An Analysis on Risk Adjusted Performance and Asset Pricing Model Comparison in Indonesian Stock Market During Covid-19

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ABSTRACT

This study calculates the performance of the Fama and French Three Factor, the Carhart Four Factor, and the Fama and French Five Factor models and compares each performance using the Mean Absolute Deviant (MAD) and Ex-ante Sharpe ratio. The data is collected from Saham KOMPAS 100 for the period of 2017 to 2021, as well as calculations using Data Analytics tools in Microsoft Excel. The results are Factor model having the highest accuracy based on the value of Mean Absolute Deviant while the Three Factor model having the highest risk-adjusted return performance based on the Ex-ante Sharpe ratio. This study also pays attention to the context of the occurrence of COVID-19 in Indonesia, and based on the statistical analysis, this condition has a significant effect on stock returns.

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INTRODUCTION

Background

The COVID-19 pandemic which has occurred globally, with no exception of Indonesia has negatively impact the economy of Indonesia, including the stock market in Indonesia.

Based on the data from the Indonesia Stock Exchange, at the end of March 2020, after the start of the COVID-19 outbreak in Indonesia, the composite index fell sharply (-36.78%) and all industrial sectors were also negatively affected.

The impact of the above, makes investors consider investing their money in the stock market, thus, it is necessary to consider the risk and return of their investment. There have been several previous studies examining the impact of the COVID-19 incident on stock price volatility. However, different empirical evidences are still found (Endri, et al, 2021).

In Indonesia itself, there are several researchers, namely Herwany et. Al (2021), Utomo and Hanggraeni (2021), and Ryandono et al. (2021) which sequentially examines the impact of

COVID-19 on abnormal returns of sectoral stocks listed on the Indonesia Stock Exchange, the impact of COVID-19 on 272 companies listed on the Indonesia Stock Exchange, and the impact of COVID-19 on Indonesian islamic stocks.

However, to our knowledge, no research has examined the Risk Adjusted Returns of stocks in Indonesia based on the methods for testing the expected returns of stocks in Indonesia in the period before and during the pandemic. There are several methods for measuring the expected return of stocks, such as the Capital Asset Pricing Model (CAPM), the Fama and French Three Factor Model, the Carhart Four Factor Model, and the Fama and French Five Factor Model.

There have been several studies from various researchers in several countries comparing the method that are best to explain the factors that influence stock returns, in which most of the studies conclude that the model with more factors can explain stock returns better (Eventci and Karaomer, 2018). However, the study was conducted at a time when there was no COVID-19
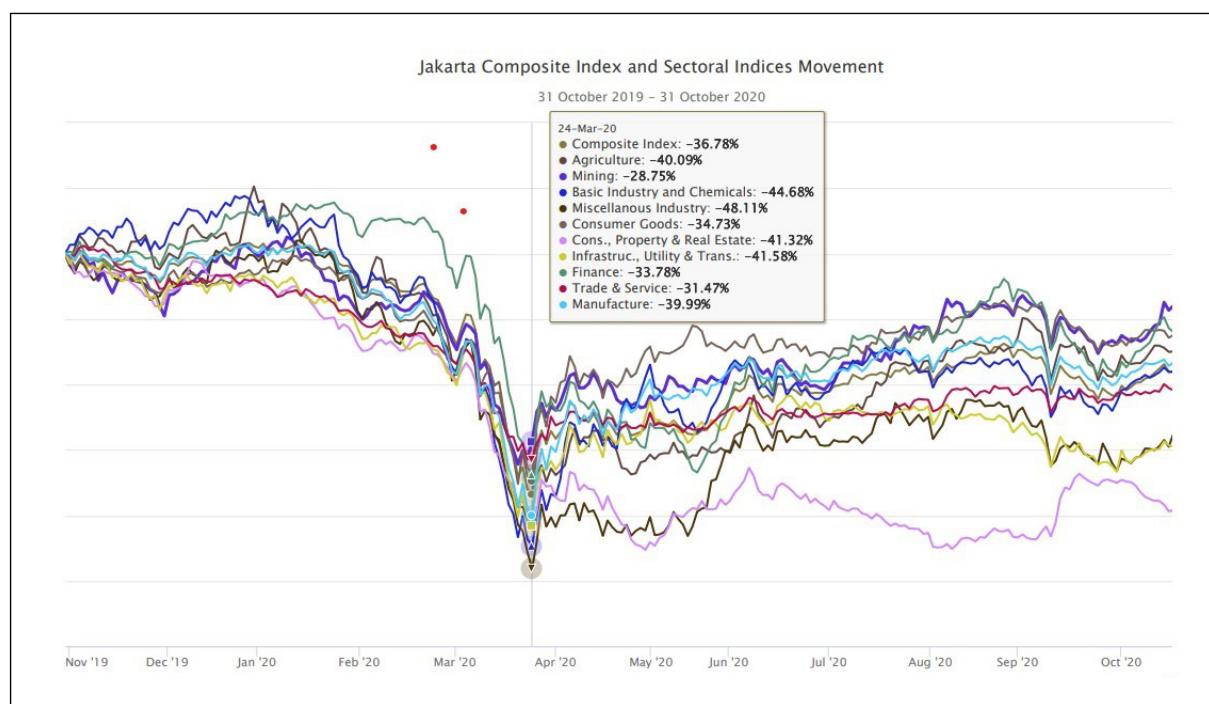
Picture 1.1. Jakarta Composite Index and Sectoral Indices Movement

