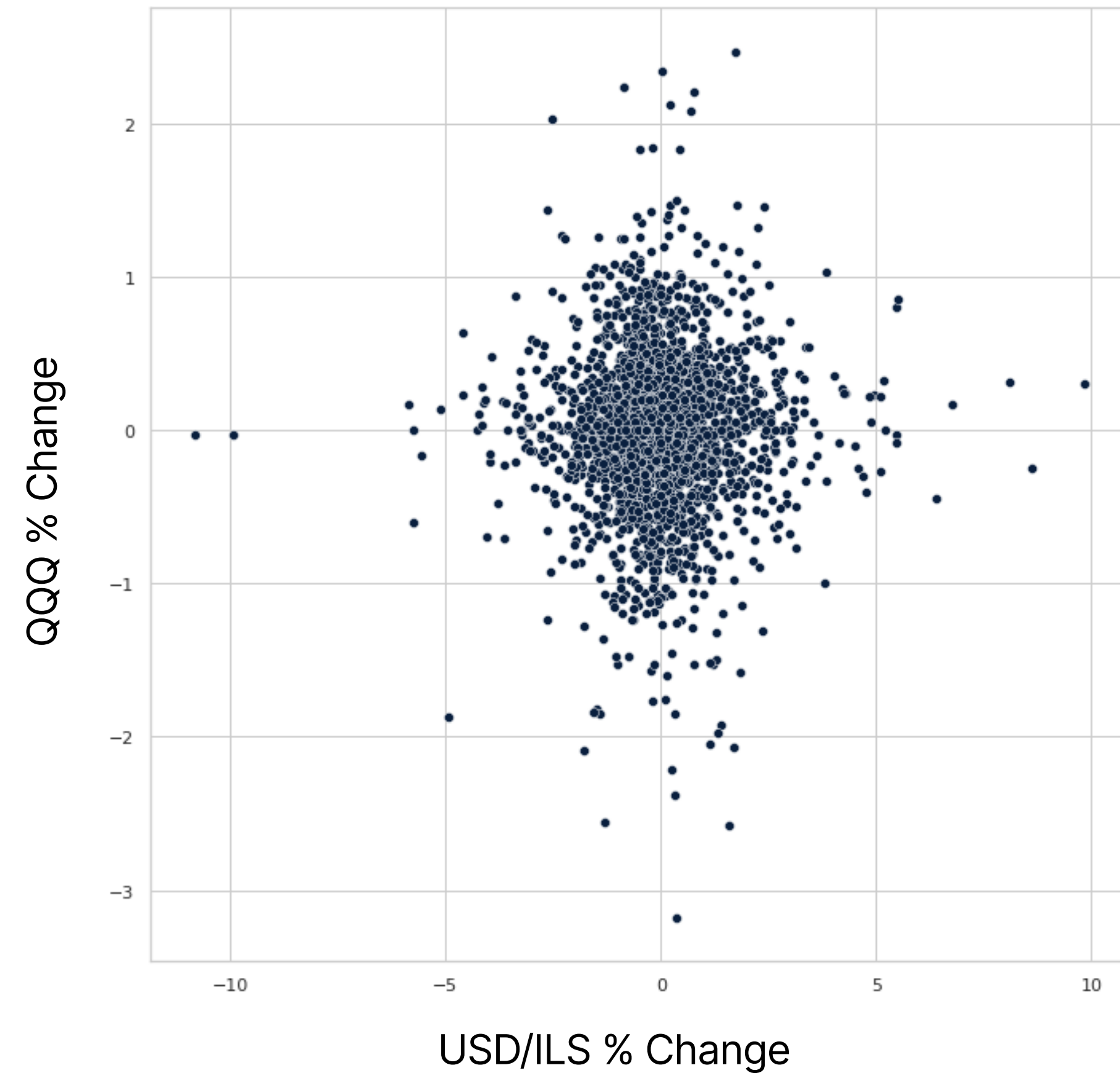


Result of % Change Columns?

