Abstract geometric lines in the top-left corner of the page, consisting of several thin, black, overlapping lines that form a complex, angular pattern.

STOCK PRICE ANALYSIS

By: Axton Cahyadi

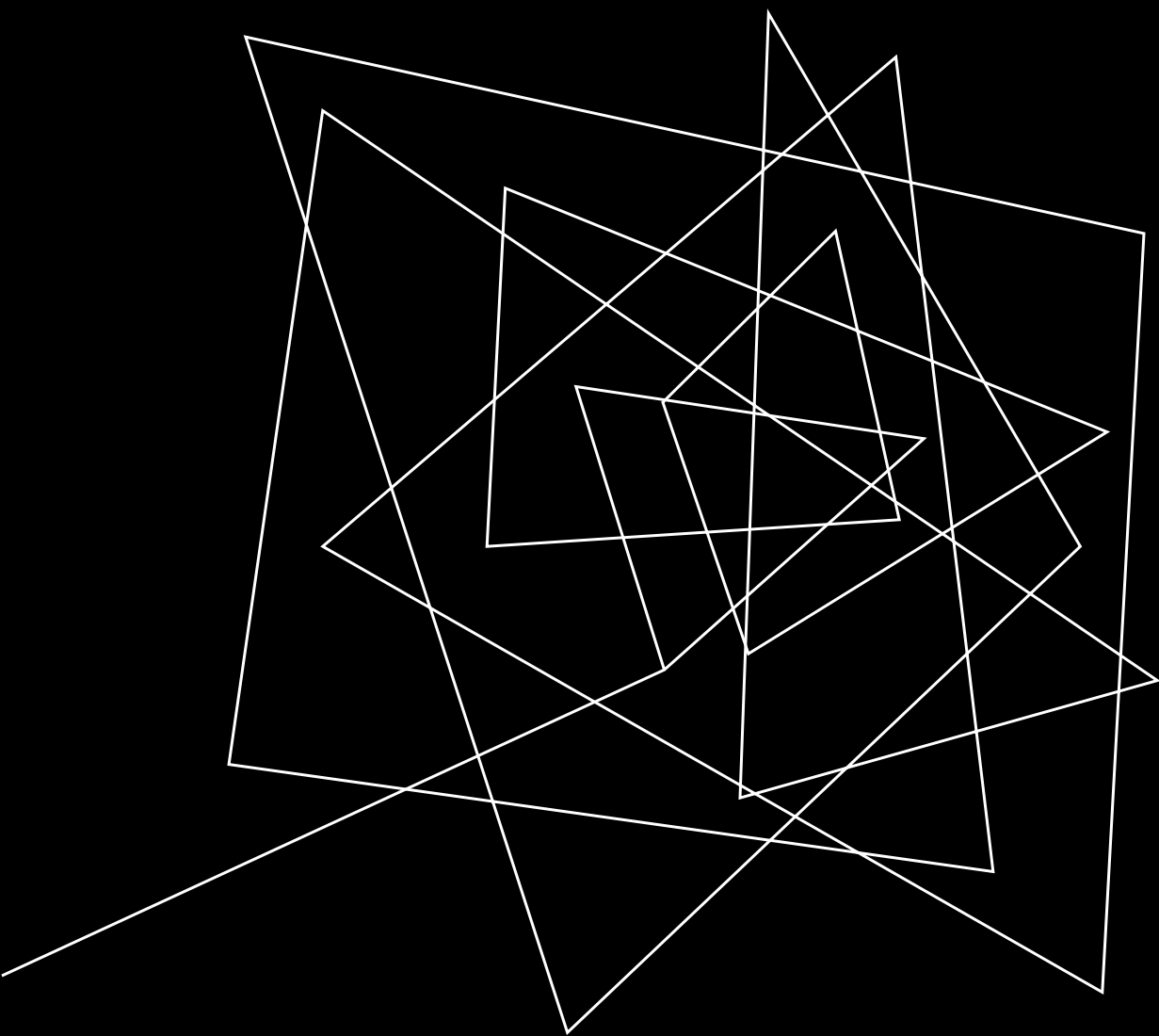
CONTENTS

- Introduction to the dataset
- Comparative Statistical Analysis
- Microsoft
- Tesla
- Apple
- Comparison Analysis
- Recommendations

An abstract geometric design featuring two thin, dark gray lines that intersect on a light gray background. One line is oriented diagonally from the top-left towards the bottom-right, while the other is oriented from the top-right towards the bottom-left. The intersection point is located to the left of the text.

INTRODUCTION TO THE DATASET

- **Project aims to study the behavior of the stocks from Apple, Tesla, Microsoft and S&P 500 based on their stock prices.**
- **Dataset used are from Yahoo Finance from 2018 to 2023.**
- **Calculations based on adjusted closing price of the stocks.**
- **Conducting comparative statistical analysis for each stock.**
- **Comparing its behaviors and trends with S&P 500.**



COMPARATIVE STATISTICAL ANALYSIS (STOCK PRICES)

ALL VALUES ARE BASED OFF ADJACENT PRICES				
stock prices	MICROSOFT	TESLA	APPLE	S&P 500
MEAN	\$190.83	\$131.79	\$97.39	\$3,457.23
MEDIAN	\$198.82	\$97.64	\$94.15	\$3,298.03
MODE	\$89.88	\$23.62	\$41.25	\$2,783.02
COUNT	1278	1278	1278	1278
MAX	\$339.92	\$409.97	\$180.96	\$4,796.56
MIN	\$80.06	\$11.93	\$34.31	\$2,237.40
VAR	5653	13684	2169	444594
SD	75	117	47	667

