Marcello Minenna

Insider Trading, Abnormal Return and Preferential Information:

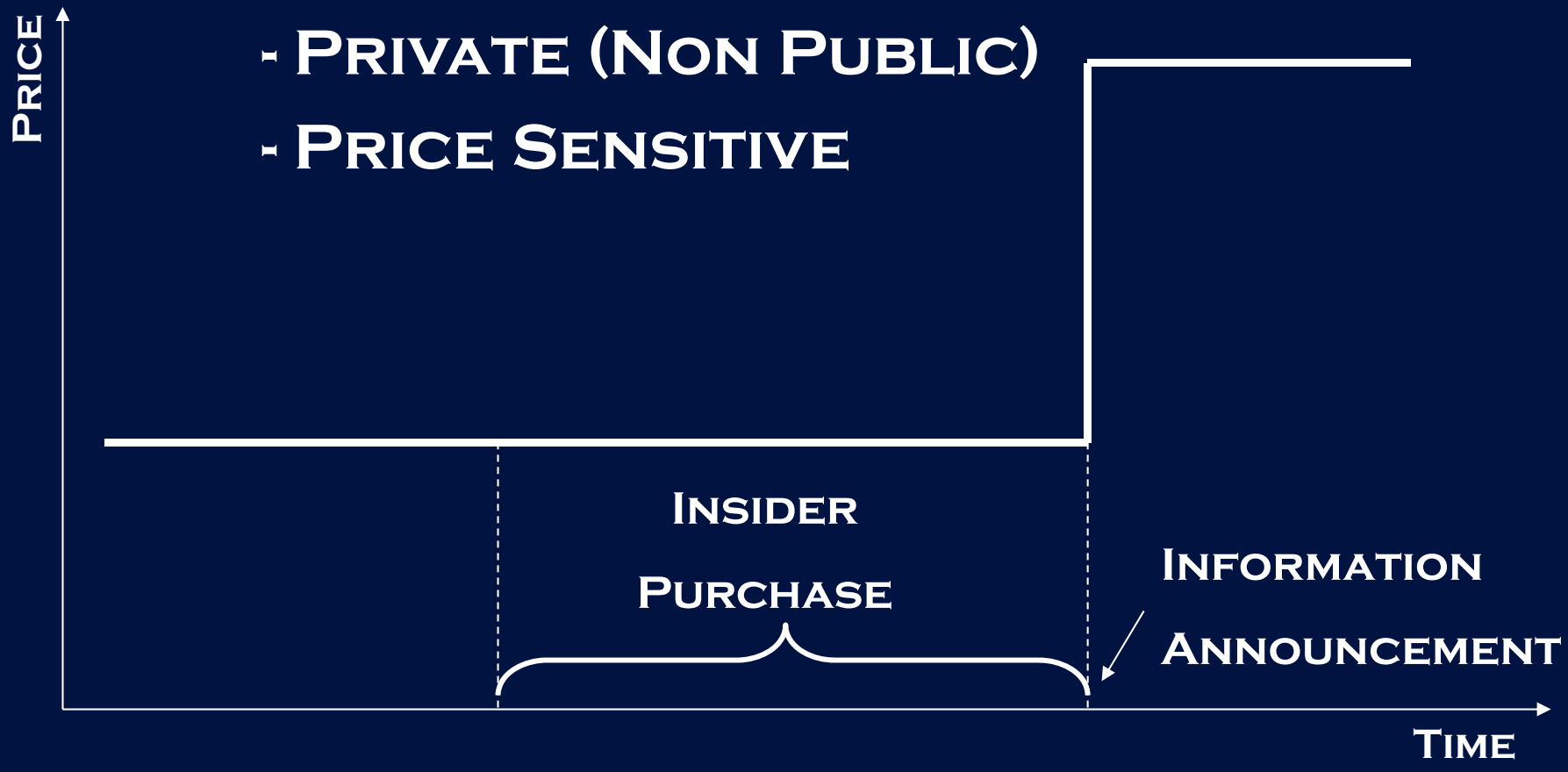
Supervising Through a Probabilistic Model

Risk Europe 2003 – Paris 8 -10 April 2003

Definition:

Abuse of Information in the Market :

- Private (Non Public)
- Price Sensitive



ELEMENTS:

1. STOCK AND MARKET TREND ANALYSIS
2. STUDY OF THE IMPACT OF THE PREFERENTIAL INFORMATION ON THE STOCK PRICE TREND
3. STUDY OF INTERMEDIARIES AND BENEFICIAL OWNERS TRADING
4. COMPUTATION OF THE PROFIT GAINED BY THE INSIDER I.E. THE DISGORGEMENT

COMPUTATION OF THE PROFIT GAINED BY THE INSIDER

I.E.

THE DISGORGEMENT

Methods:

- Actual Disgorgement
- Potential Disgorgement
  - Deterministic
  - Econometric
  - Probabilistic

Actual Disgorgement

Value of the Insider Closed Position

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Value of the Insider Open Position

Issues:

- Applicability to all Insider Trading investigation cases

ex. The insider does not close the position

Potential Deterministic Disgorgement

Post-News Price x Quantity of Insider Open Position

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Insider Open Position

Issues:

- Applicability to all Insider Trading investigation cases:

ex. The insider opens his position on the stock in periods far from the disclosure of the Preferential Information

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EVENT
STUDIES
ANALYSIS

Econometric Method for the Computation of the Disgorgement

Event Studies Analysis

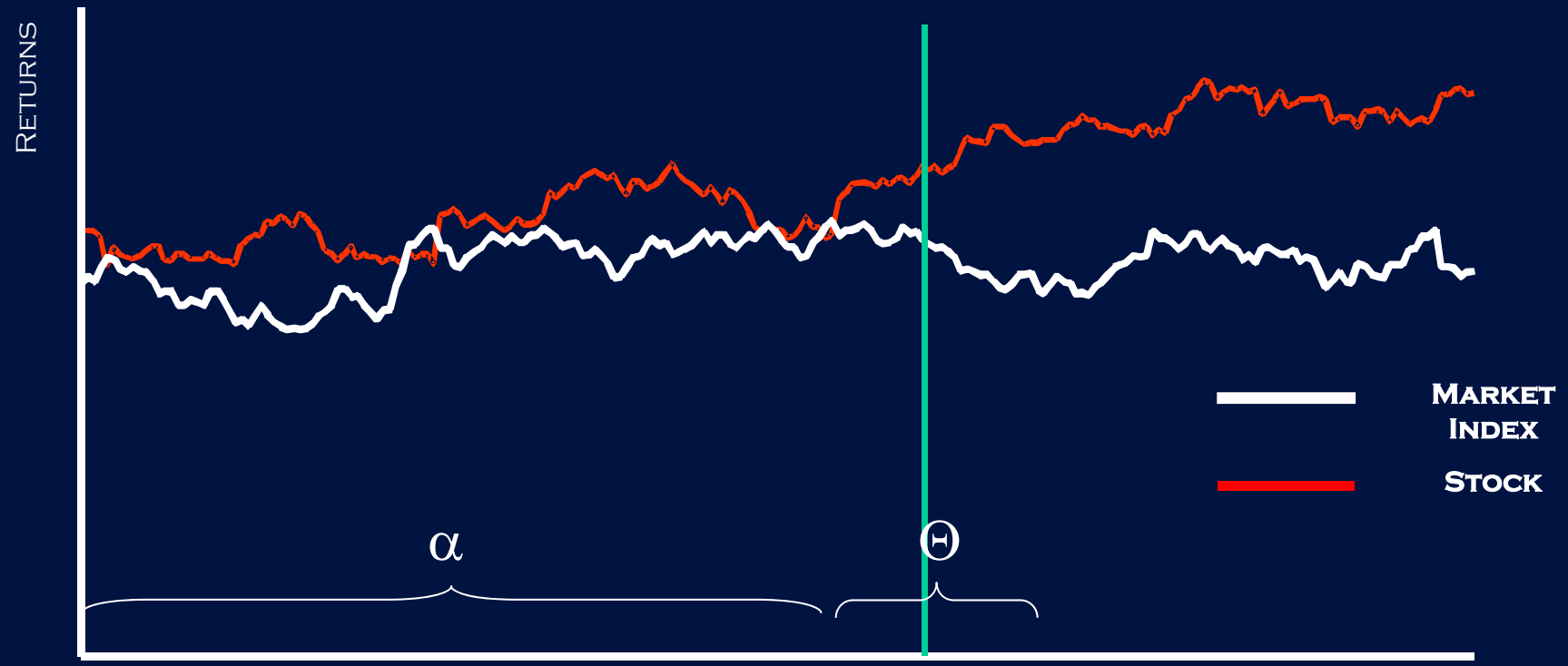
Goals:

Quantification of the Event impact on the stock market value

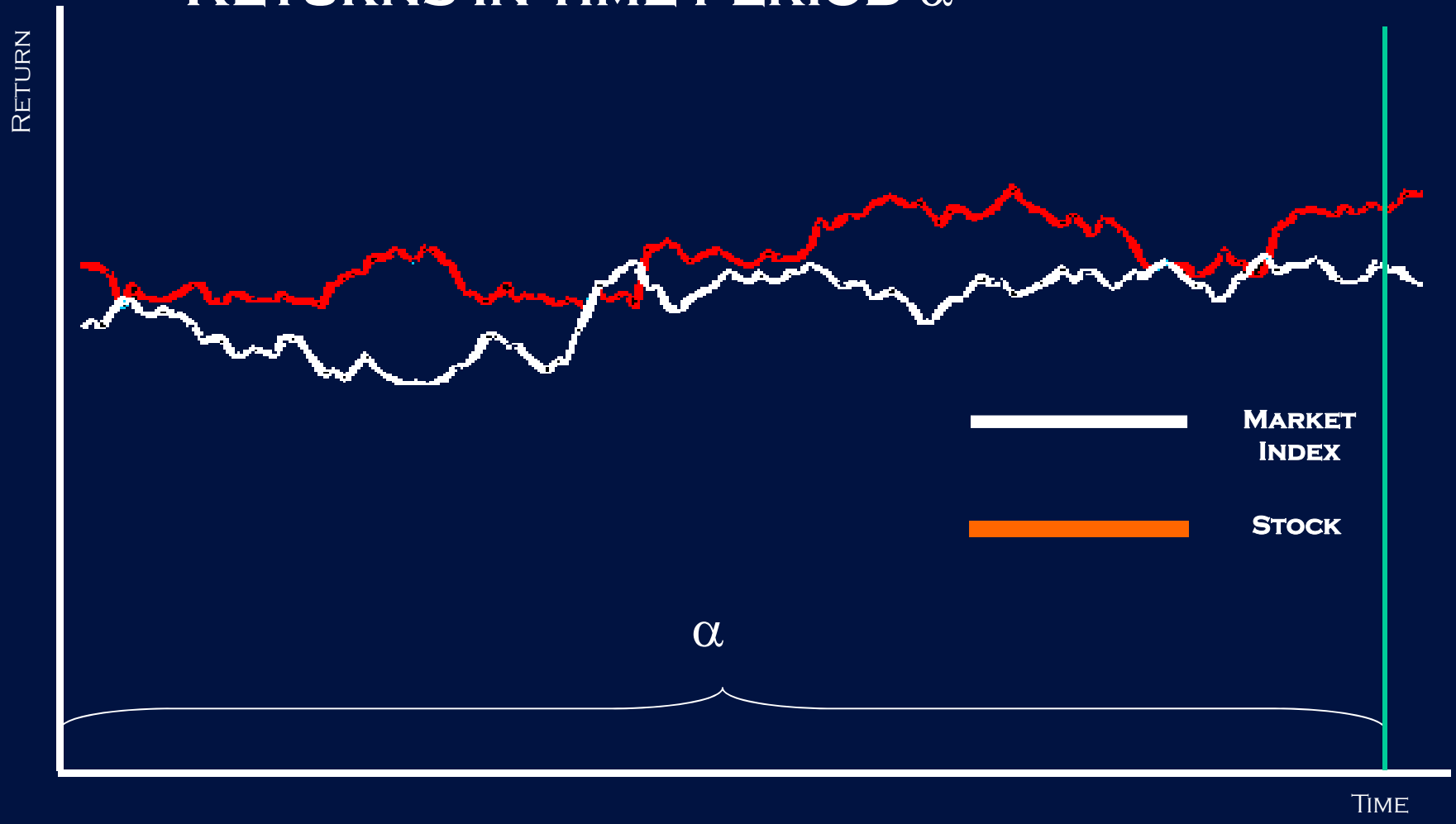
Steps of the Methodology: 4

1) General Case Analysis:

Definition of 2 time horizons : α and Θ

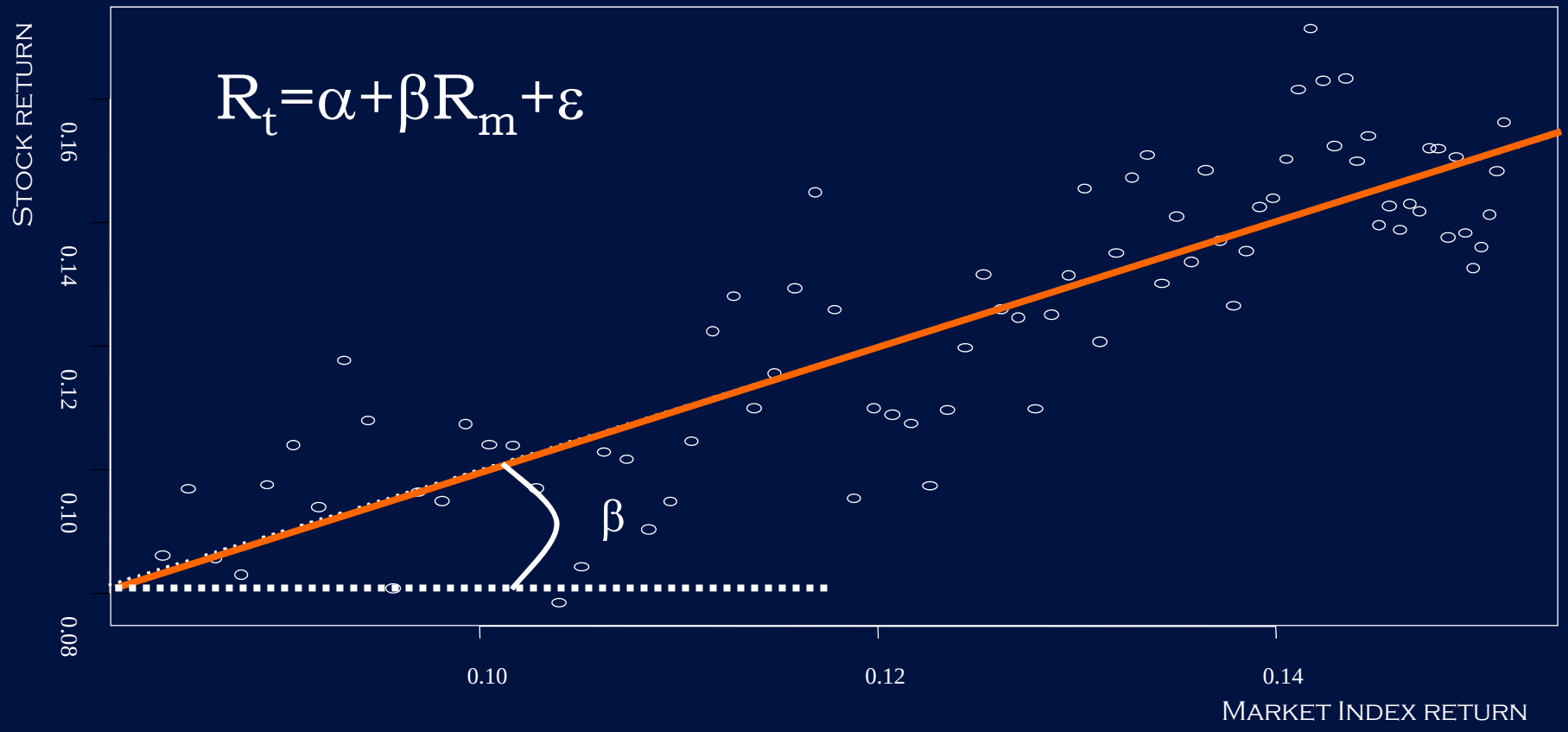


2.i) Analysis of Stock and market index Returns in time period α



2.ii) Market Model in time period

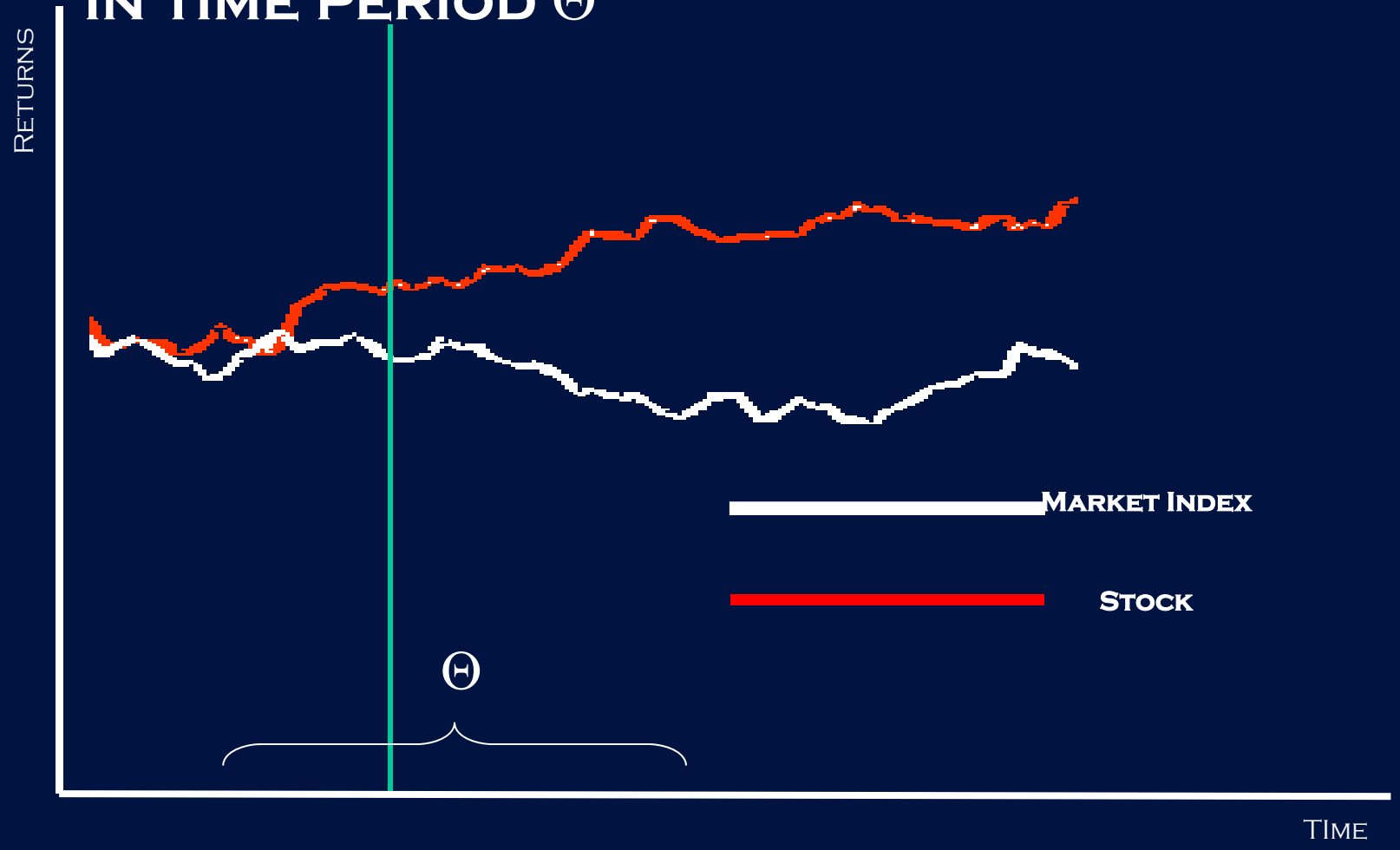
α



2.iii) Statistical Tests of the Robustness of the regression

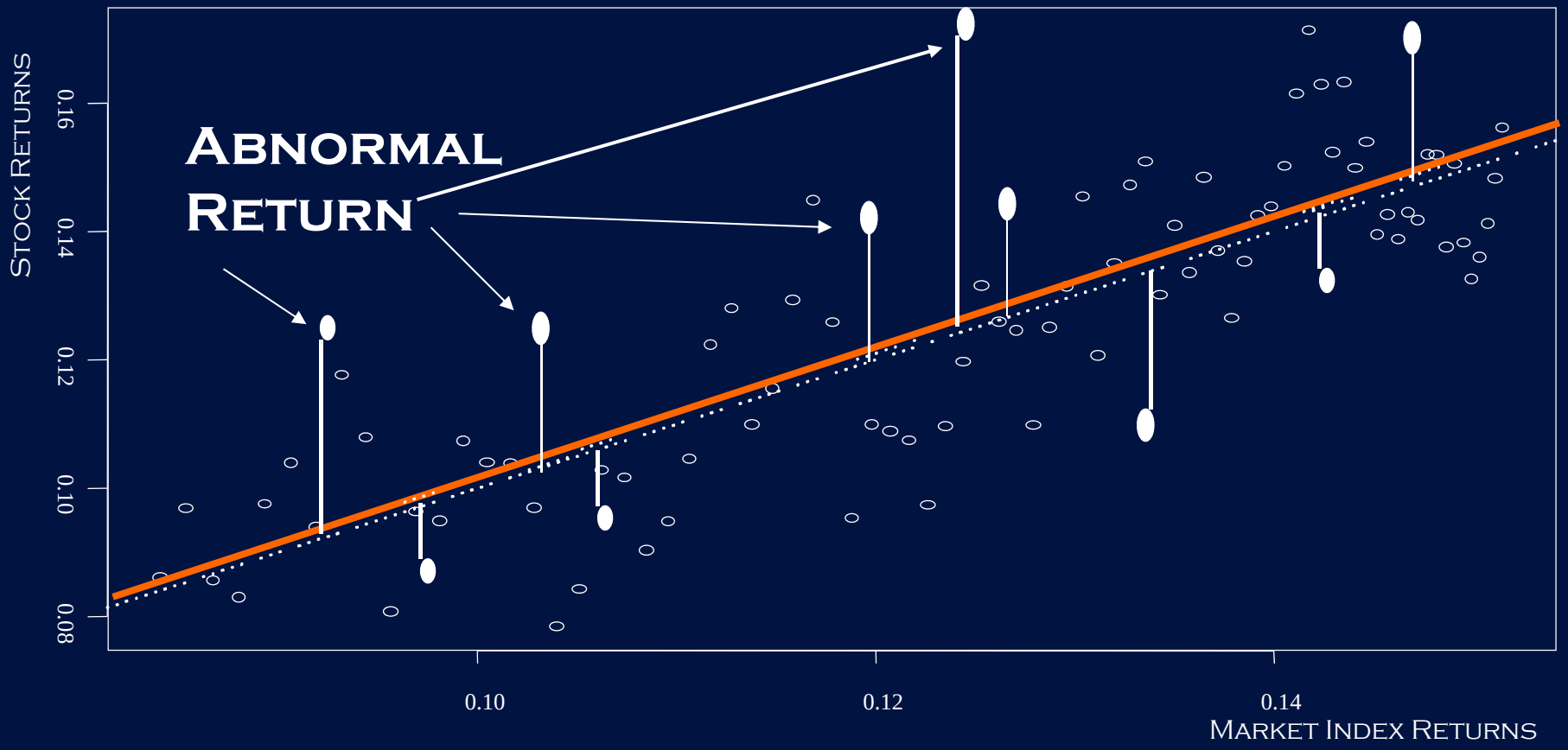
- Regression Coefficients and T statistic on coefficients
- Graphical Tests: residual Plot, qqplot, Residuals vs fit, Recursive beta
- Numerical Tests: Breush - Pagan, Levene
- .....