Observations

- Spread of data points much less random
- Stronger starting point for future linear regression

QQQ Against USD/ILS



Introduction

Data Exploration

Models

Insights

Conclusion

MODELS



Pre-Processing

Drop Unnecessary Columns

Other FX Data

Open Interest

High

Low

Open

Volume

Introduction

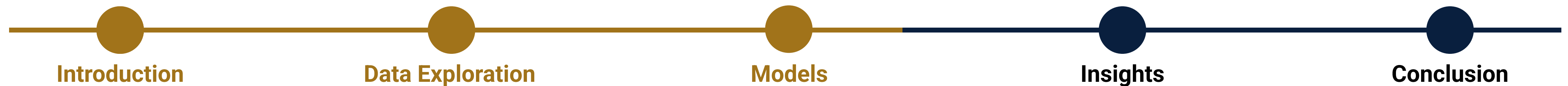
Data Exploration

Models

Insights

Conclusion

Models



LINEAR REGRESSION MODELS



Linear Regression

QQQ → USD/ILS
The Classic Model

QQQ % Change → USD/ILS % Change
The Normalized Model

QQQ → Shifted USD/ILS
The Lagged Model

R²

0.224

0.011

0.223

RMSE

0.315

0.353

0.313

Introduction

Data Exploration

Models

Insights

Conclusion

LOGISTIC REGRESSION MODELS



Pre-Processing

Creation of Up/Down Columns

1

Duplicate the price column
of USD/ILS

2

Shift the duplicated column
1 row down

3

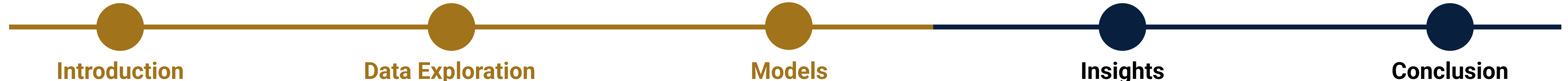
Delete the top row to offset
the shift (contains NaN)

4

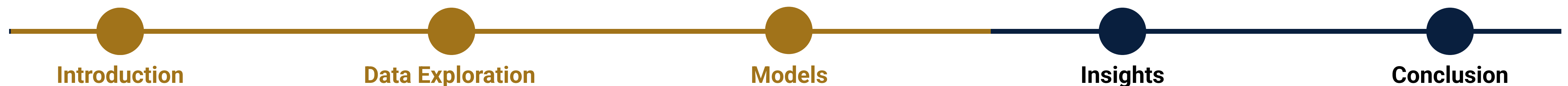
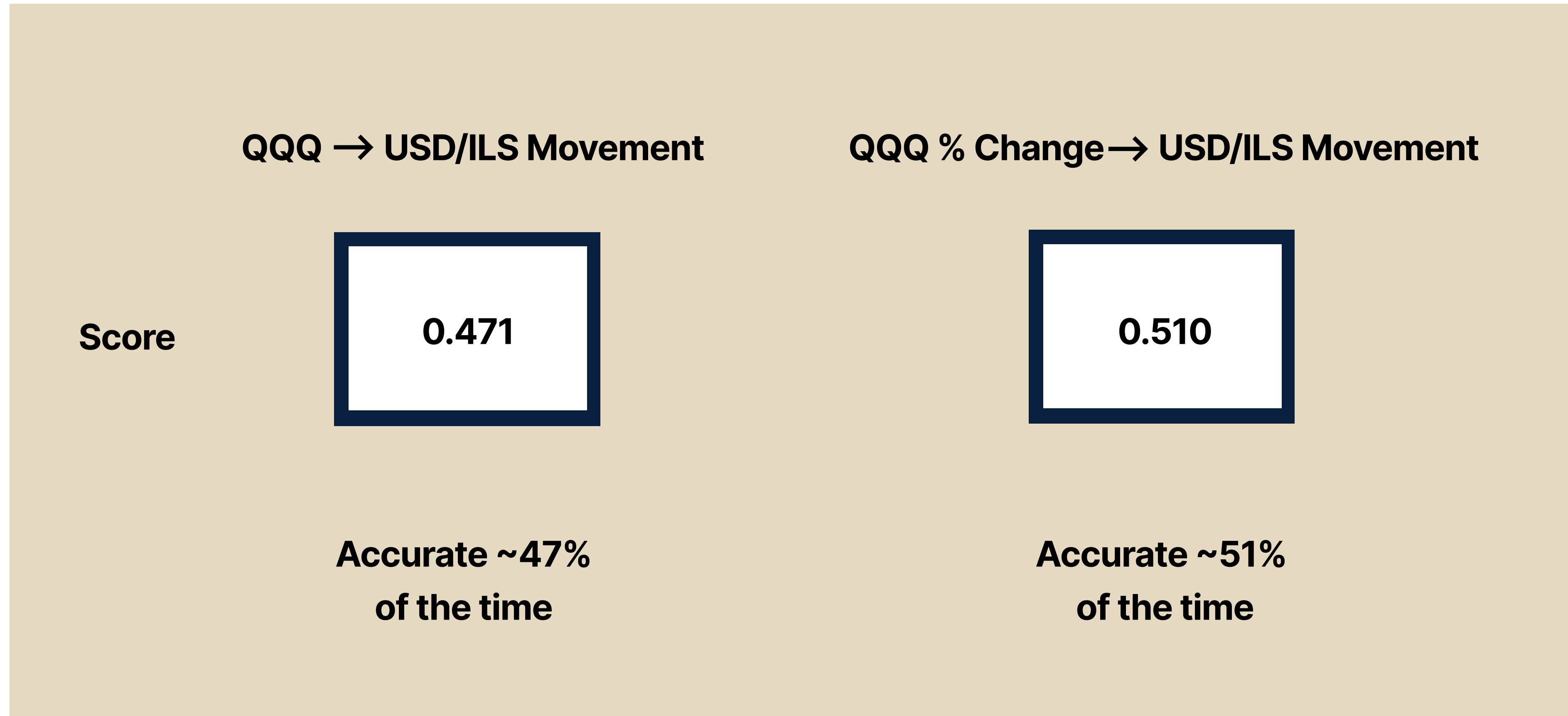
Create a new column for
USD/ILS movement