INSIGHTS

General trends

1. **Microsoft (MSFT)** has the **highest mean (\$190.83)** and **median (\$198.82)**, suggesting that its stock price is relatively stable and consistently high over time.
2. **Tesla (TSLA)** has a lower **mean (\$131.79)** and **median (\$97.64)** but a much lower **mode (\$23.62)**, indicating significant historical price fluctuations.
3. **Apple (AAPL)** has the lowest **mean (\$97.39)** and **median (\$94.15)** among the three, meaning its stock price has generally been lower but more stable.
4. **S&P 500 Index** has a very high mean value (**\$3,457.23**), as expected, since it's an index tracking 500 companies.

INSIGHTS

Risk Analysis

1. **Tesla has the highest standard deviation (SD = 117) and variance (13,684), meaning its stock is the most volatile.**
2. **Microsoft has an SD of 75 and variance of 5,653, showing moderate volatility.**
3. **Apple has the lowest standard deviation (SD = 47) and variance (2,169), making it the least volatile among the three.**
4. **S&P 500's SD (667) is very high but expected since it represents a broad market index rather than an individual stock.**

Conclusion: Tesla is the **riskiest** stock, while Apple is the most **stable**.



STOCK PRICES OVER TIME



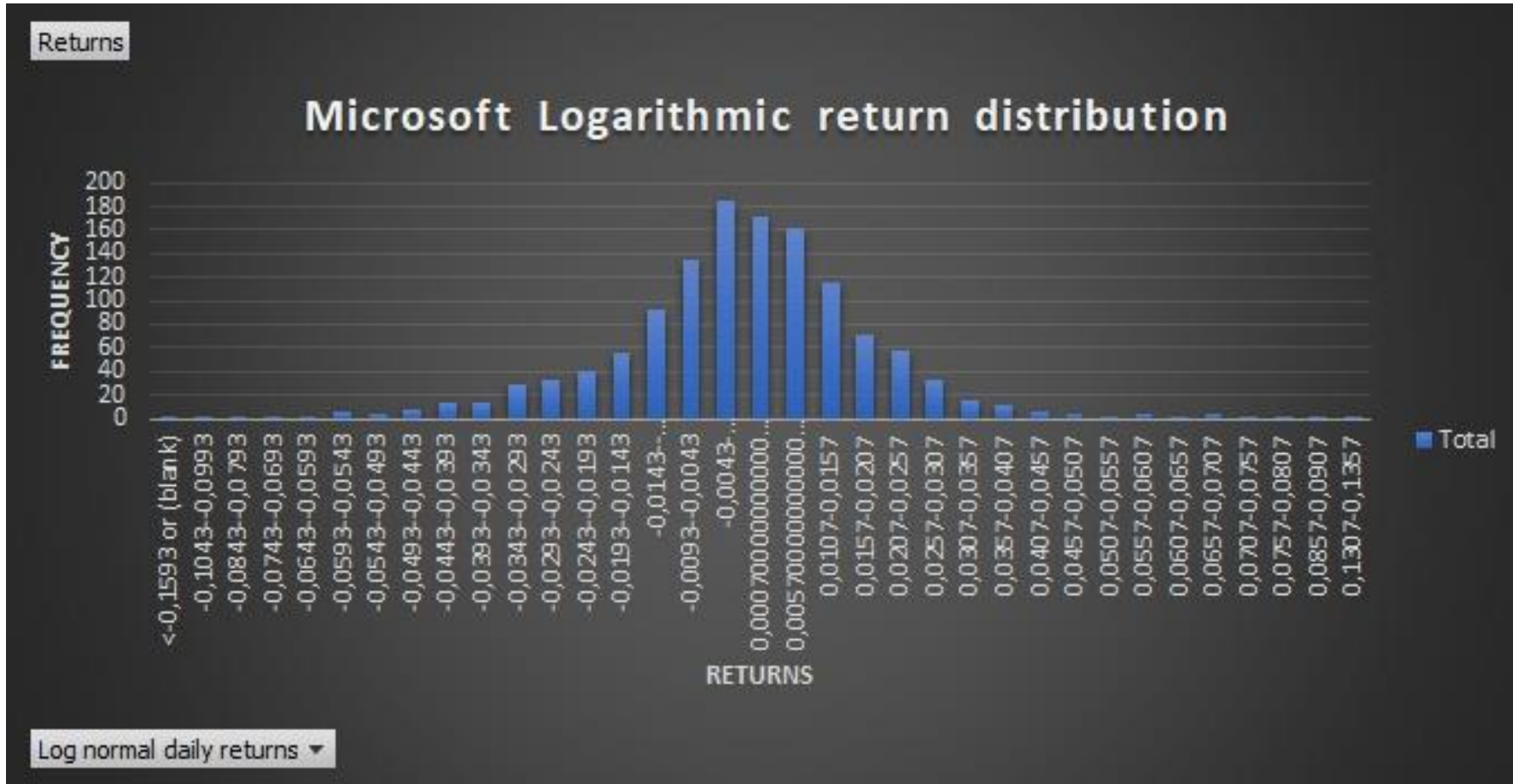
- Microsoft shows the **steady upward** trend with few major **corrections** over the years.
- Clear **uptrend** from 2018 to late 2021, followed by **correction** and **stabilization**.
- Mode price of **\$89.88** is way below the mean, suggesting **most historical price points were during earlier periods**.
- **Peaking** at **\$339.92** at 19 October 2021.
- Showed **resilience** during market **drawdowns**.