3.i) Stock and market index Return Analysis in time period Θ



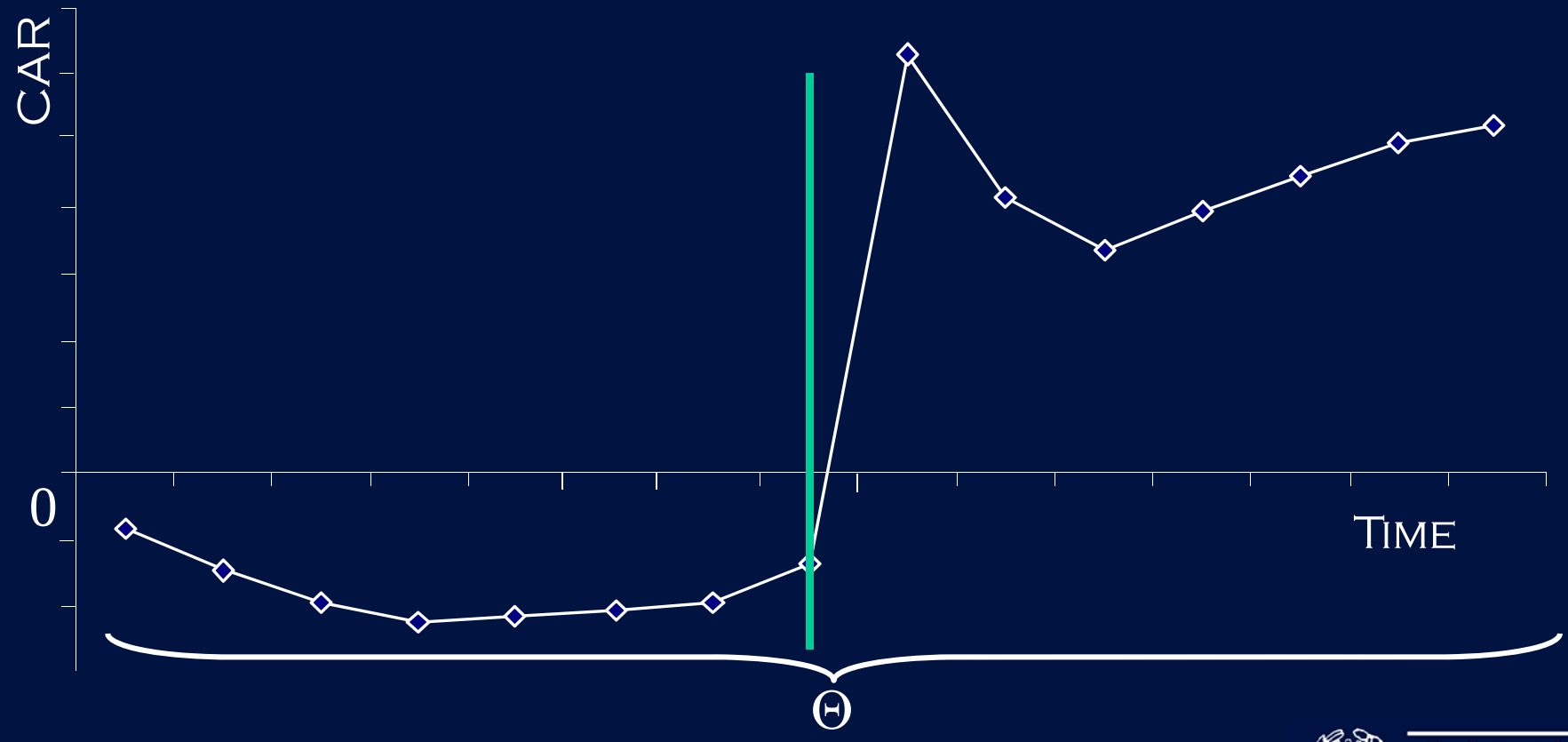
3.ii) Identification of Abnormal Return

$$AR=R_t-\alpha-\beta R_m$$



3.iii) Statistical Test of the Effective return Abnormality

Computation of the *Cumulative Abnormal Return*



4) Computation of the *Disgorgement*

Value of Insider Open position

x

Abnormal Return

Econometric Method for the Computation of the Disgorgement

Issues

Considerations

Issues

Potential Econometric Disgorgement: Issues

1. Applicability to all Insider Trading investigation cases :
   - Wideness of α
     - Data set Availability
     - Time series discontinuity
     - rumors
     - .....
2. Market Index statistically Robust
   - Endogenous regression
   - Existence of the Index
   - .....
3. Robustness of the regression
   - Temporal stability of the Parameters
   - non – stationarity of the Time Series
   - .....

Considerations

Pot. Econometric Disgorgement: Considerations

1. Time is not included in the model
2. Linear Method
3. Deterministic Method
4. Method based on the "past":

   not coherent with the weak form of market efficiency

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Probabilistic Method for Disgorgement Computation

Steps of the Methodology: 4

1) General Case Analysis:

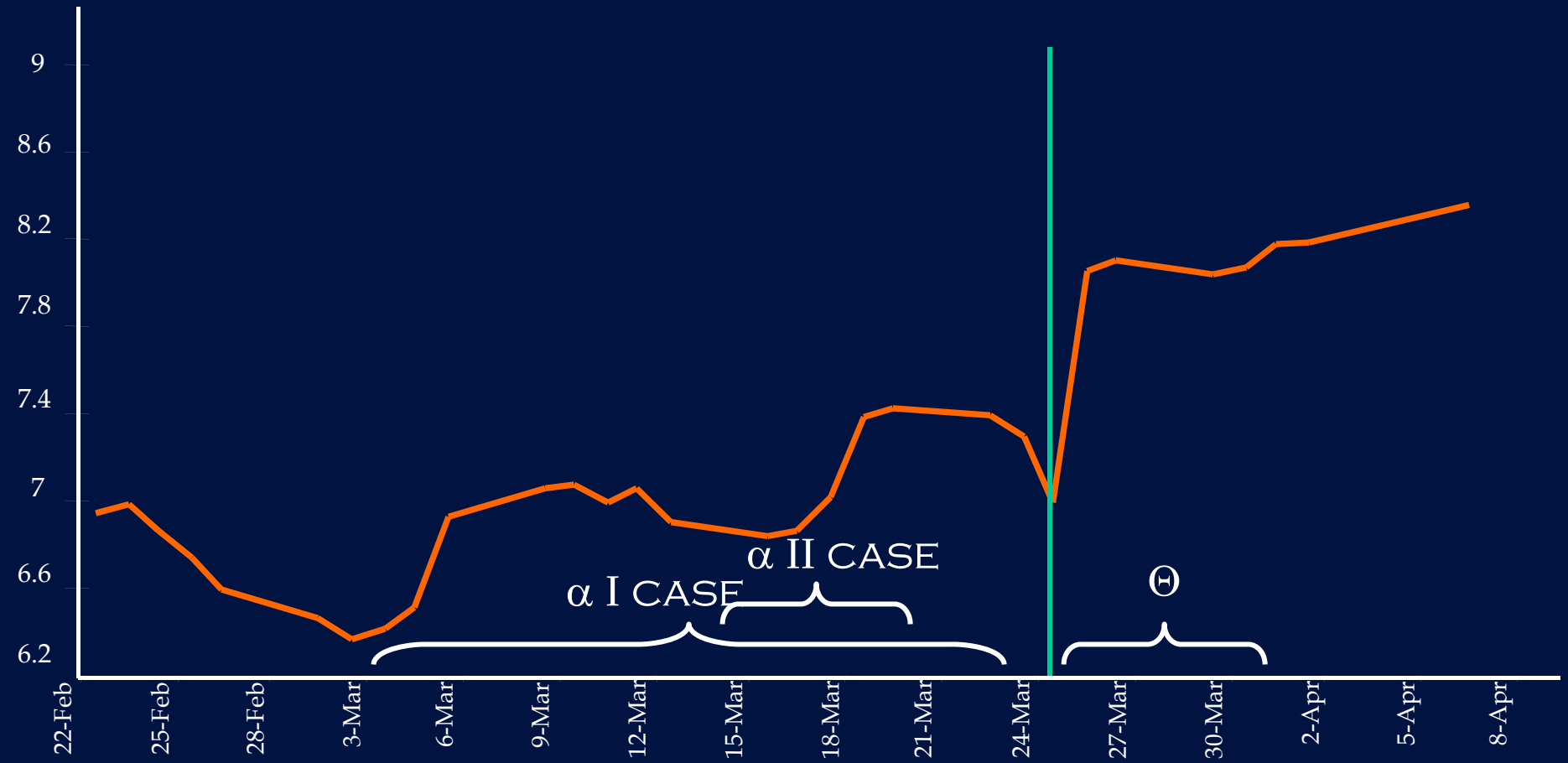
Definition of 2 time horizons : α and Θ

α = period in which the insider opens his position on the stock

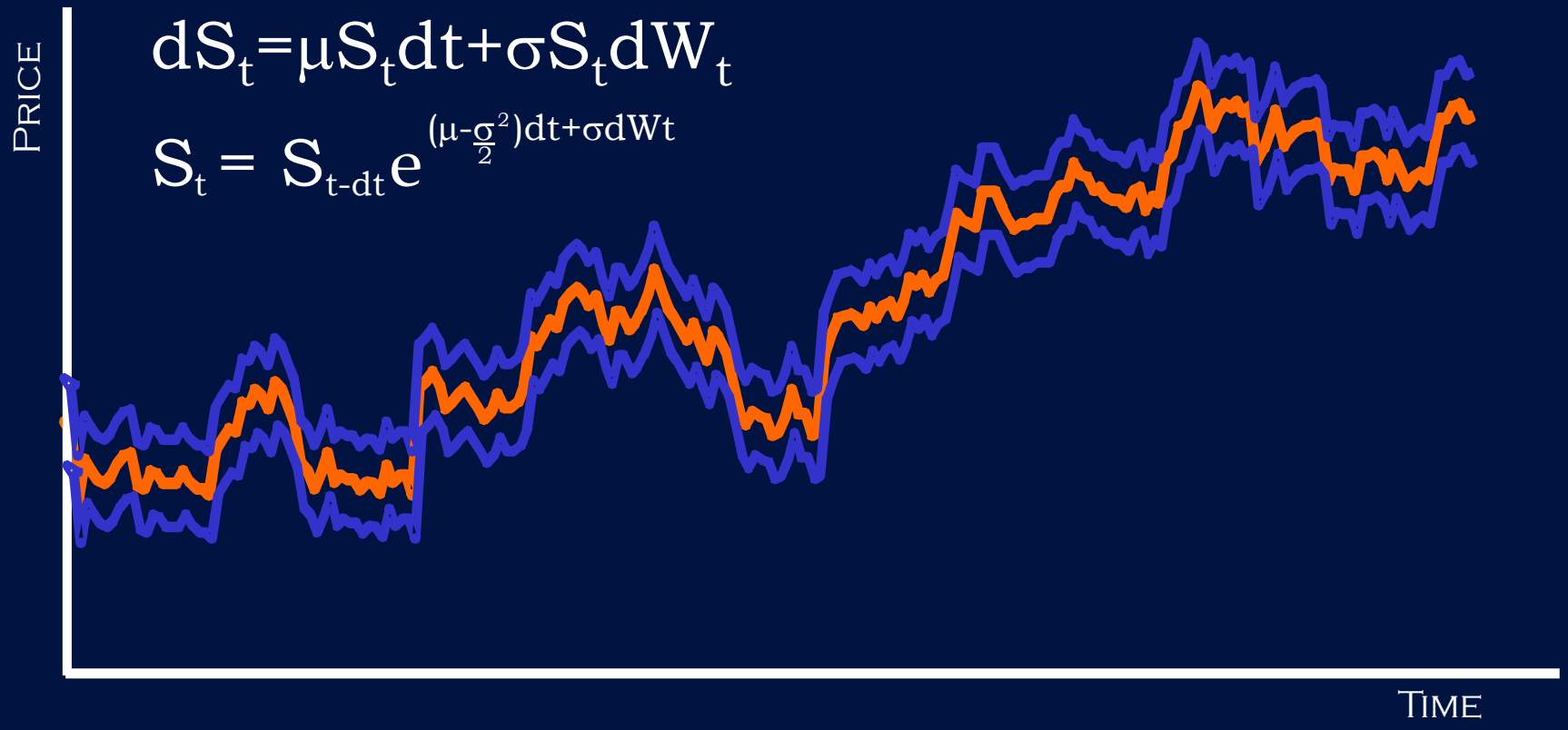
Θ = period after the disclosure of the Preferential information