5

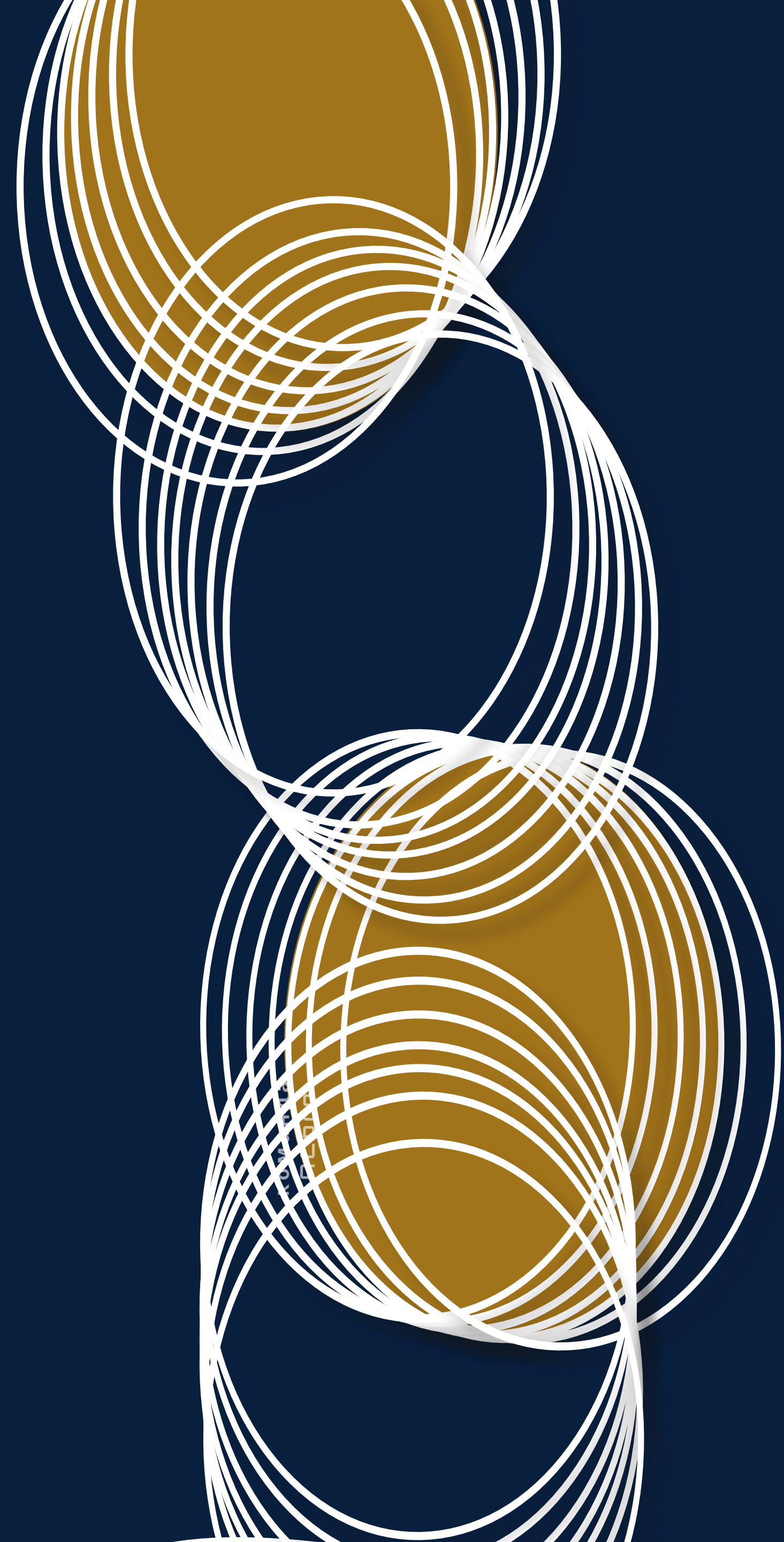
If close price < shifted price: “-”
If close price > shifted price: “+”