LOGARITHMIC DAILY RETURN ANALYSIS

- **Microsoft** ranks **3rd** in mean returns.
- The stock grew **24.20%** per year compounded annually from 2018-2023.
- **Microsoft's annual return** typically varies by **±31.07%** from its average each year.
- **Moderate risk** and **volatility** at **1.96%** for Standard Deviation and **0.04%** for Variance.
- **Slight negative** skewness indicate more **frequent large losses than large gains**.
- **Kurtosis** of 7 indicate fat tails with more **extreme outcomes** than a **normal distribution**.
- Its return to risk percentage is **78%**.

Log daily returns	MICROSOFT
MEAN	0.086%
MEDIAN	0.128%
MODE	0
COUNT	1277
MAX	13.29%
MIN	-15.95%
VAR	0.04%
SD	1.96%
Annual return	24.20%
Annual stdev	31.07%
Sharpe ratio	77.88%
Skewness	-0.279653329
Kurtosis	7.014607808

TESLA RESULT DISTRIBUTION

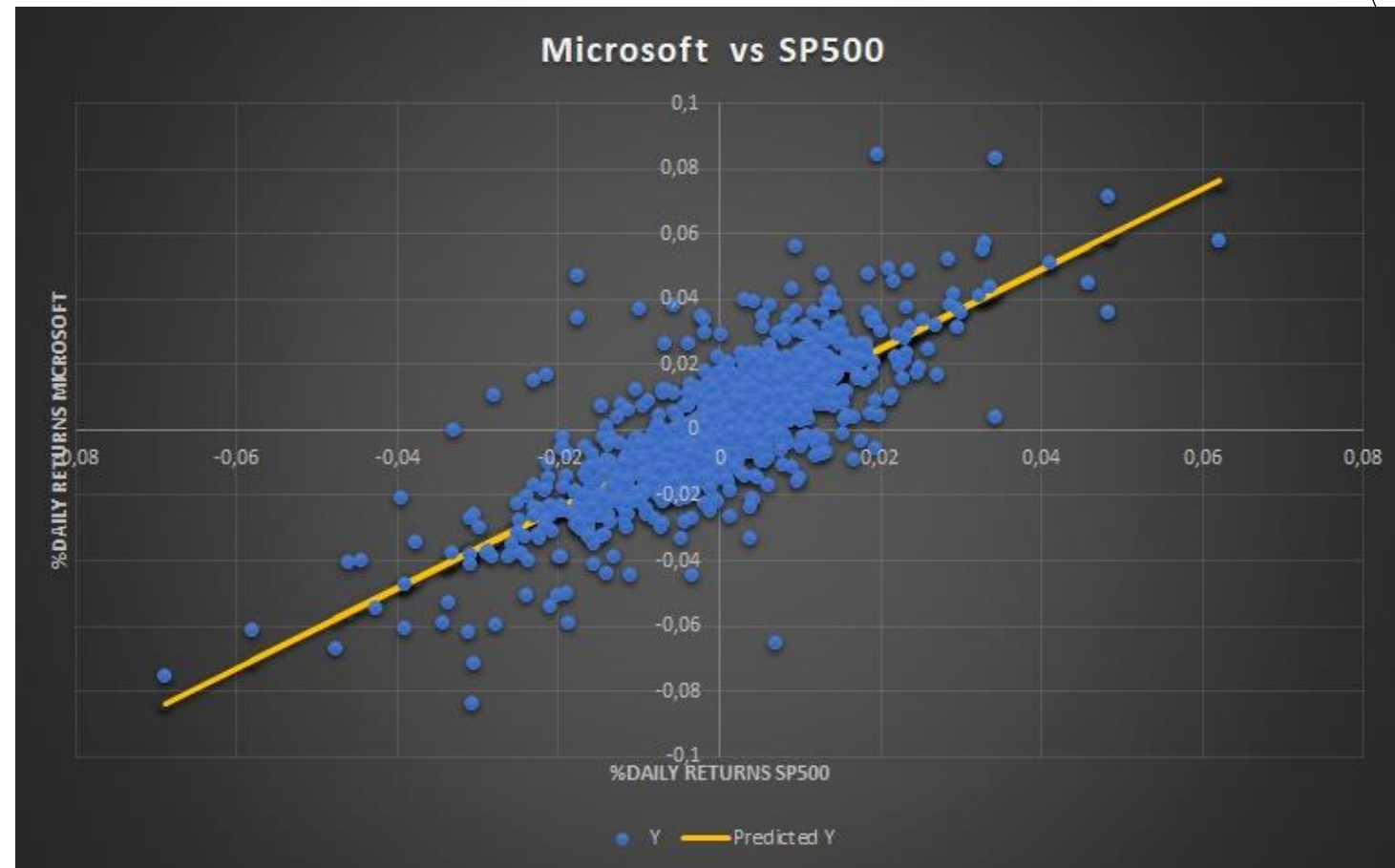


- Relatively symmetrical bell curve with **most returns** being **clustered around 0%**.
- **Small** positive or negative returns daily.
- Slightly **negatively** skewed with **fat tails**.
- **Low volatility**, more **predictable** return pattern and **stable** daily performance most of the time.