Source: Indonesia Stock Exchange

pandemic. Hence, according to the authors, it is necessary to test these methods during the COVID-19 pandemic.

Research Question
Based on the background above, the research questions of this paper are as follows:
1. How is the comparison of Risk adjusted performance of the Fama and French Three Factor Model, the Carhart Four Factor Model, and the Fama and French Five Factor model in predicting the stock returns in the Indonesian stock market before and during the COVID-19 pandemic?
2. Which model can explain stock returns in Indonesia better?

Research Objective
Based on the research question above, this study aims to provide answers to several problems as follows:
1. Analyzing the comparison of Risk adhusted performance of the Fama and French Three Factor Model, the Carhart Four Factor Model, and the Fama and French Five Factor model in predicting the stock returns in the Indonesian stock market before and during the COVID-19 pandemic.
2. Analyzing which model can explain the stock returns in Indonesia better.

Scope of the Research
Analyzing the stocks that are included in the Indeks Kompas 100 from 2017 to 2021.

LITERATURE REVIEW
Indeks KOMPAS 100
Indeks KOMPAS 100 is an index that measures the price performance of 100 stocks that possess a good liquidity and large market capitalization. The Indeks KOMPAS 100 was launched on July 13, 2007 and is managed in collaboration with the media company, Kompas Gramedia Group. 150 selected shares from the IDX Composite constituents that have been listed for at least 6 months based on the transaction value in the regular market for the last 12 months. Of the 150 shares, 100 shares were chosen to be KOMPAS

100 constituents by considering liquidity factors, such as transaction value, transaction frequency, number of transaction days in the regular market and market capitalization, as well as fundamental factors, namely financial performance, compliance, and others (IDX, 2021).

Fama and French Three Factor Model
Sharpe (1964) developed the Capital Asset Pricing Model (CAPM) which states that there is only one factor that affects asset prices, namely market risk. Banz (1981) found that firm size is important. Small-sized firms tend to provide higher risk-adjusted returns, on average, than larger firms. Basu (1983) then stated that there are other factors that affects asset prices, namely Earning Price Ratio (E/P). His findings suggest that stocks with high E/Ps, on average, have higher risk-adjusted returns compared with stocks with low E/Ps, and that this effect is particularly significant when a size control changer are used, which supports Banz's (1981) research.

Fama and French (1992) creates a Three Factor Model where the factors are market risk, market capitalization level (size) and Book-to-Market equity (BE/ME). Companies that are judged having poor prospects by the market, characterized by low stock prices and high BE/ME, have higher expected returns (due to higher cost of capital) compared to companies with strong prospects.

With reference to the Fama and French Three Factor Model (1992), below is the regression model to calculate the excess return.

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB + \delta_i HML + e_i$$

Where R_{it} is the return of stock i in period t, R_{ft} is the return from risk-free asset, α_i is intercept, β_i, γ_i, δ_i is regression coefficient, R_{mt} is market return in period t, SMB (Small Minus Big) is the difference between stock portfolio return that has a small and large market capitalization, and HML (High BE/ME Minus Low BE/ME) is the difference between stock portfolio return that has a high and small Book to Market.