Logistic Regression



BINARY CLASSIFICATION MODEL



Pre-Processing

Creation of Up/Down Columns

1

Duplicate the price column
of QQQ

2

Shift the duplicated column
1 row down

3

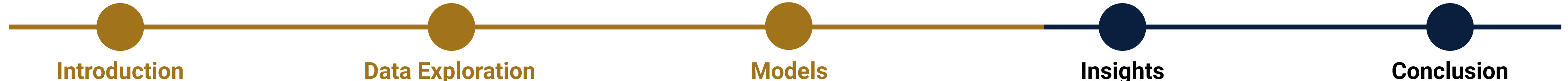
Delete the top row to offset
the shift (contains NaN)

4

Create a new column for
QQQ movement

5

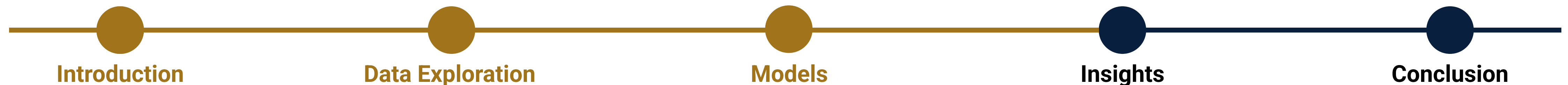
If close price < shifted price: 0
If close price > shifted price: 1