- Beta score of **1.22**, indicating it typically **follows** the markets movements closely.
- For every **1%** change, **MSFT** is expected to change by **1.22%**.
- Strong correlation of **78%** for MSFT against SP500, indicating its returns tend to **move more consistently with the market**.
- **Low dispersion** standard error of **0.011** meaning that returns are tight to the regression line.
- **R square** values of **60%** indicate that its prices are mostly explained by the market.

Regression Statistics	
Multiple R	0,777176063
R Square	0,604002633
Adjusted R Square	0,603692047
Standard Error	0,011341909
Observations	1277

MICROSOFT VS S&P 500



INSIGHTS

- **Solid returns with manageable volatility.**
- **High R-squared values** make MSFT more **predictable** but maybe **less useful** for portfolio diversification.
- A market-aligned investment with **great predictability** and significant influence on the market itself makes it a great stock to have.
- Favorable return to risk ratio, indicating **efficient performance**.
- It's at a **middle ground** between **stability** and **growth** potential.



STOCK PRICES OVER TIME



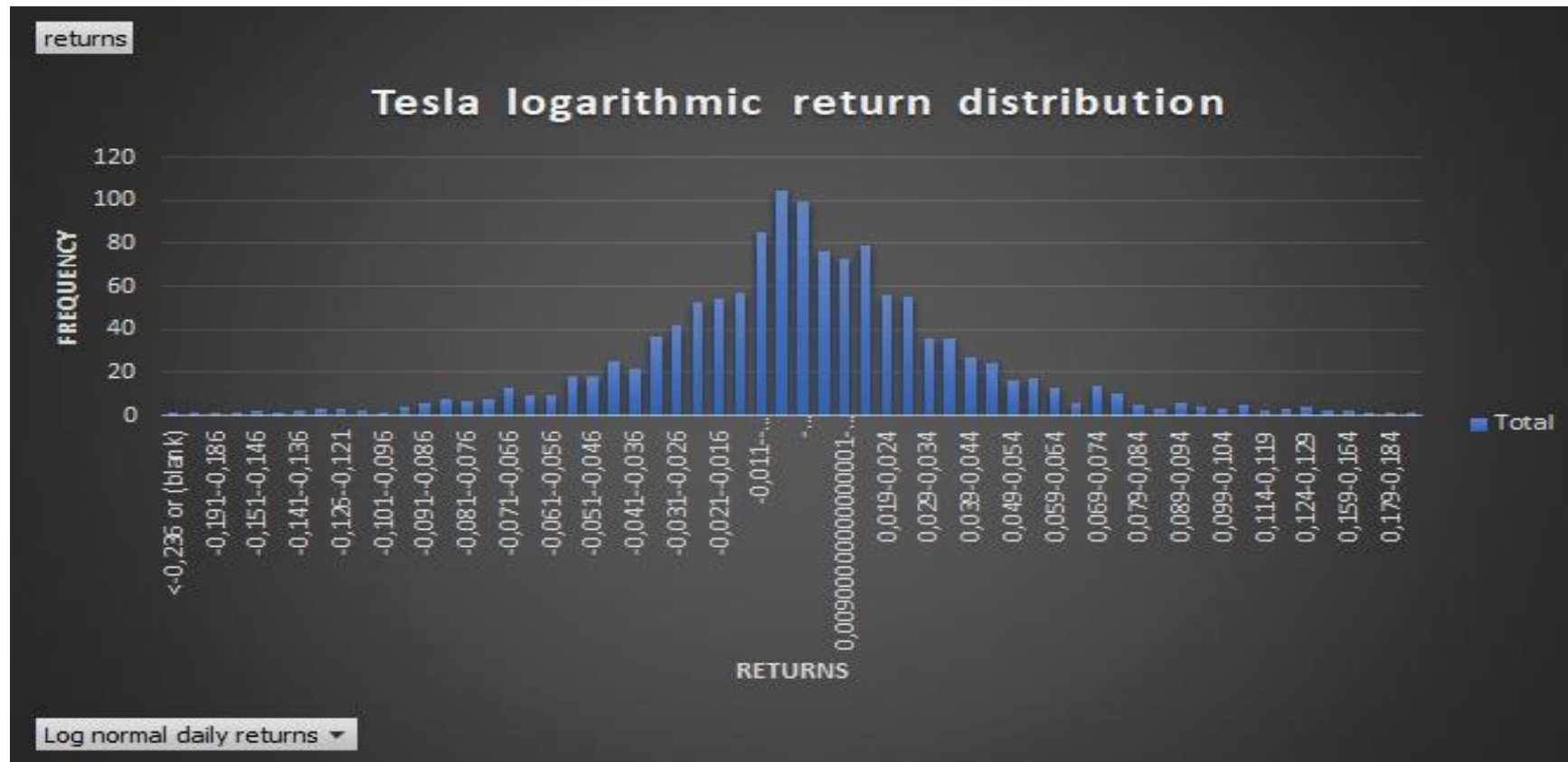
- Tesla has a dramatic **price surge** starting at late 2020.
- **Extreme volatility** with a lot of corrections, with **largest variance and SD** amongst all three stocks.
- Mode price \$23.62 and mean price \$131.79 indicates the **dramatic price appreciation**.
- Relatively **new** to the market compared to the other companies and still **unstable**.