Potential Probabilistic Disgorgement

Each Insider has his α



2.i) Definition of the Probabilistic Model



2.ii) Definition of the Probabilistic Model In period α

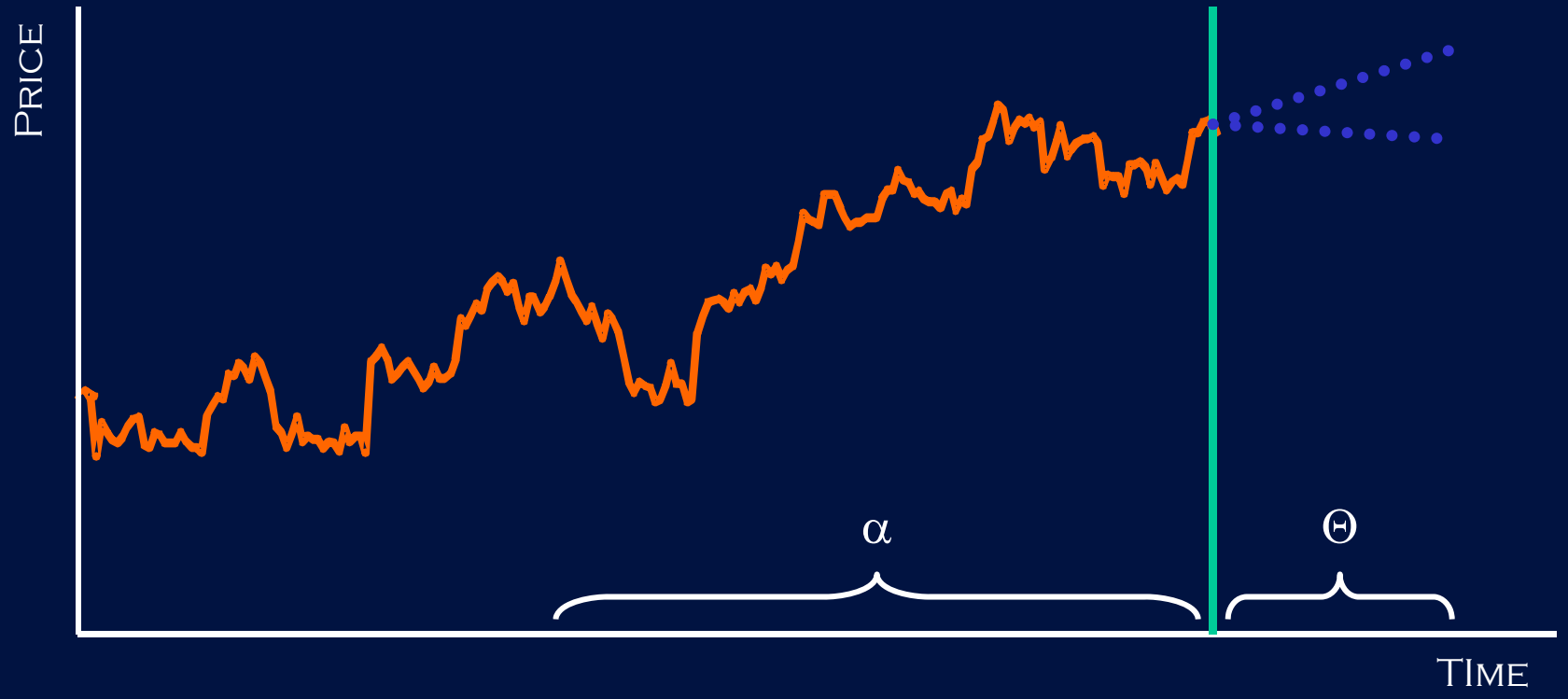
a) Simulate the trading strategy of the suspected Insider

b) Identify the stock price trend that the insider incorporates in his position

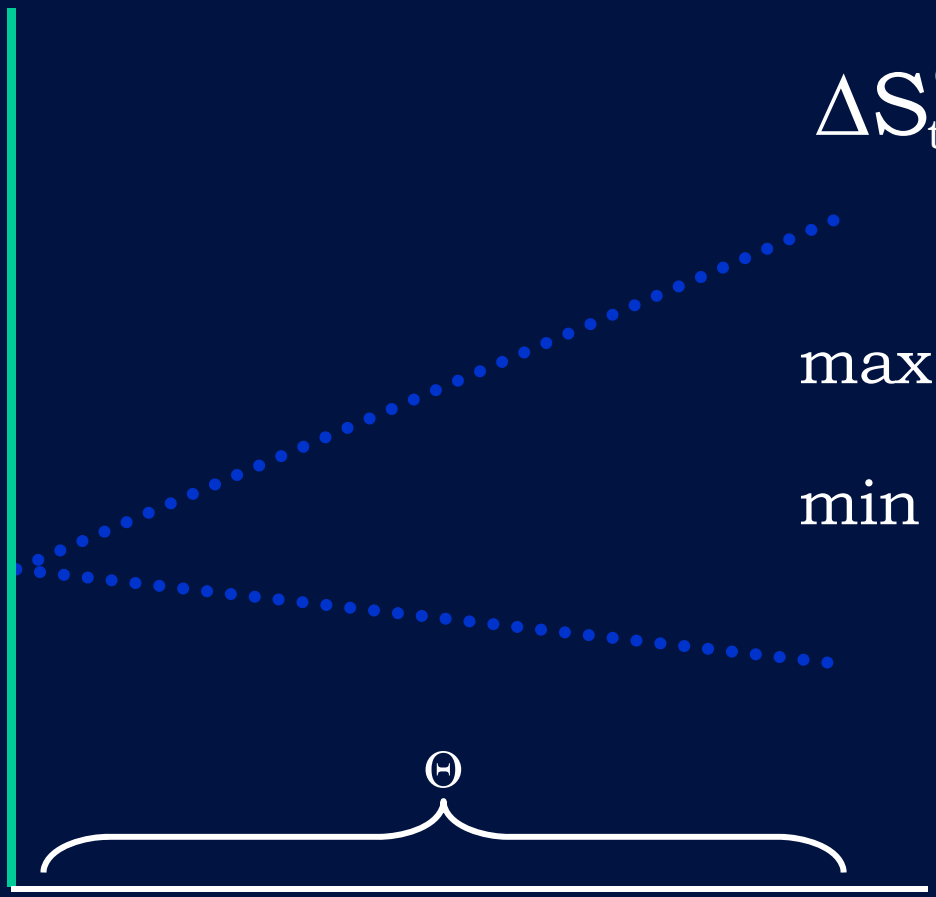
c) define the Stock Price trend <u>without</u> the *price sensitive* Information