Carhart Four Factor Model

Jegadeesh and Titman (1993) published a paper which states that the strategy of buying stocks that performed well in the past (winners) and selling stocks that performed poorly in the past (losers) yielded significant positive returns. Inspired by Jegadeesh and Titman (1993), Carhart (1997) added a fourth variable, Winners-minusLosers (WML) to the Fama and French Three Factor Model.

Below is the model based on the Carhart Four Factor Model (1997).

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB + \delta_i HML + \mu_i WML + e_i$$

where WML (Winners Minus Losers) is the difference between returns on stock portfolios that had a higher average return in the previous year and one that was lower.

Fama and French Five Factor Model

Novy-Marx (2013) states that profitability, which is measured by gross profit to assets, has roughly the same power as Book-to-Market (BE/ME) in predicting returns. Profitable companies generate much higher returns than unprofitable companies. Aharoni (2013) found that there is a negative relationship between investment and return. Motivated by the evidence presented by Novy-Marx (2013) and Aharoni (2013), Fama and French (2015) proposed a Five Factor Model by adding profitability and investment factors, where the results were better when the research was conducted in the United States. In its research, BE/ME tend to have low investment.

The below equation is the model with reference to Fama and French Five Factor Model (2015).

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \gamma_i SMB + \delta_i HML + \varphi_i RMW + \lambda_i CMA + e_i$$

where RMW (Robust Minus Weak) is the difference between returns on stock portfolios that have higher profit and stock portfolios with lower profits, and CMA (Conservative Minus Aggressive) which is the difference between returns on stock portfolios with smaller investment and larger investments.

Conceptual Thinking Framework

The thinking framework of this study are as follows: Comparison of the Risk adjusted performance of the Fama and French Three Factor Model, the Carhart Model and the Fama and French Five Factor Model in predicting stock returns in the Indonesian stock market were analyzed using the Mean Absolute Deviation and Ex ante Sharpe ratio of each model.

The image above can be explained as follows:
1. Selecting issuer which are members of Indeks Kompas100 from 2017 to 2021.
2. Estimating the expecred return of each issuer using the Fama and French Three Factor Model, the Carhart Four Factor Model, and Fama and French Five Factor Model.
3. Calculating MAD, Ex ante Sharpe ratio and Adjusted R squared per share, and the average of MAD, Ex ante Sharpe ratio and Adjusted R squared per share.
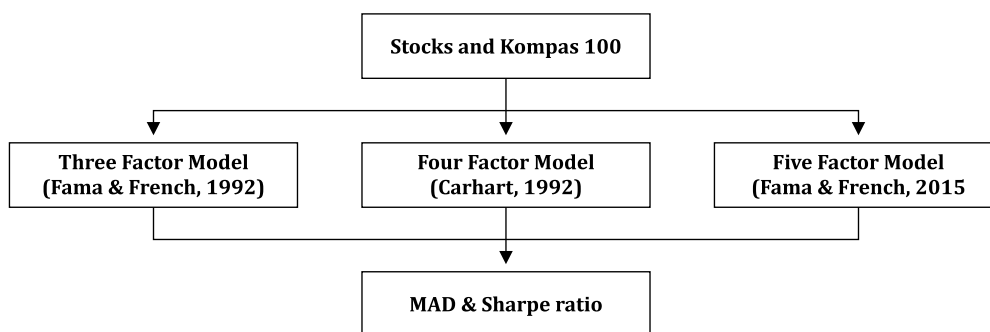4. Comparing the average MAD, Ex ante Sharpe ratio and Adjusted R squared per share of

Figure 2.1. Conceptual Thinking Framework

Fama dan French Three Factor Model, Carhart Four Factor Model, and Fama and French Five Factor Model.

RESEARCH METHOD
Type and Source of Data
The Data type of this study is secondary data that are obtained from Bloomberg. The Population in this study is all the shares that are members of Kompas100 and are listed on Indonesia Stock Exchange during the period of 2017 to 2021. Purposive sampling technique are used to determine the sample of this study.