LOGARITHMIC DAILY RETURN ANALYSIS

- Tesla has the **highest daily mean return** at **0.161%** with a similar median.
- Its stock has **impressively grew** almost **50%** per year compounded annually from 2018-2023.
- With its **annual return** varying by **±65.94%** from its average each year.
- It has the **highest volatility** with a SD of **4.15%** with extreme outliers of **18.14%** and **-23.65%** for daily returns.
- Slight negative skewness indicate **frequent large losses than large gains**.
- **Kurtosis** of **3.6** is the lowest amongst all three companies but still **indicates fat tails**.
- Its return to risk percentage is **75.80%**.

Log daily returns	TESLA
MEAN	0.161%
MEDIAN	0.159%
MODE	#N/A
COUNT	1277
MAX	18.14%
MIN	-23.65%
VAR	0.17%
SD	4.15%
Annual return	49.98%
Annual stdev	65.94%
Sharpe ratio	75.80%
Skewness	-0.151998254
Kurtosis	3.593053027

TESLA RESULT DISTRIBUTION

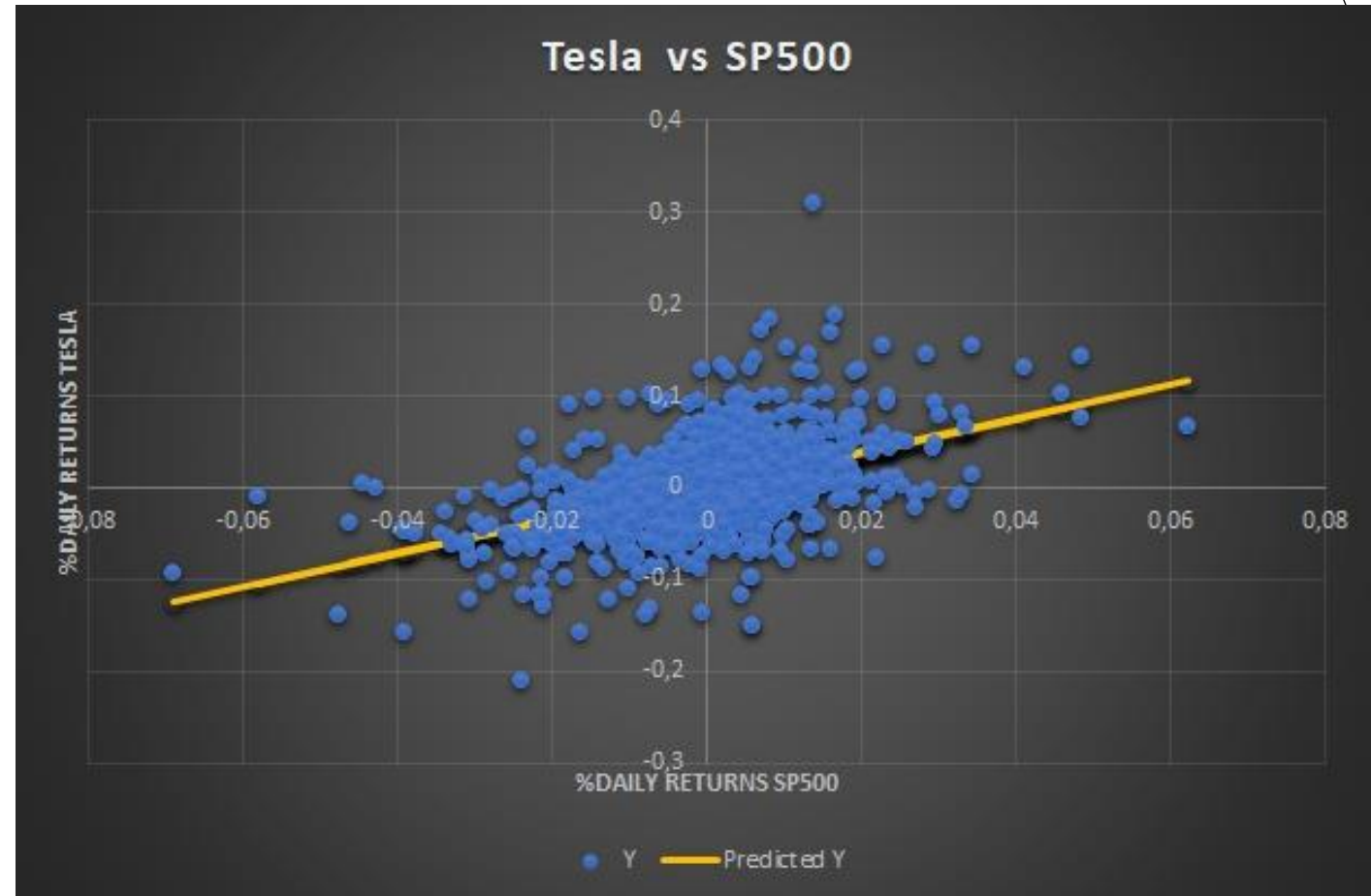


- Roughly bell shaped distribution, **adherence to log-normality**.
- **Fat tails** indicating presence of **outlier returns** (both negative and positive).
- **Slightly negatively skewed**, more extreme negative returns than expected.

- Beta score of **1.83**, indicating that it moves almost twice as much as SP500, very risky and volatile.
- For every **1%** change, Tesla is expected to change by **1.83%**.
- **Moderate** correlation of **48%** for **Tesla** against SP500, not as tightly correlated as other stocks.
- **High dispersion** standard error of **0.038** reflecting its **high volatility**.
- **R square** values of **23%** indicate that its prices are mostly driven factors in **Tesla**.