3.1) Definition of a Price Fluctuation Band in period Θ

Describe the stock price Trend <u>without</u> the Information



3.I) PRICE FLUCTUATION BAND IN PERIOD Θ

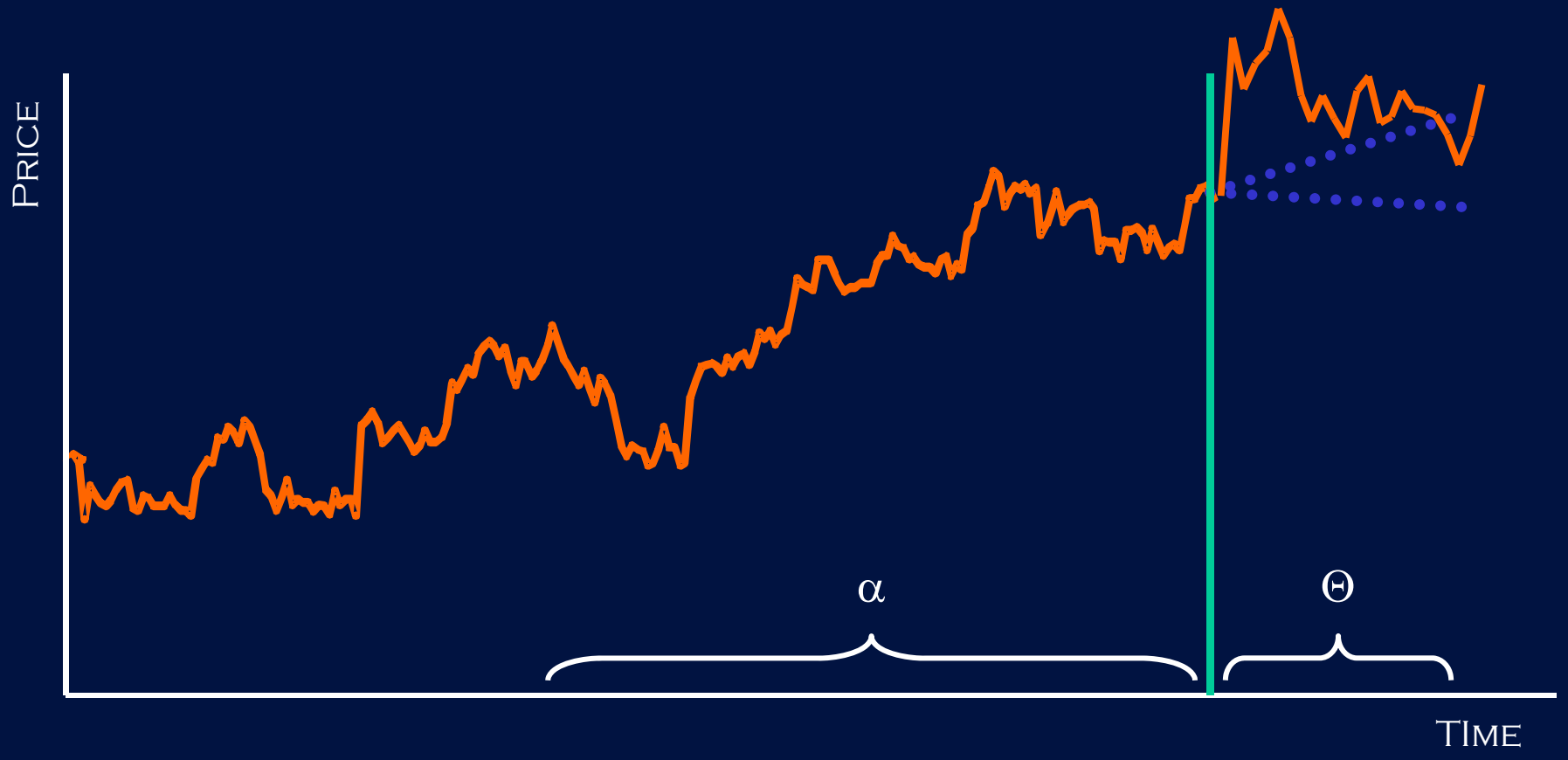


$$\Delta S_t^{\Theta} = [S_0^{\Theta} e^{max} , S_0^{\Theta} e^{min}]$$

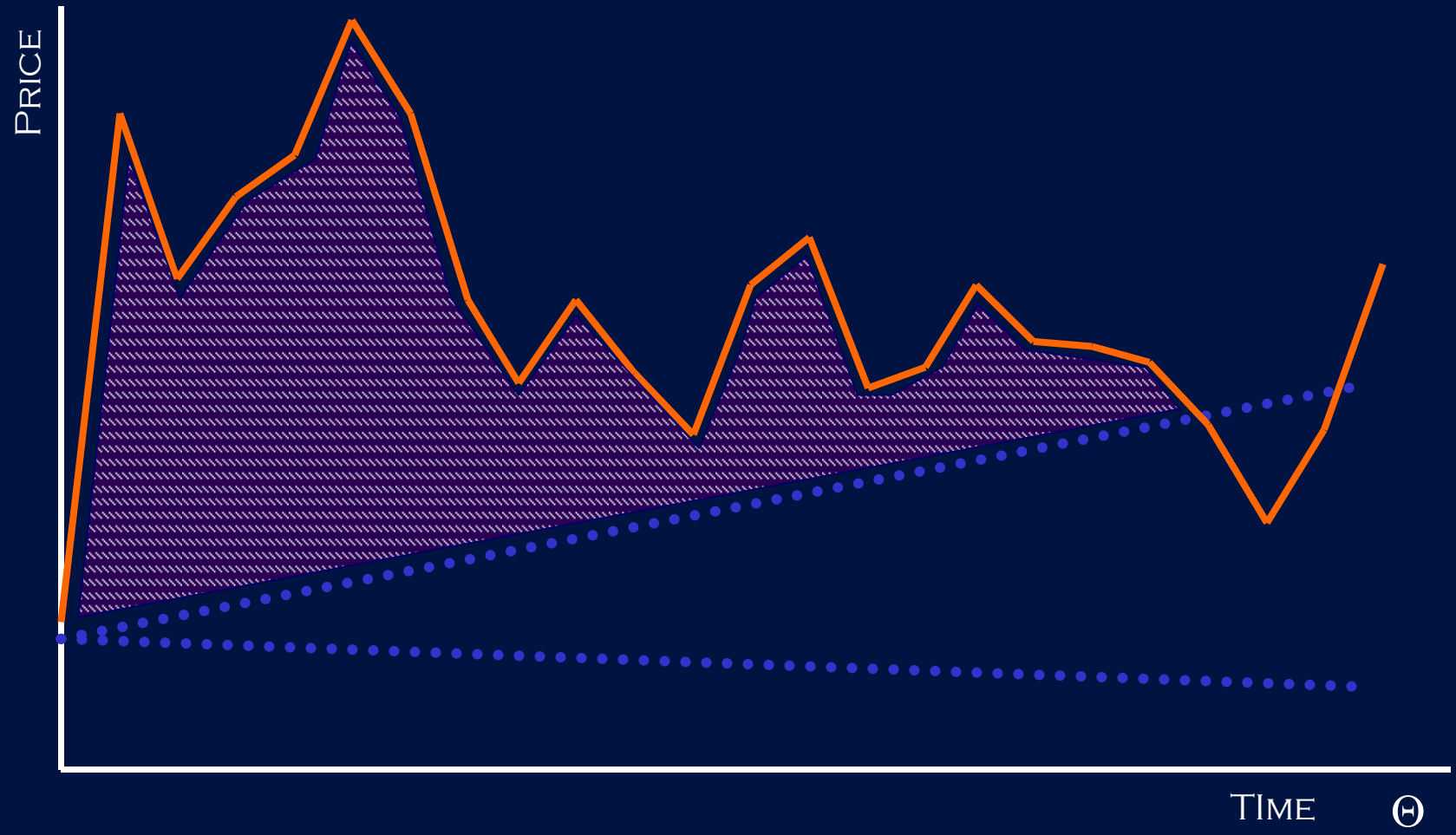
$$max = \sigma Z_{\frac{\xi}{2}} \sqrt{t} + (\mu - \frac{\sigma^2}{2})t$$

$$min = \sigma (-Z_{\frac{\xi}{2}}) \sqrt{t} + (\mu - \frac{\sigma^2}{2})t$$

3.ii) Stock Price after the Disclosure of the Preferential Information



4) Disgorgement Computation



Probabilistic Method for the Disgorgement Computation

Advantages

Considerations

Advantages

Pot. Probabilistic Disgorgement: Advantages

1. Applicability to all Insider Trading investigation cases:
   - It is not affected by the Stock Liquidity
   - It is not influenced by the Discontinuity of the Time Series
   - It is not Influenced by the Lack of the Time Series (ex. Recent Quotations)
2. Customized Computation
   - Accuracy
   - Distinction between Insiders vs Followers
3. Forecast just based on the Stock price
   - It does not Require a Market index Regressor
4. Implementation
   - Straight forward Procedure: it works directly on price and not on return
   - Operative Efficiency

Considerations

Pot. Probabilistic Disgorgement: Considerations

1. The Statistical Hypothesis are verified a priori
2. It benefits from the Markov Property, that is coherent with the weak form of market efficiency
3. Time is included in the model
4. Use of a daily Abnormal Return instead of a Cumulative Abnormal return on Θ

Comparison of different Methodologies

Empirical case

Insider Trading Investigation related to the conversion of Preferential shares into ordinary ones

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Analysis of 2 different Insider Disgorgements

Price Sensitive Event:

Board Decision of Converting the Preferential shares into Ordinary ones with an adjustment of 1 €.

Quantitative Information

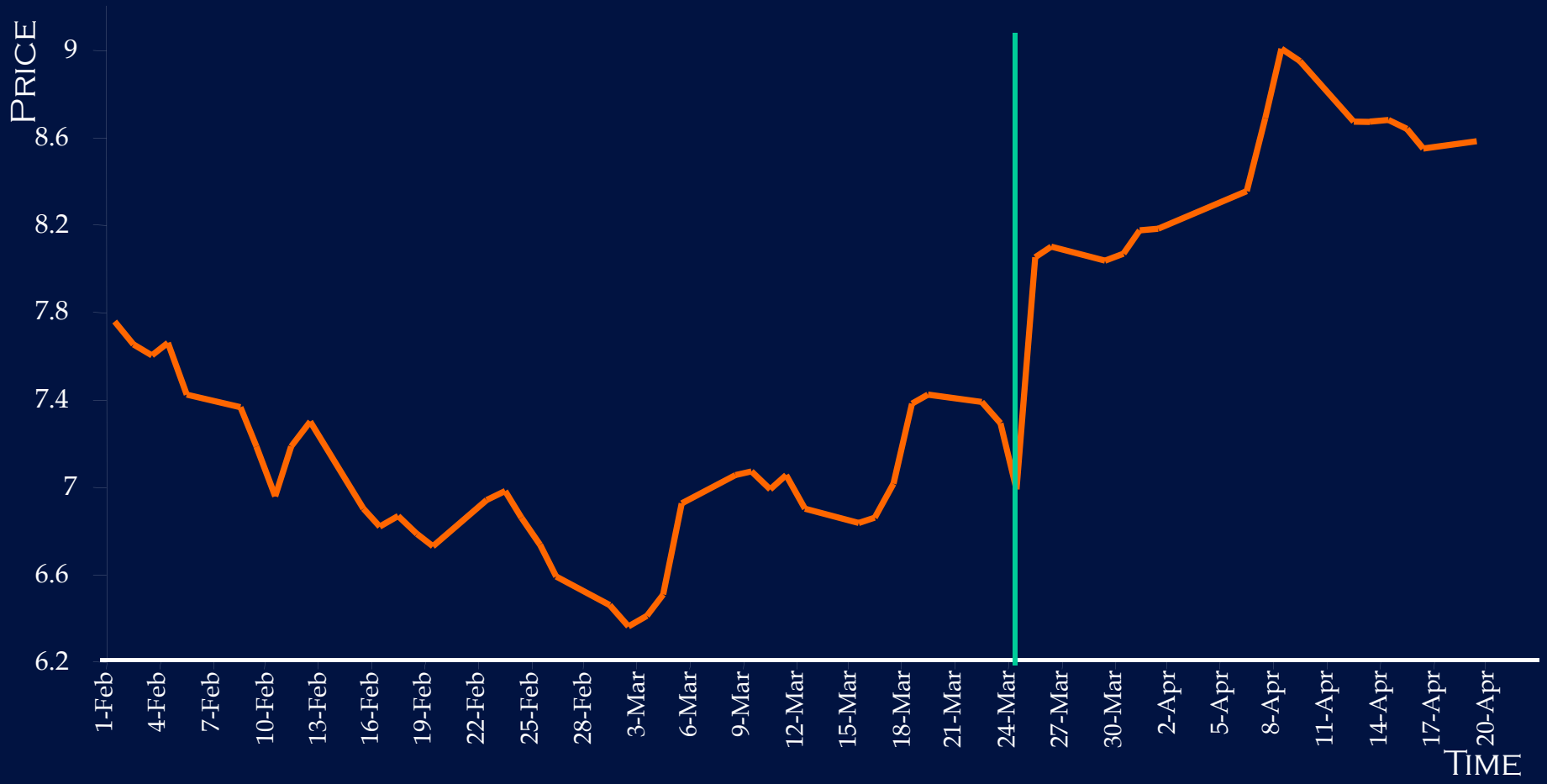
Before the disclosure of the Information:

Ord. Share Price – Pref. Share Price = 2.5 €

After the Disclosure of the Information:

Ord. Share Price – Pref. Share Price = 1.1 €

Stock Price Trend



Actual Disgorgement

1st Insider 479.000 € 2nd Insider 124.000 €

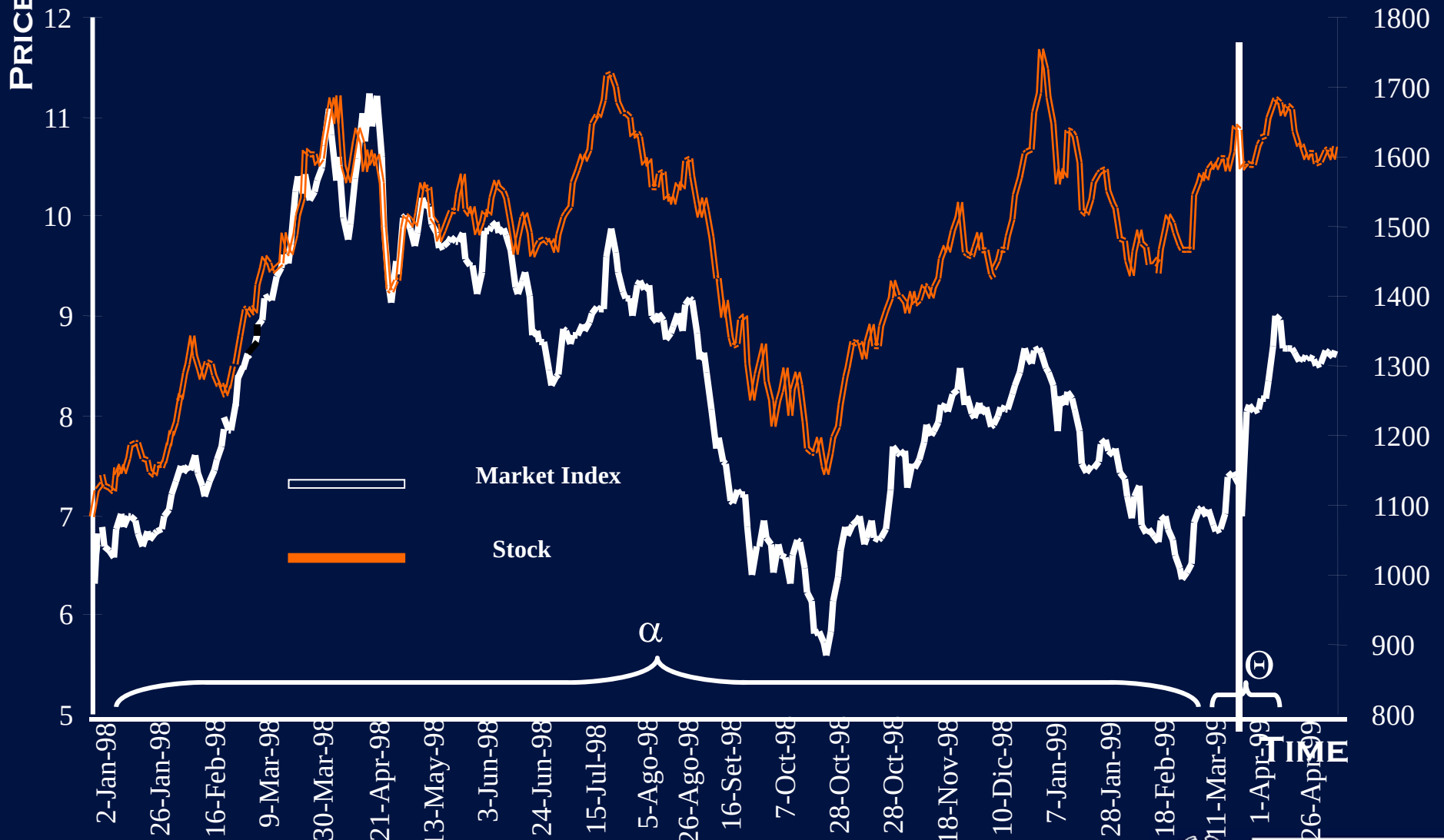
Problems

I Case: Purchases and sales far from the disclosure of the Information

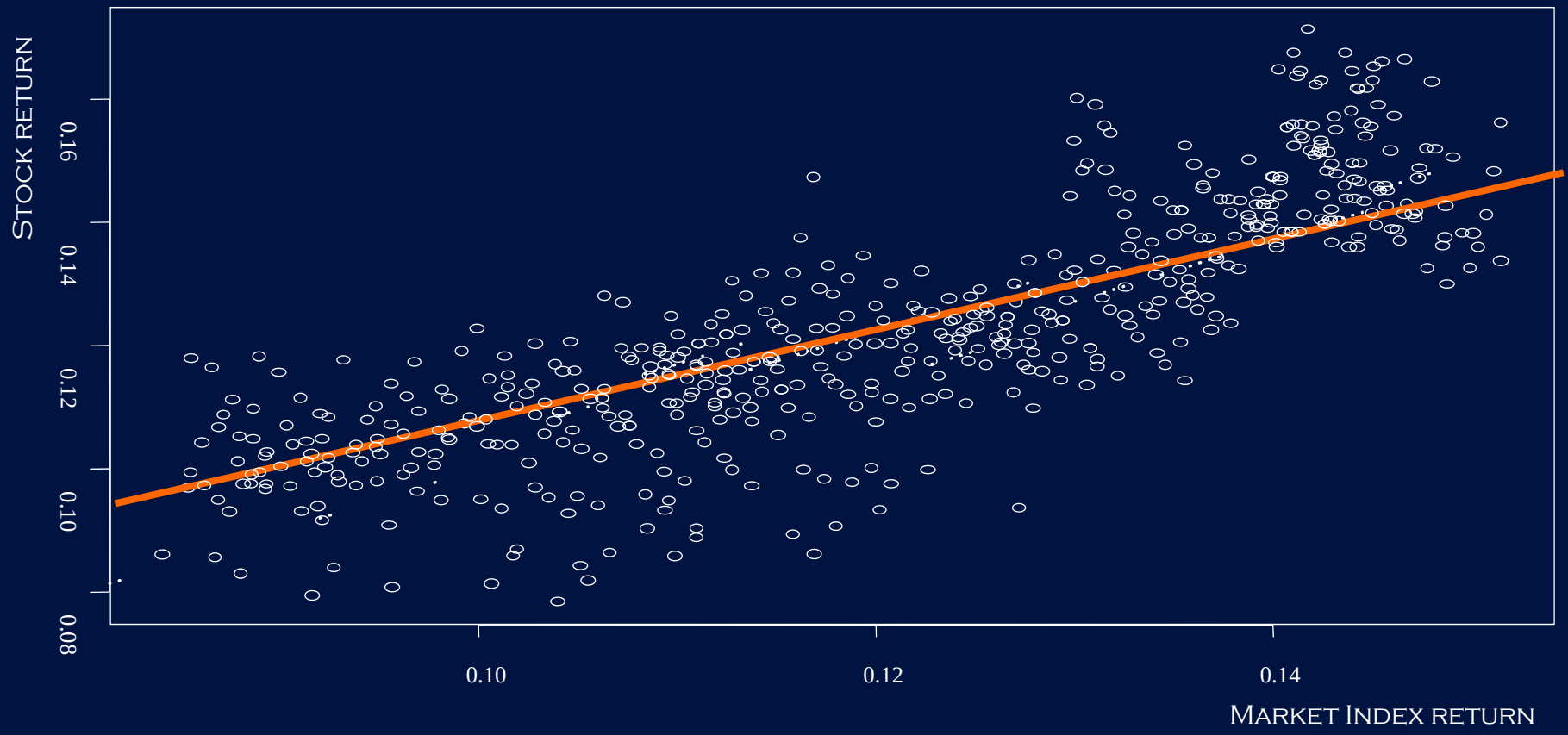
II Case: Partial Sales before the Disclosure of the information