The sample criteria for this study are:
1. Stock that have been registered as members of Kompas100 for 2017 to 2021 period.
2. Stock have complete prices and financial data for 2017 to 2021 period.

Data Collection Method
The data collection method in this research is by conducting a literature research method through data collection from Bloomberg. The data colleted are as follows:
- Monthly closing price of the Indeks Kompas100;
- Monthly closing price of Indeks Kompas100 members;
- Monthly risk-free interest rate (BI repo rate)
- Monthly market capitalization rate;
- Quarterly Book value;
- Quarterly Return on Equity (ROE); and
- Quarterly issuer's asset value.

Operationalization variable

Data Analysis Method
1. Mean Absolute Deviation

   The MAD using the absolute-deviation of the rate of return of a portfolio as a measure of the risk (Konno, 1990; Konno and Yamazaki, 1991). Despite considered to be mere computational scheme without solid theoretical foundation, MAD is superior to the Mean Variance (MV) model both theoretical and computational (Konno and Koshizuka, 2007). This model used by some researchers in formulating and solving portfolio optimization problems that not be properly using the corresponding MV model (Konno and Yamamoto, 2003; Konno and Li, 2000; Konno and Suzuki, 1996). In this paper we used MAD to calculate the level of accuracy of data forecast. The MAD formula is:

   $$MAD = \sum \frac{[Ri - E(Ri)]}{n}$$

   MAD = Mean Absolute Deviation
   Ri = Actual return of stock i on observation
   E(Ri) = Exptected return of stock i on observation
   n = Amount of Data

No	Variable	Variable description	Formula
1	Small minus Big (SMB)	The difference between stock portfolio returns that have a small and large market capitalization	(Small Low+ Small Medium + Small High)/3 - (Big Low + Big Medium + Big High)/3.
2	High minus Low (HML)	The difference between stock portfolio return that have a high and small Book to Market (book value of equity divided by market capitalization)	½ (Small High+ Big High) - ½ (Small Low + Big Low).
3	Winners Minus Losers (WML)	The difference between stock portfolio returns that have a higher and lower average return in the previous year	½ (Small Winners + Big Winners) – ½ (Small Losers + Big Losers)
4	Robust Minus Weak (RMW)	The difference between the return of a stock portfolio that has a higher profit (ROE) and a lower one	½ (Small Robust + Big Robust) – ½ (Small Weak + Big Weak)
5	Conservative Minus Aggresive (CMA)	The difference between the returns on stocks portfolio that have a lower and higher investments (asset growth ratio).	½ (Small Conservative + Big Conservative) – ½ (Small Aggressive + Big Aggressive)

2. Ex ante Sharpe ratio

   Ex ante Sharpe ratio is used to measure the performance of risk-adjusted stock return. Ex ante Sharpe ratio works by calculating stock returns minus risk free asset, and then compared with the standard deviation. The calculation of the Ex ante Sharpe ratio is carried out using the following formula (Sharpe, 1994):

   $$S_i = \frac{\overline{R_i} - \overline{R_F}}{\sigma_i}$$

   Description:

   Sp = Stock's Ex ante Sharpe ratio

   Ri = Average return during the observation period

   $\overline{Rf}$ = Average risk-free return during the observation period

   σTR = Standard deviation of stock returns during the observation period

RESULT AND DISCUSSION

Descriptive Statistics

159 shares from Kompas100 in the period of 2017 to 2021 with price and return performance as shown in Picture 4.1 are obtained. From the picture, it can be seen that a large decline in returns occurred in March 2020 or in other words, when the COVID-19 pandemic occurred.
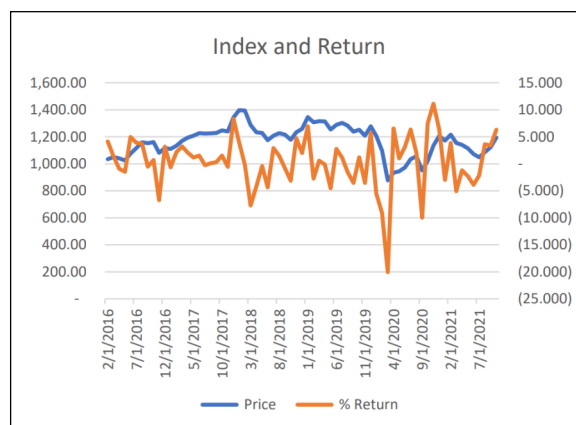

Figure 4.1. Kompas 100 Stock Index and Return

The 159 companies are divided into 10 sectors with the most number of companies in the Trade, Service, & Investment sector, while the industrial results for consumption sector has the highest monthly return during the period of 2017 to 2021.

