Linear relationship between Maha stock price and the WTI oil price

DOCUMENT: SAR-2023-011-HM-v01

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Linear relationship between Maha stock price and the WTI oil price

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1 ABBREVIATIONS
- CI: confidence interval
- SD: standard deviation

2 CONTEXT

2.1 Objectives

To evaluate the strength of the linear relationship between Maha stock price and the WTI oil price.

3 METHODS

The data procedures, design and analysis methods used in this report are fully described in the annex document **SAP-2023-011-HM-v01**.

This analysis was performed using statistical software R version 4.2.1.

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4   RESULTS

4.1   Descriptive analysis

Price changes were collected between 2023-01-02 and 2023-01-31 (Table 1). Average (SD) Maha stock price change was 0.47 (2.53) percent and the average (SD) WTI oil price change was -0.06 (2.04) percent.

Table 1 *Descriptive statistics of price changes.*

Characteristic	N = 21
Maha stock price change in % (SEK), Mean (SD)	0.47 (2.53)
WTI oil price change in % (USD), Mean (SD)	-0.06 (2.04)

The distribution of Maha price changes appear fairly symmetric, ranging between -4.5% and 5.1% (Figure 1). The distribution of WTI price changes appear slightly bi-modal with a heavier left tail, and ranges between -5.2% and 3.1%. The larger amount of observations in the lower extremity of the data range gives rise to a second

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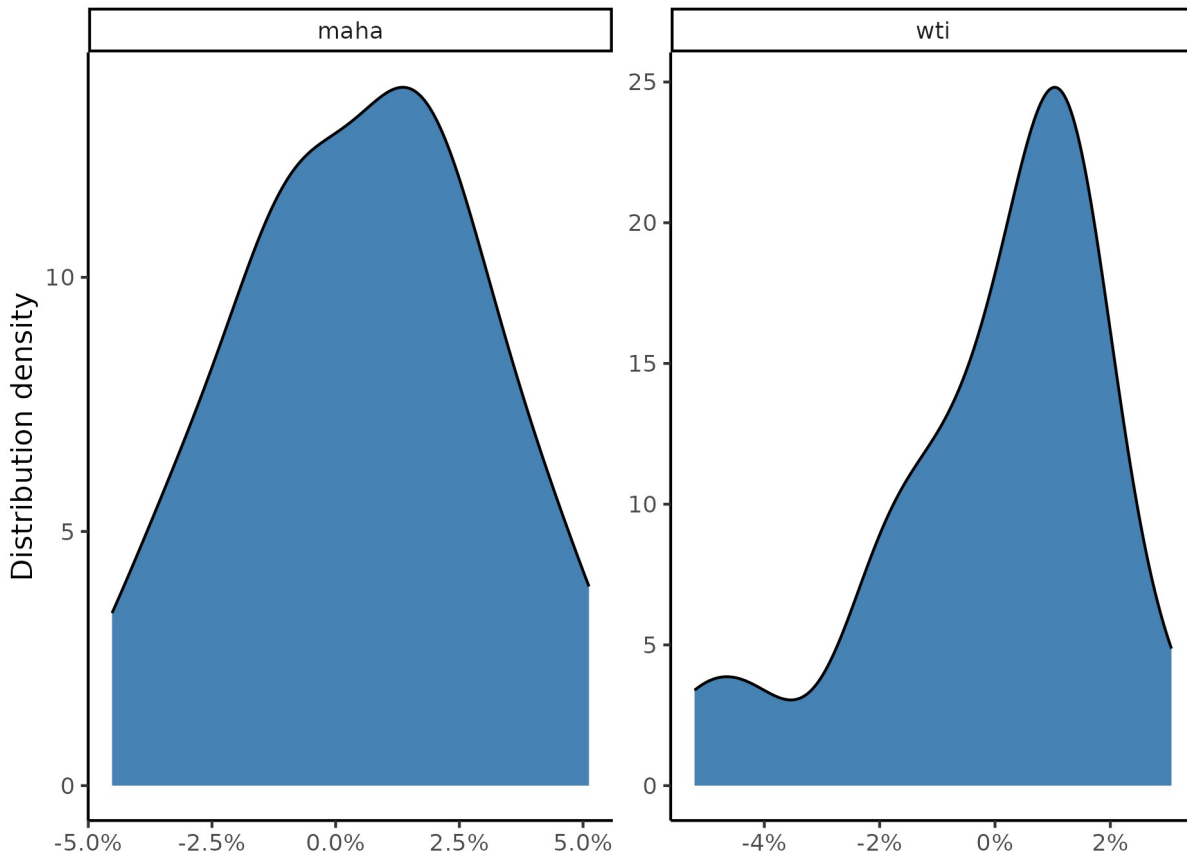| Version	Year	Page
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Figure 1 *Distribution densities of Maha and WTI price changes.*