Case Study: Potential Econometric Disgorgement

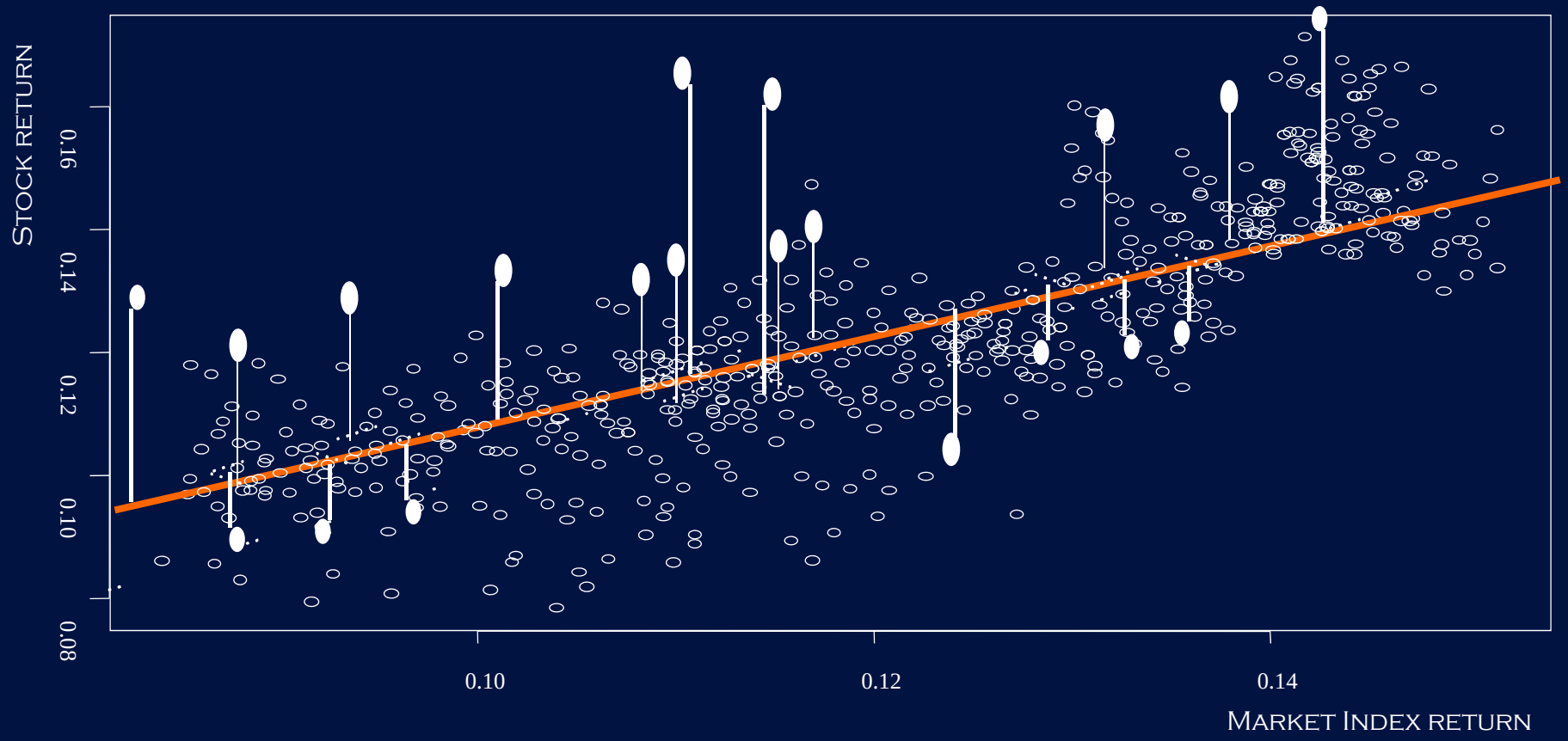
Definition of 2 time horizons : α and Θ



Stock and market index Return Analysis in time period α

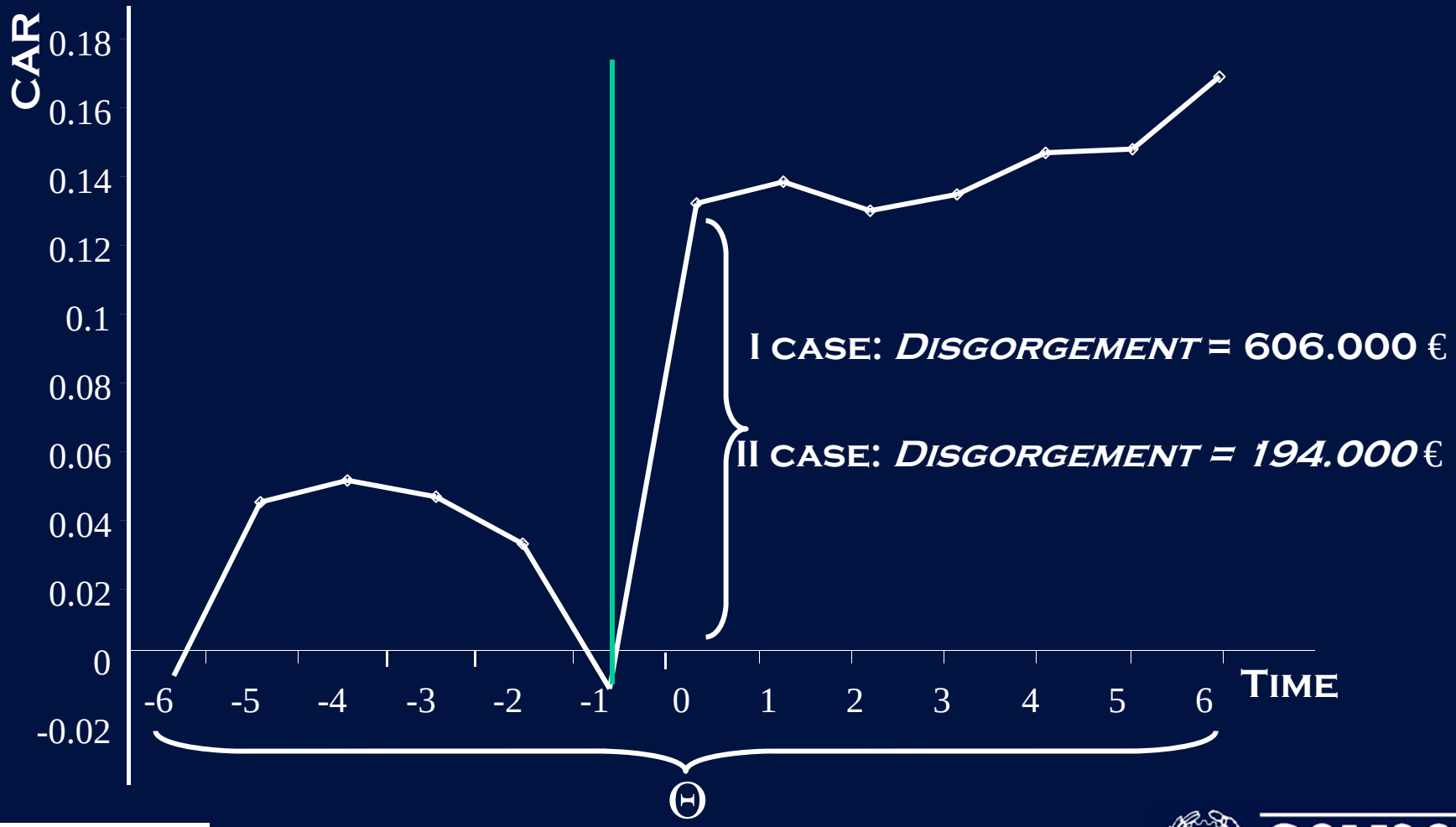


Abnormal Return



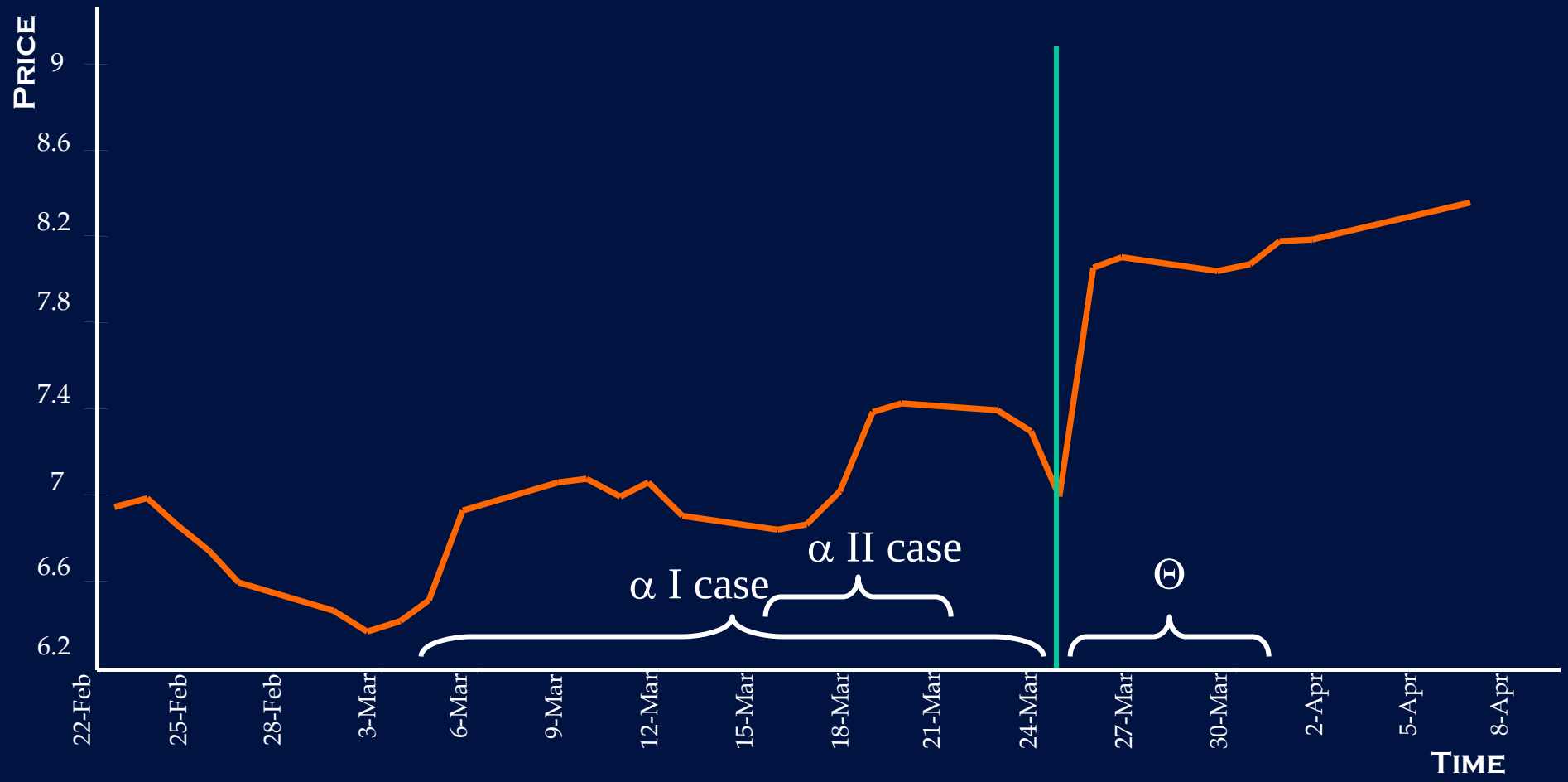
Case Study: Potential Econometric Disgorgement