TESLA VS S&P 500

Regression Statistics	
Multiple R	0,481352
R Square	0,2317
Adjusted R Square	0,231097
Standard Error	0,038246
Observations	1277

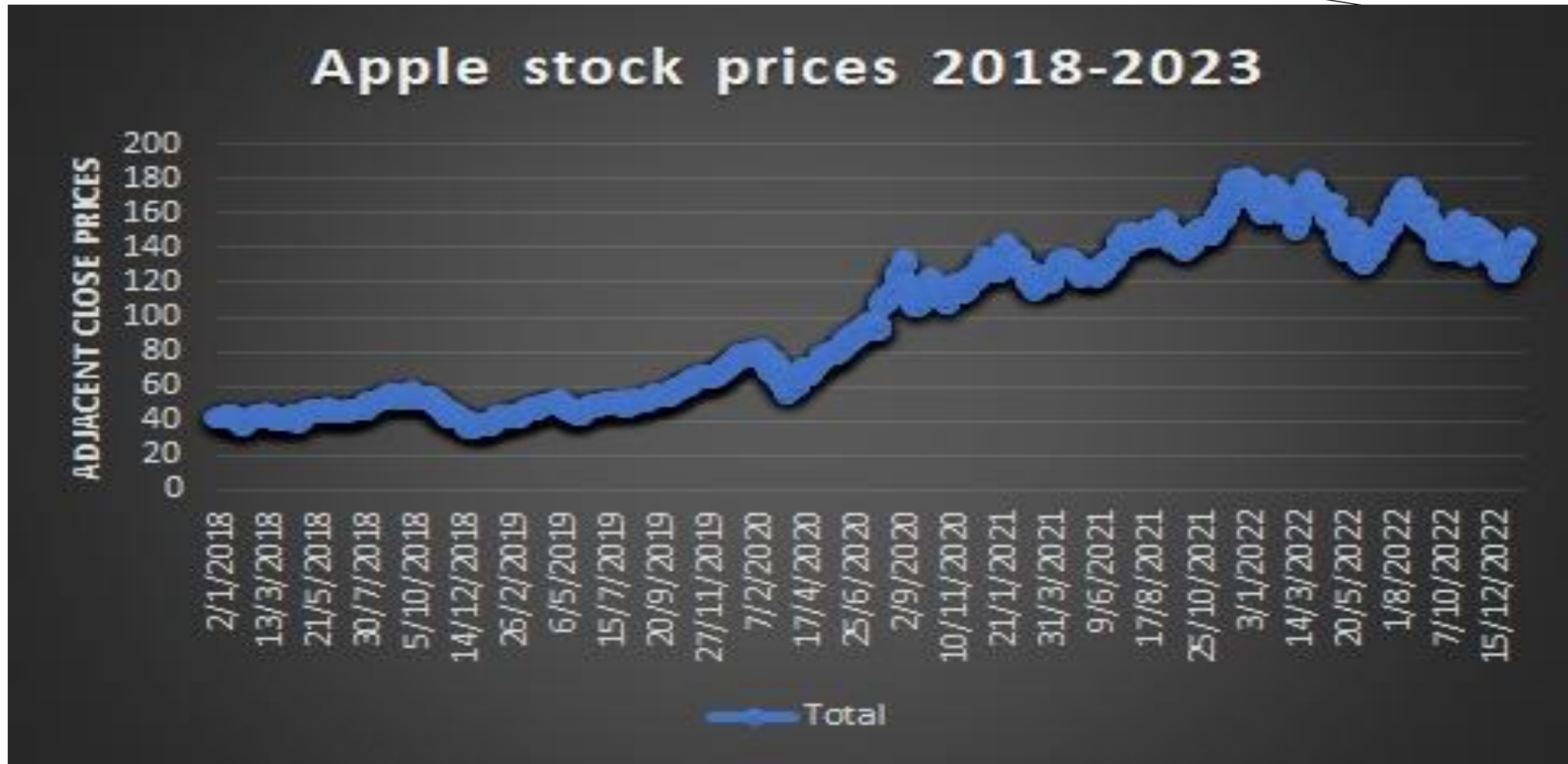


INSIGHTS

- **Highest risk highest reward option.**
- Tesla is an **unpredictable** stock as it does not really move with the market but may offer **diversification benefits** in a broader portfolio.
- Relatively low kurtosis shows more **consistent high volatility** than unpredictable jumps.
- Risk to return tradeoff is favorable but **requires high risk tolerance.**
- It's a **growth stock** with significant **upside** potential but with **high volatility.**