Alternative visualizations for these distributions are available in the Appendix (section 8.1).

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4.2   Inferential analysis

Correlation between Maha and WTI during the study period was r = 0.39 (Figure 2). Although the scatter is large, there is a positive association between both price changes, and the association does not follow obvious non-linear trends.
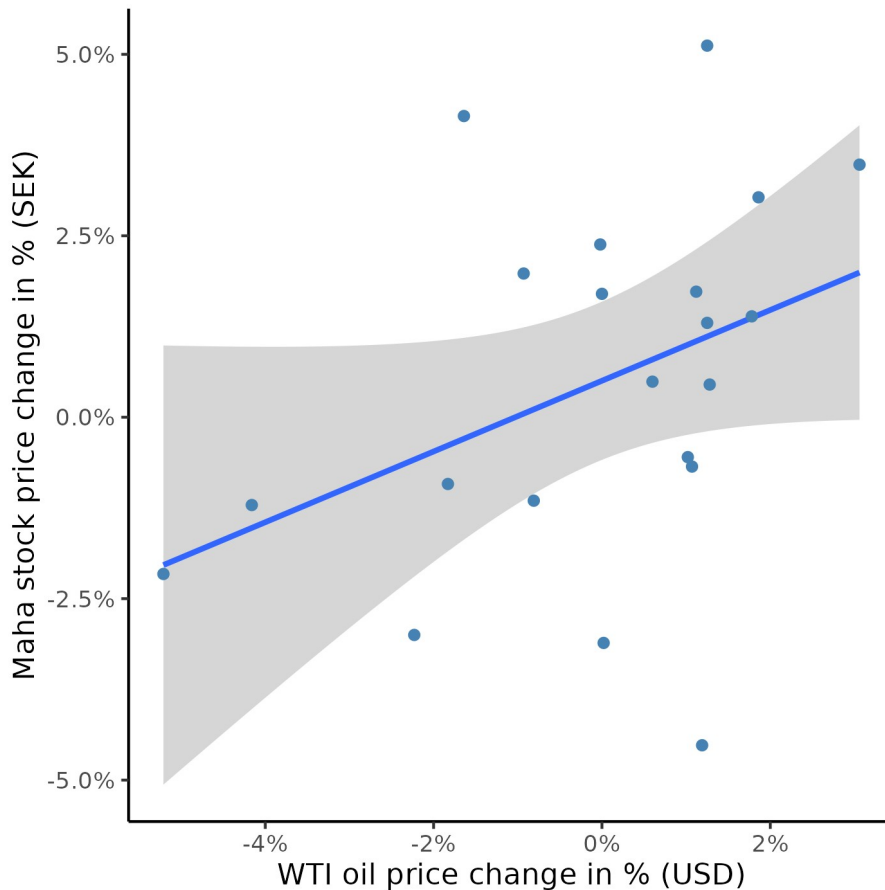

Figure 2 *Scatter plot of Maha price changes on WTI price changes.*

The positive association can be measure by the slope of the linear regression in Table 2. For each percent increase in WTI oil price there was an average increase in Maha price change of 0.5%. The variation in WTI price change explains R^2=15.4% of the price variation in Maha price change. This indicates a poor fit to the data, likely due to small sample size.