Cumulative Abnormal Return

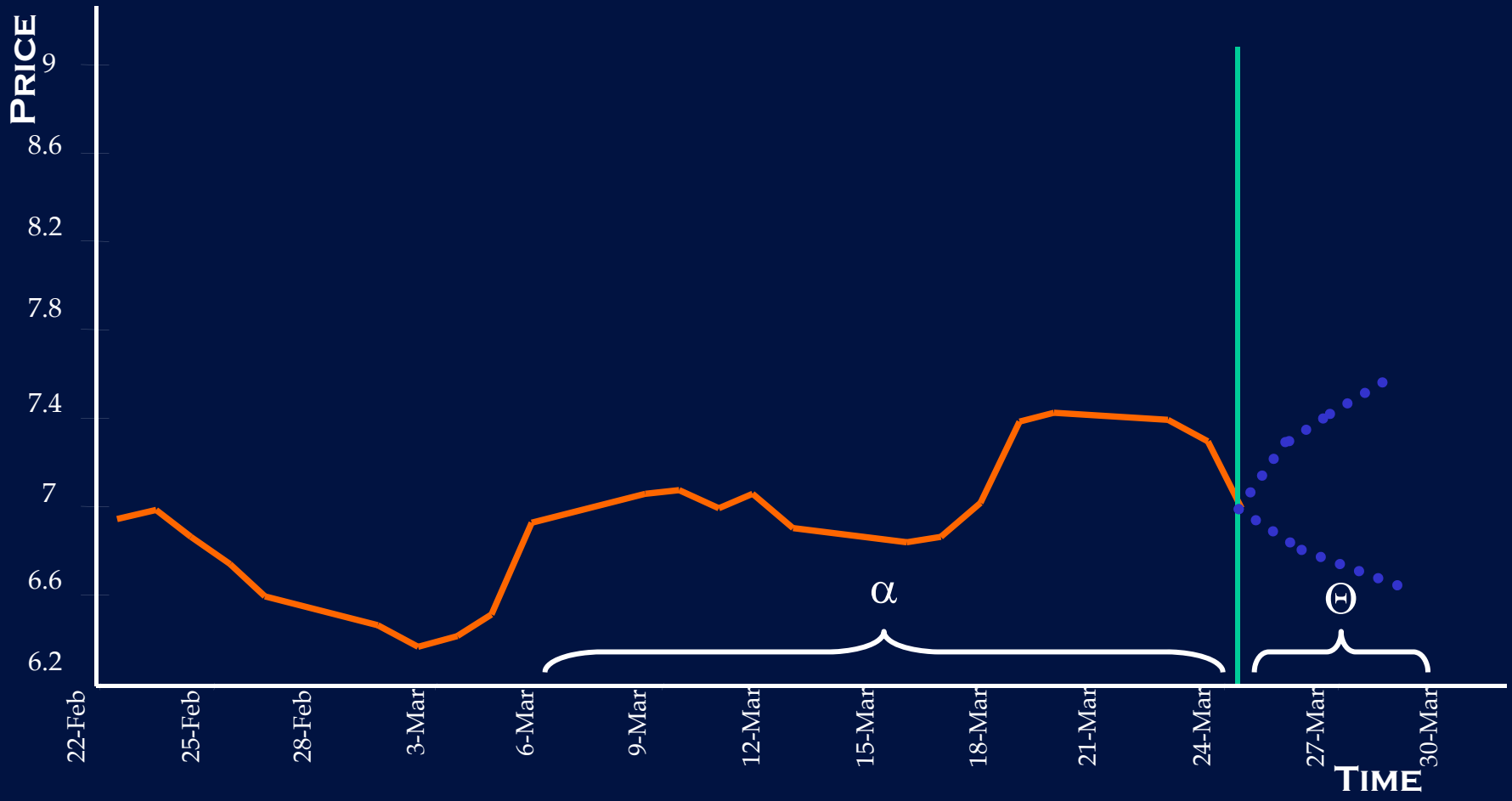


Case Study: Potential probabilistic Disgorgement

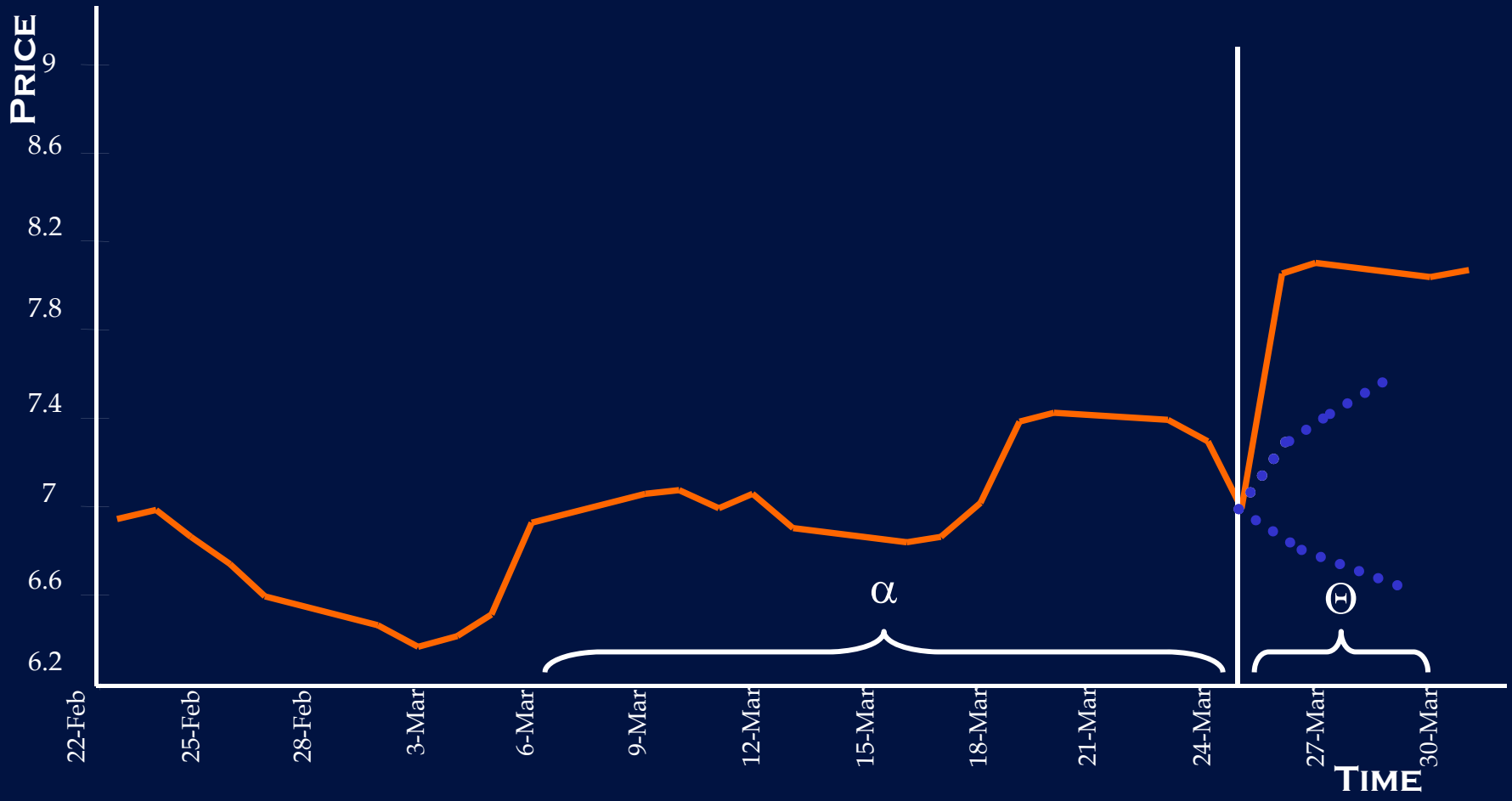
Definition of 2 time horizons : α and Θ



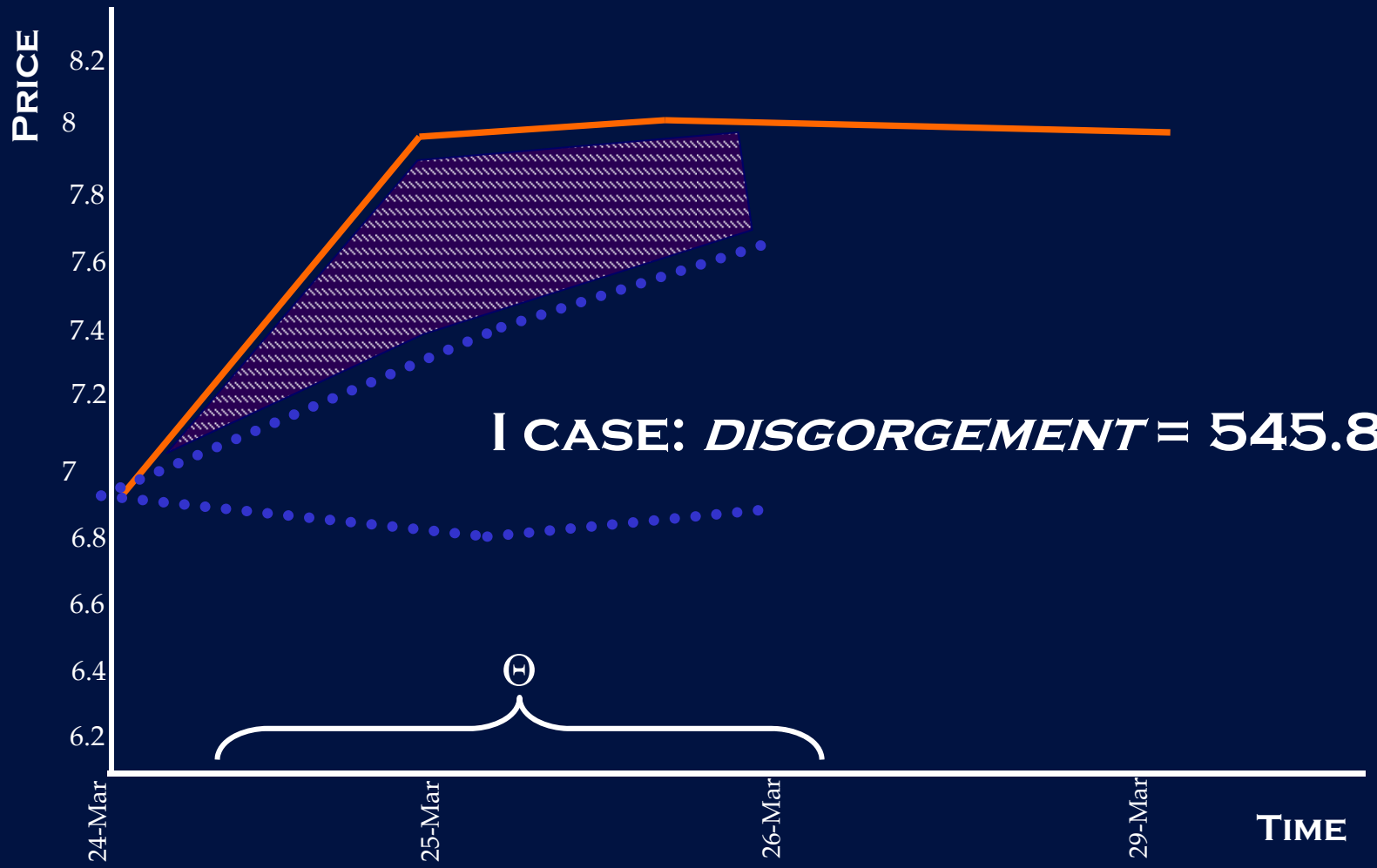
I case: determination of the band



I case: Comparison to Market Price



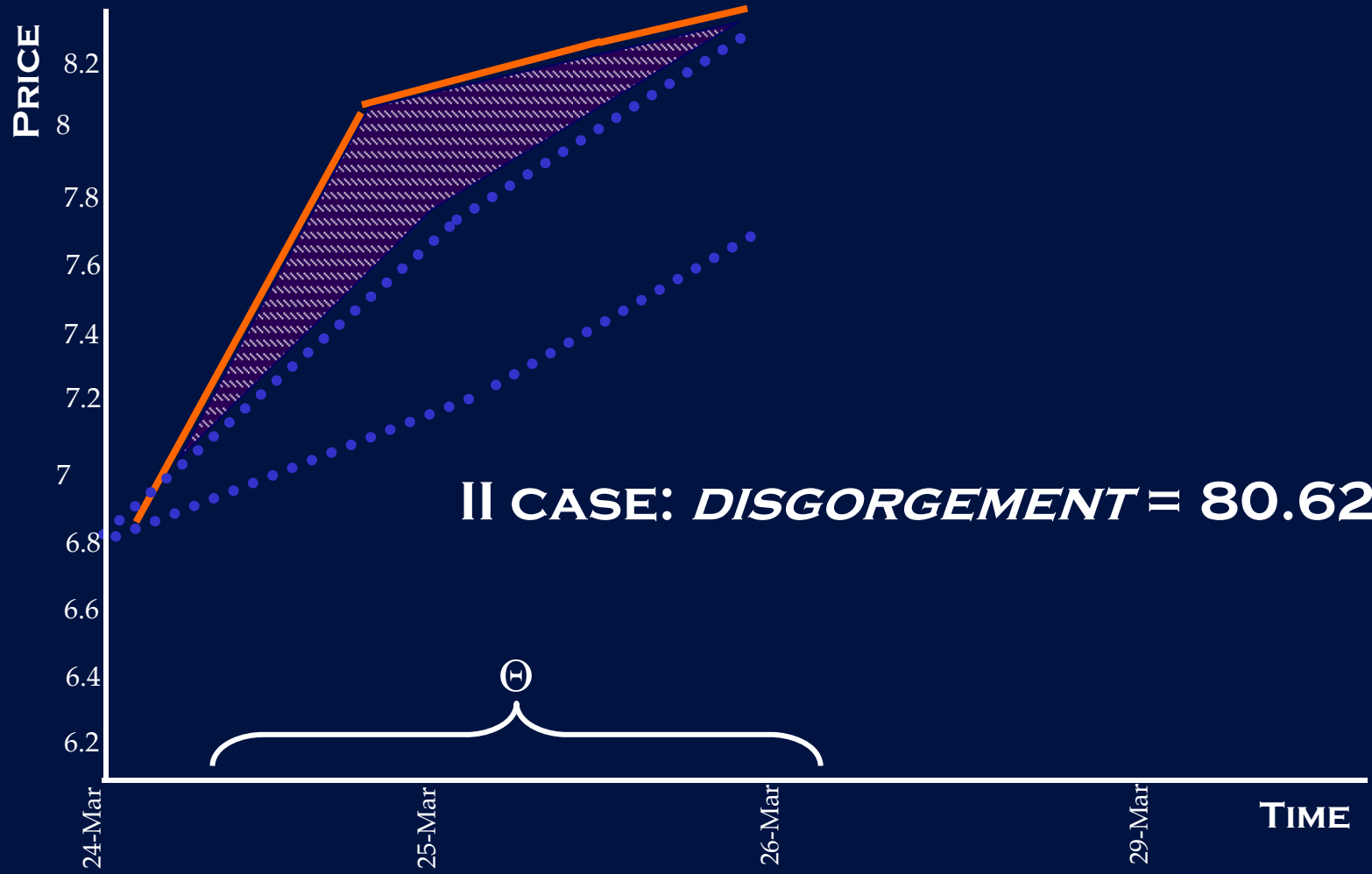
I case: *Disgorgement* Computation



I case: *disgorgement* = 545.803 €

II case: determination of the band
Comparison with Market price

II case: *Disgorgement* Computation



II case: *disgorgement* = 80.629 €

Disgorgement Computation: Empirical Case

Comparison of the three Methodologies

	Actual	Econometric	Probabilistic
I case	479.000 €	606.000 €	545.803 €
II case	124.000 €	194.000 €	80.629 €

Disgorgement Computation: Empirical Case

Comparison of the three Methodologies

	Actual	Econometric	Probabilistic
I case	479[illegible]00 €	606.000 €	545.803 €
II case	124.000 €	194.000 €	80.629 €

References

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3. Mitchell, M.L., Netter J.M., (February 1994) The role of financial economics in securities fraud cases: applications at the SEC, The Business Layer.
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5. Minenna, M., (2002) Inside Insider Trading Risk, march 2002
6. Minenna, M., (2003) Insider Trading Abnormal return and Preferential Information: supervising through a probabilistic approach, Journal of Banking and Finance 27 (2003) 59-86.

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Insider Trading, Abnormal Return and Preferential Information:

Supervising Through a Probabilistic Model

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