STOCK PRICES OVER TIME



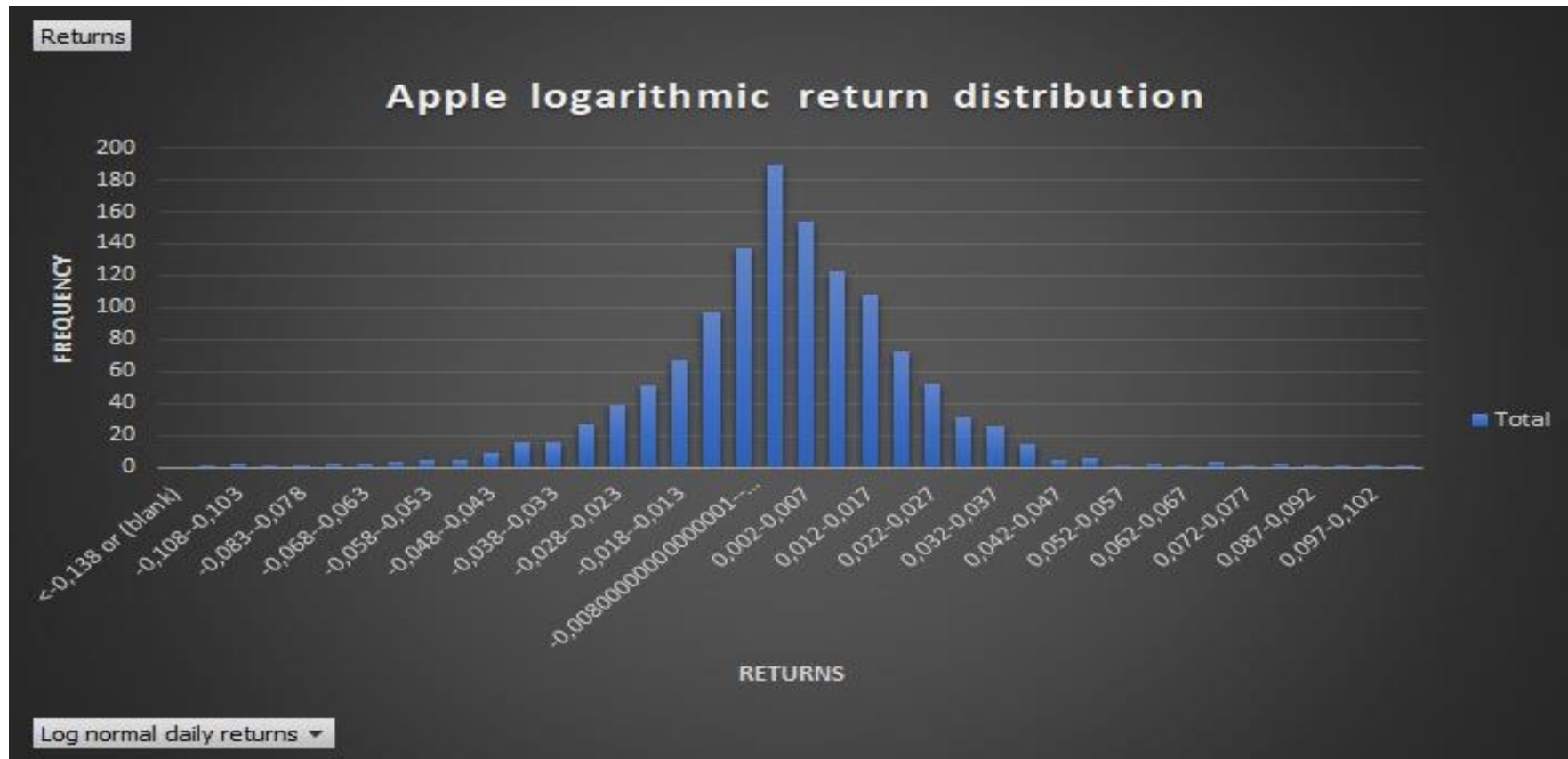
- Price is **consistent** and **steady** like Microsoft.
- Clear **upward growth** until 2022 which had few corrections.
- **Lowest volatility** based on variance and SD among all companies.
- **Stable price** movement with **less risk**.
- Median price \$94.15 being close the mean \$97.39, meaning a **balanced distribution of prices** over time.

LOGARITHMIC DAILY RETURN ANALYSIS

- **Strong** daily mean return of **0.098%** with a slighter higher median.
- Its stock grew about **28%** per year compounded annually from 2018-2023.
- With its **annual return** varying by **±33.41%** from its average each year.
- Has a low variance **0.04%** and SD value **2.1%**, indicating **consistency and moderate risk and volatility**.
- **Moderate** negative skewness-more frequent large losses than large gains.
- **Kurtosis of 4.63** indicate fat tails but with less extremities than Microsoft.
- Its return to risk percentage is **83.76%** making it the **best ratio** out of all.

Log daily returns	APPLE
MEAN	0.098%
MEDIAN	0.114%
MODE	0
COUNT	1277
MAX	11.32%
MIN	-13.77%
VAR	0.04%
SD	2.10%
Annual return	27.99%
Annual stdev	33.41%
Sharpe ratio	83.76%
Skewness	-0.239063211
Kurtosis	4.627723372