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Table 2 *Linear regression of Maha price changes on WTI price changes.*

Asset	Beta	95% CI[1]	p-value
(Intercept)	0.01	-0.01 to 0.02	0.347
WTI oil price change in % (USD)	0.49	-0.06 to 1.0	0.078

[1]CI = Confidence Interval

This slope however is not significantly different from zero (p=0.078). The 95% CI contains zero (CI = -0.06 to 1.0), which indicates that the uncertainty does not allow the conclusion that the association is consistently positive. It can be noted, however, that the lower extremity of the CI is very close to zero, while both the point estimate and the upper extremity of the CI are comparatively distant from zero in the relevant scale. This could be explained by the study almost reaching, but failing, to achieve sufficient power to significantly detect this association.

5   OBSERVATIONS AND LIMITATIONS

N/A

6   CONCLUSIONS

There is a positive association between WTI and Maha price changes, and it appears linear. The WTI only explains 15% of the Maha price change, and this association is not significant.

7   REFERENCES

- **SAP-2023-011-HM-v01** – Analytical Plan for Linear relationship between Maha stock price and the WTI oil price

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8 APPENDIX

8.1 Exploratory data analysis

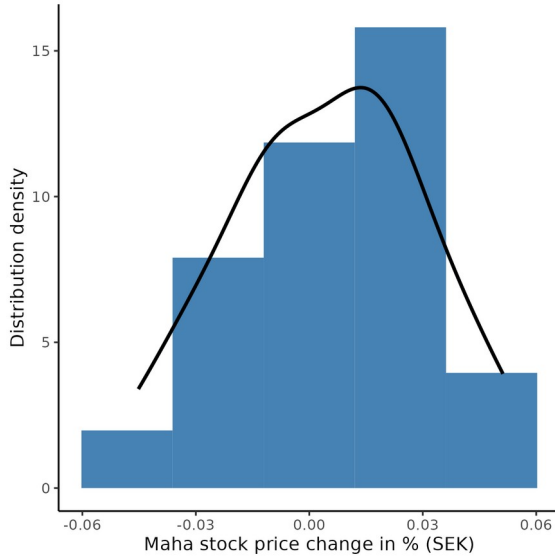*Figure A1* *Distribution of Maha price change in the study period.*
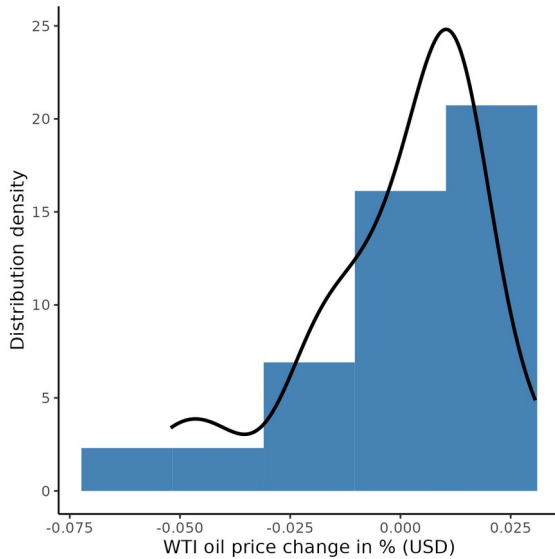
Figure A2 *Distribution of WTI price change in the study period.*

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8.2   Availability

All documents from this consultation were included in the consultant's Portfolio.

The portfolio is available at:

https://philsf-biostat.github.io/SAR-2023-011-HM/

8.3   Analytical dataset

Table A1 shows the structure of the analytical dataset.

Table A1 *Analytical dataset structure*

id	day	maha	wti
1			
2			
3			
…			
N			

Due to confidentiality the data-set used in this analysis cannot be shared online in the public version of this report.

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