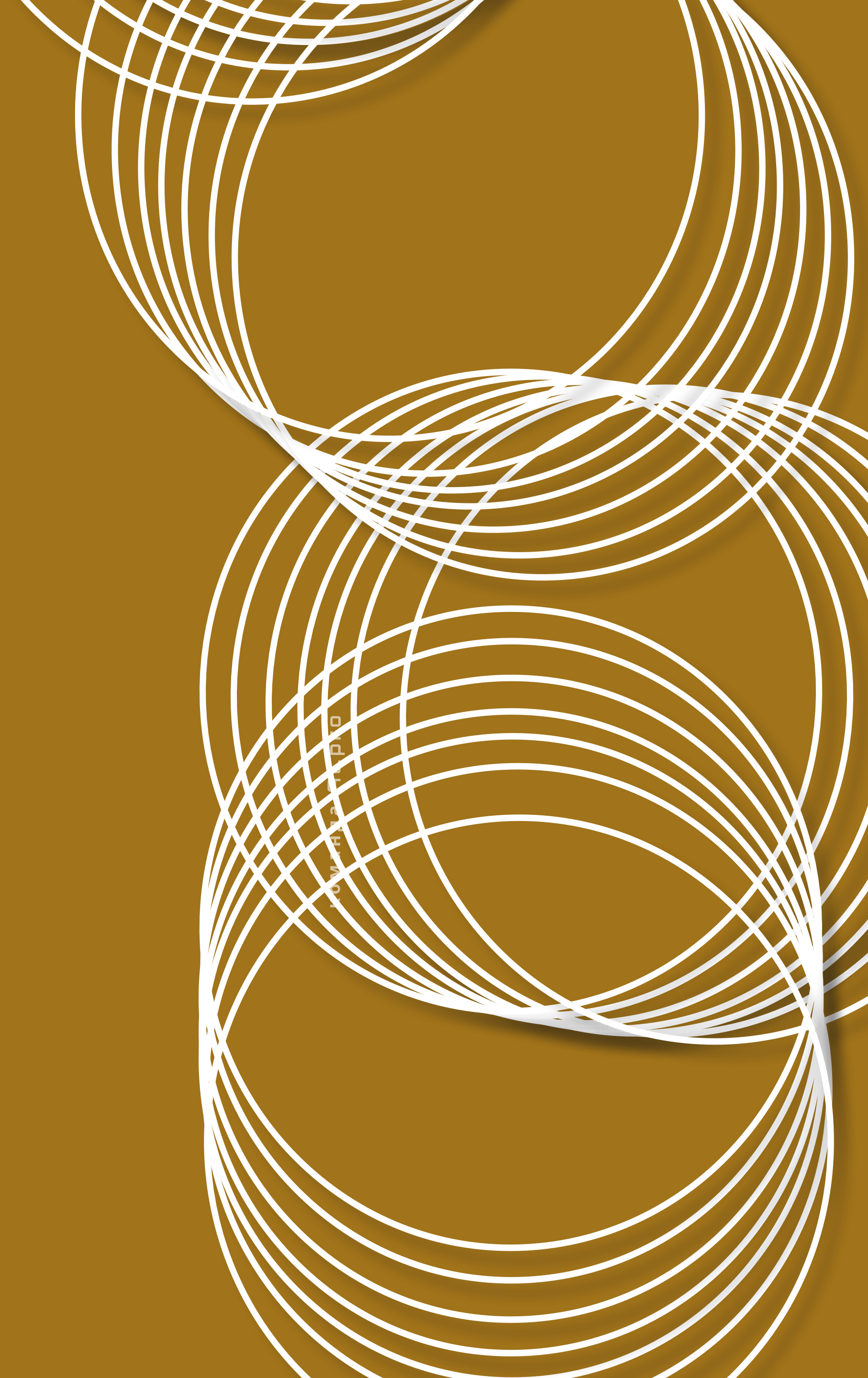
Binary Logistic Regression

QQQ Mvt → USD/ILS Mvt
Score: 0.567

Able to predict USD/ILS
movement correctly over
50% of the time



INSIGHTS

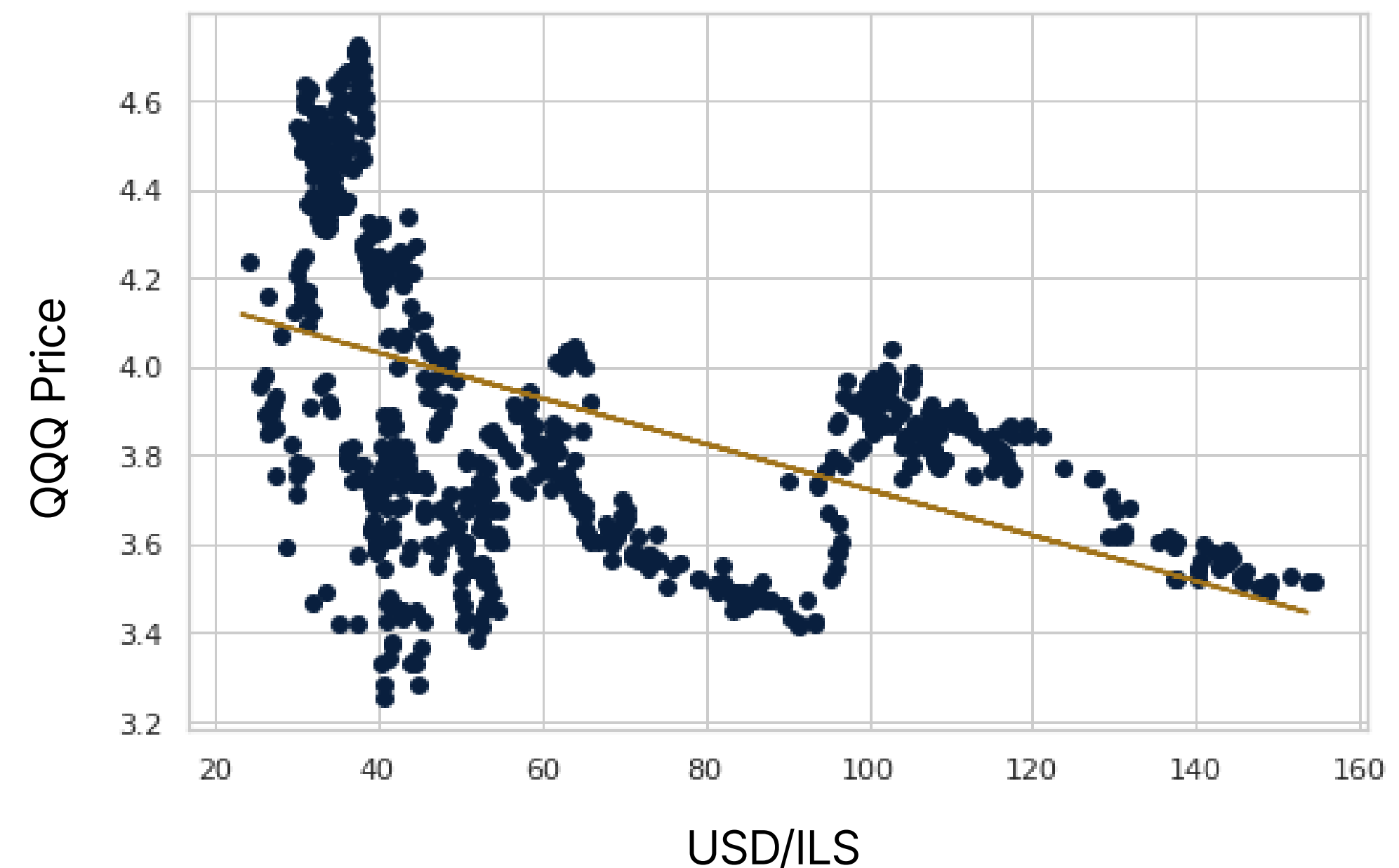


Negative Correlation- Why?

Slope: -0.211

- **As QQQ decreases, USD/ILS increases**
- **The shekel depreciates relative to the dollar when QQQ decreases**

QQQ & USD/ILS Linear Regression



Introduction

Data Exploration

Models

Insights

Conclusion

The Israeli Tech Sector



QQQ:
composed of more than
50% tech companies

Israeli GDP:
~50% tech
(exports)