Next, we calculated the Fama and French Three Factor model, the Carhart Four Factor Model, and the Fama and French Five Factor Model. This study includes the COVID-19 variable in the model, which is a value of 1 for the occurrence of COVID-19 events in Indonesia, which is during and after March 2020, and a value of 0 for the

Table 4.1. Descriptive Statistics by Sector

Sector	Jumlah	Min	Max	Mean	Std Dev	Skew	Kurt
Agriculture	9	-0.444737	0.647436	0.004725	0.118347	0.961257	4.147529
Chemical Industry	19	-0.453988	1.083333	0.012718	0.168920	1.790752	7.179924
Consumer Goods	10	-0.345550	0.932331	0.002654	0.125301	2.973545	17.887359
Finance	24	-0.573333	1.224667	0.012429	0.153354	2.375331	14.276161
Industrial result for consumption							
Hasil Industri Untuk Konsumsi	4	-0.586580	1.250958	0.017757	0.223480	2.320224	10.814422
Infrastructure & Transportation	18	-0.490385	1.600897	0.014731	0.169227	2.111113	12.166228
Materials	16	-0.400756	0.898649	0.017660	0.164527	1.532703	5.001428
Misc Industry	8	-0.474510	0.911371	0.005381	0.146547	1.251244	6.426653
Property & Construction	22	-0.719101	1.545455	-0.001575	0.157753	1.545336	13.164078
Trade, Service & Investment	29	-0.863388	1.734899	0.009265	0.166886	2.266446	19.529313

Source: The Result of the Research Team Processing (2021)

absence of COVID-19 events in Indonesia, which is before March 2020.

In order to calculate each model, firstly, the market return factor values, SMB, HML, WML, RMW, and CMA as explained in chapter 3 are calculated. By following these steps, the value of each factor is obtained with descriptive statistics as follows:

From the above descriptive statistic, it can be seen that the average market excess return and value (HML) is negative during the period of 2017 to 2021. The low return value shows that stocks with a high book to market actually get low excess return during this period. Meanwhile, other factor shows a positive average excess. However, if we look at the correlations with each other, it can be found that several factors have a negative relationship with market excess returns.

The results show that size (SMB) and COVID-19 conditions have a positive relationship with market excess return, while value (HML), investment (CMA), profitability (RMW), and momentum (WML) have a negative relationship

with market excess return. Suprisingly, the COVID-19 conditions has a positive correlation to market excess return and value. These results can also be seen by separating the observation period before and during COVID-19 pandemic and looking at the excess return per share. This period division shows that the majority of Kompas 100 shares have a positive average excess and experienced an increase in standard deviation during the COVID-19 period.

Table 4.4. Average Excess Return Before and During COVID-19

	Before COVID-19	During COVID-19
Average Excess Return	0.00071	0.02052
Average Standard Deviation	0.12334	0.16281
Company with negative excess return	86	35

Source: Research Team Processing (2021)

To calculate the market beta return, beta SMB, beta HML, beta WML, beta RMW, and beta CMA for each model in this study, we used the regression feature found in the "Data Analysis" in the Microsoft Excel application. After obtaining the coefficients of each factor, we can proceed to the analysis of MAD and Sharpe ratio.