APPLE RESULT DISTRIBUTION

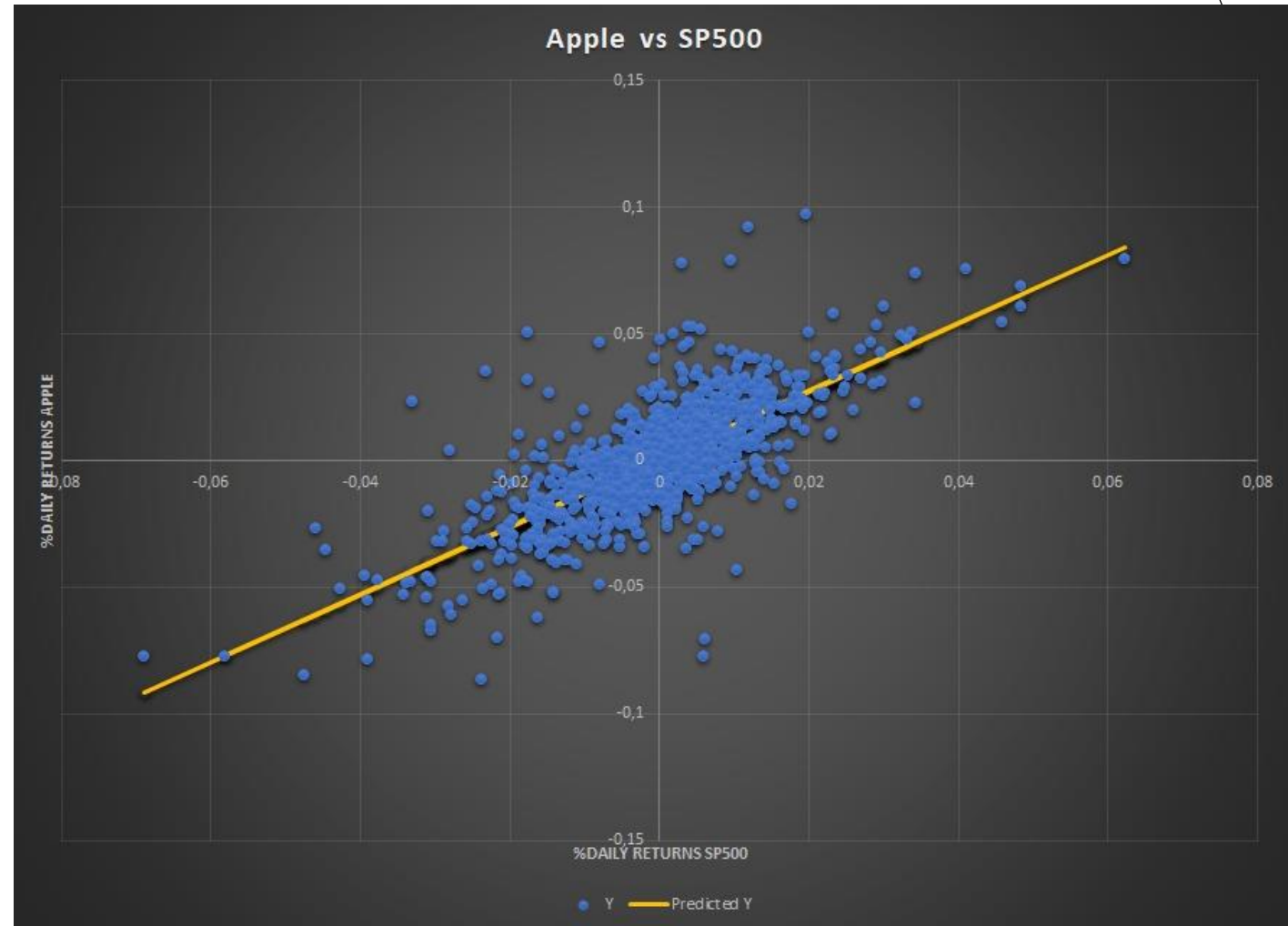


- Based on the return distribution, we can tell that its **slightly negatively skewed**.
- Share distribution has a slightly longer tail in the left, indicating the **returns were more negative than positive**.
- Its concentrated at around **-1.3% to 2.7%** having most of its returns at **0.2% to 0.7%**.

- It has a **beta score of 1.33**, indicating that it tends to **move in the same direction** as SP500 but with greater magnitude.
- For every **1% change**, **Apple** is expected to change by **1.33%**.
- **Correlation of 74%** for **Apple** against SP500, meaning **strong positive relationship** between the two.
- **Average distance from regression line** is **0.0139** which is still considered fairly accurate
- **R square** values imply that **54.9%** can be explained by SP500 movements.

Regression Statistics	
Multiple R	0,7411
R Square	0,54923
Adjusted R Square	0,54888
Standard Error	0,0139
Observations	1277

APPLE VS S&P 500



INSIGHTS

- **Best risk-adjusted returns** out of all three companies **83.76%**.
- Relatively **balanced distribution** of returns based on its skewness.
- Apple performance are going strong with **moderate** and **manageable risk**.
- Based on its **beta value 1.33**, it indicates that Apple is more volatile than the market as a whole.
- Based on its return statistics, it indicates a **mature growth** company with a **solid market position**.

COMPARISON ANALYSIS

- Company with the **highest volatility** is **Tesla**, with the **highest risk** but could give **results faster**.
- Company with the **most positive consistency** are both **Microsoft** and **Apple**, providing **security** to your portfolio based on its returns.
- **Microsoft** touches on the middle ground on both while still maintaining **steady** and **stable growth**.
- All companies have **strong growth** with **good positive correlation** with the **market**.

RECOMMENDATIONS

- **Investors looking for stability:**  **Apple** is the safest choice.
- **Investors seeking high growth with risk:**  **Tesla** has the highest volatility and largest price swings, meaning it could offer higher rewards but with significant risk.
- **Balanced risk and return:**  **Microsoft** offers a mix of **stability and growth**, making it an attractive medium-risk investment.
- All in all, it's best to always **diversify your portfolio** and **invest in good positively correlated companies** in the market. All three companies are worth investing in, each having their own strengths and weaknesses we need to **take advantage** of.



THANK YOU

Axton

0406823507

www.linkedin.com/in/axton-cahyadi-378115233

axtoncahyadi@gmail.com