Introduction

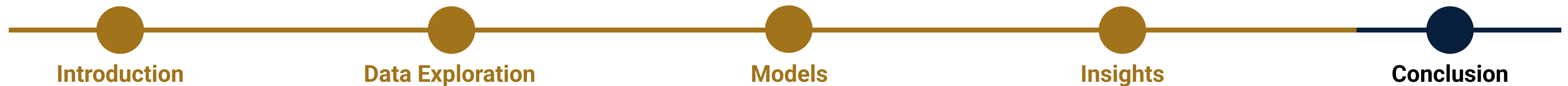
Data Exploration

Models

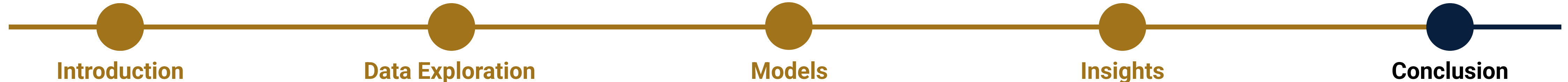
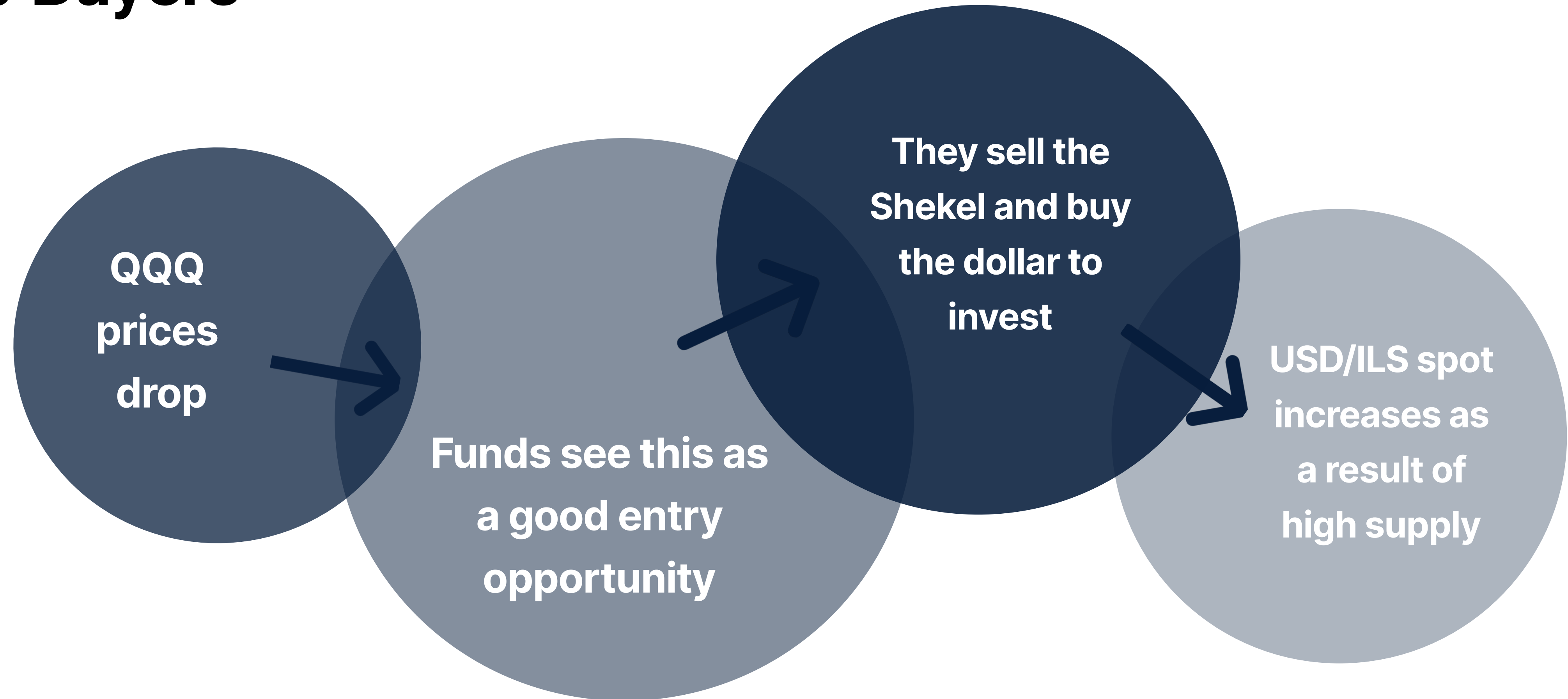
Insights

Conclusion

The Israeli Pension Fund Industry



Dip Buyers



CONCLUSION



Conclusions

1

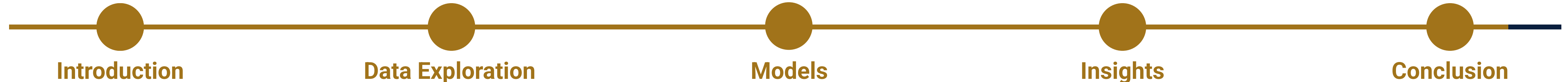
There is some correlation between USD/ILS and the QQQ

2

This correlation is best capitalized upon using binary classification

3

Israeli pension funds & the tech sector impact USD/ILS spot



Business Conclusions

1

To some extent, investing in the Shekel also allows an investor to take a view on the QQQ

2

However, the low scores of my linear regression models reveal that there are a whole host of other factors that impact spot price

3

Investing is difficult, and the markets and the economy are unpredictable!

Introduction

Data Exploration

Models

Insights

Conclusion

QUESTIONS?