Table 4.2. Descriptive Statistic

Sector	Rmt-Rf	SMB	HML	WML	RMW	CMA
Min	-0.204437	-0.095548	-0.140286	0.055060	-0.287634	-0.140110
Max	0.108141	0.119172	0.096928	0.108892	0.231939	0.105085
Mean	-0.002872	0.016895	-0.021248	0.081113	0.012182	0.017465
Std Dev	0.053944	0.053665	0.049526	0.012287	0.073414	0.046398
Skew	-0.941970	-0.098443	0.339835	0.184415	-0.891052	-0.612706
Kurt	2.770387	-0.537143	0.545584	-0.343236	5.729205	1.434020

Source: The Result of the Research Team Processing (2021)

Table 4.3. Correlations between Factors

	Rmt-Rf	SMB	HML	WML	RMW	CMA	COVID
Rmt-Rf	1.00	0.02	(0.03)	(0.09)	(0.12)	(0.14)	0.10
SMB	0.02	1.00	(0.58)	(0.03)	0.54	0.26	(0.20)
HML	(0.03)	(0.58)	1.00	(0.15)	(0.55)	(0.15)	0.11
WML	(0.09)	(0.03)	(0.15)	1.00	0.19	0.04	0.14
RMW	(0.12)	0.54	(0.55)	0.19	1.00	0.49	(0.19)
CMA	(0.14)	0.26	(0.15)	0.04	0.49	1.00	(0.24)
COVID	0.10	(0.20)	0.11	0.14	(0.19)	(0.24)	1.00

Source: Research Team Processing (2021)

MAD and Sharpe Ratio Analysis

The next steps are:

1. Finding the expected stock return based on the calculation results of the Fama and French Tree Factor Model, the Carhart Four Factor Model, and the Fama and French Five Factor Model.

2. Finding the MAD value for each monthly share by substracting the monthly actual stock return with expected stock return based on the calculation results of each model, where the results is being absoluted, then averaged.

3. Calculating the MAD value of all share by combining all of the average MAD values of each shares, then dividing it with the number of share issuers.

4. Calculating the Ex ante Sharpe ratio by reducing the expected stock return based on each model with risk free assets, then compares it with the standard deviation.

5. Calculating the Ex ante Sharpe ratio value of all shares by combining the entire Ex ante Sharpe ratio value of each share, then dividing it bt the number of issuers of share.

The following results are obtained (written in the average value):

Table 4.5. MAD Comparison of each Model

Variable	Score
MAD three factor Fama and French	0.091272
MAD four factor Carhart	0.091155
MAD five factor Fama and French	0.089930

Source: Research Team Processing (2021)

Table 4.6. Ex ante Sharpe ratio Comparison of each Model

Variable	Score
Sharpe Ratio three factor Fama and French	0.011091
Sharpe Ratio four factor Carhart	0.010792
Sharpe Ratio five factor Fama and French	0.013115

Source: Research Team Processing (2021)

From the table above, it can be seen that the calculation model that has the highest accuracy in predicting stock returns from the three models tested is the Fama and French Five Factor Model with the lowest MAD value of 0.089930. Meanwhile, based on the Ex ante Sharpe ratio, the Fama and French Three Factor Model with Ex ante Sharpe ratio value of 0.013115 has the highest value.

In reality, MTDL stock has the highest Sharpe index value, followed by MDKA and IRRA. Meanwhile, CPRO stock has the lowest Sharpe index value. However, this is different from what are produced by the three models. According to Three Factor Model, BEKS, WEGE, BBNI stocks are expected to have the highest share, while the Four Factor Model and Five Factor Model generate the same results, that is expecting MAMI shares to have the highest Sharpe index. Meanwhile, MTDL stock is expected to have a low sharpe index.

When compared with average actual stock return, the following results are obtained:

From the result above, it can be seen that the actual return is higher compared to the respective expectations of each model. The high level of accuracy in The Fama and French Five Factor Model that are seen in the lowest MAD value causes the expected return to be closest to the actual. However, the three model shows a high difference in the standard deviation value, which causes the actual sharpe ratio value to be lower than the expectations of each model.

Would these results be different if modeled with data in the period of before and during COVID-19? To answer these questions, we tried

Table 4.7. Actual and Model Comparison

Variable	Actual Return	3 Factor FF	4 Factor Carhart	5 Factor FF
Return	0.009191	0.007143	0.007327	0.007507
Std Dev	0.146183	0.074457	0.077362	0.081274
Sharpe Ratio	0.007101	0.013115	0.010792	0.011091
Adjusted R		0.215014	0.214614	0.224454

Source: Research Team Processing (2021)

to remodel it with the period before and during COVID-19. Following the previous procedure, the following results were obtained.

It was found that the use of the model using data before COVID-19 gave lower accuracy and sharpe ratio values. This is because the model shows lower return expectations and standard deviation at -0.0036 and ± 0.06. The use of the pre-COVID data also shows lower adjusted R square results. However, when using data during COVID-19, there was an increase in both accuracy and adjusted R square which represented a better model, especially in the Five-factor model.

So that for better accuracy in calculate the expected return of Indonesia stock market during COVID-19 pandemic, investment managers are advised to use the five-factor model with data from COVID-19 period. Investment manager can also use other methods to analyse the risk adjusted performance such as Jensen Portfolio Performance Measure, and Sortino Performance Measure. Then, considering the data used consists of various companies with a long-time interval the panel data approach can also be used. Through the better accuracy of calculation we hope investment manager can do better analysis on risk adjusted performance and asset pricing model in Indonesia stock market and take better decision during COVID-19.

Discussion

It can be said that there have not been many studies discussing Asset Pricing in Indonesia during the COVID-19 period. Apriwandi et al (2021) utilizes data of the year of 2018 to 2021 to compare the CAPM and Ohlson models in predicting stock prices and returns, which

resulted in the CAPM model predicting test results for a company's market value that was more accurate and had a lower error rate compared to the Ohlson model. This research does not use the latest asset pricing calculation model for comparison, but it can be a suggestion for further research. In addition, we have not found any research that aims to compare among asset pricing models. Nonetheless, several studies using the asset pricing model during the COVID-19 pandemic can be obtained from Susanti et al (2020) who examined investment decision making during the pandemic using the CAPM and found that the beta value had a conflicting relationship. The analysis in this study also shows undervalued or overvalued conditions based on the CAPM. This study also analyzes these conditions which could be seen in table 4.7, that the average actual value (Ri) is greater than each factor, which means it poses as an opportunity for investors to enter and earn profits in the future while still paying attention to stocks which meet these characteristics. Thus, the results obtained are in line with Susanti's research. Research on financial topics outside of asset pricing but still discussing corporate behavior during the COVID-19 period in Indonesia are Putri et al (2021), Endri et al (2021), Pontoh & Budiarso (2021), Aryani et al (2019), and other researchers.

In a study that compares the calculations between asset pricing models in Indonesia, Gumanti et al. (2017) compared the performance of the Fama and French Three Factor with the Carhart Four Factor using data from July 2005 to June 2015, and it was found that the Carhart Four Factor performed better than the Fama and French Three Factor Model, as it was found in this study

Table 4.8. Three Model Comparison Before and During COVID-19

	3 Factor FF		3 Factor FF		3 Factor FF	
	Before COVID-19	During COVID-19	Before COVID-19	During COVID-19	Before COVID-19	During COVID-19
MAD	0.08007	0.09145	0.07876	0.08956	0.07701	0.08485
Sharpe Ratio	-0.27614	0.31032	-0.25849	0.30590	-0.27058	-0.65041
Adjusted R Square	0.11475	0.31032	0.12126	0.30590	0.11437	0.33091

Source: Research Team Processing (2021)

by looking at the average MAD and Sharpe index of all KOMPAS100 stocks from 2017 to 2021. Ekaputra & Sutrisno (2020) discussed the application of the Fama and French Three Factor and Five Factor in Indonesia and Singapore using data from the year of 2000 to 2015. Five Factor did not give better results than the Three Factor, the same results if we took a look at the study by Saleh (2020) that uses data from 2012 to 2016. These results are different from our findings, however, data period collection and the absence of condition of COVID-19 pandemic might have been the causes of the differences in the research results.

The impact of COVID-19 news which had a negative impact on the Jakarta Composite Index (Haryanto & Mawardi, 2021) gave different results from our findings where COVID-19 gave a positive correlation instead. Zainuri et al (2021) also examined the impact of COVID-19 news on the IDX Composite and found similar results. Nonetheless, Haryanto & Mawardi and Zainuri et al used data from March to June 2020, in contrast to our study which used data from 2017 to 2021. The results in Picture 1 does show a decline in both price and return. However, if we analyze the latest data in October 2020, a positive average return is obtained. Even when we compare the data before and during COVID-19 pandemic, we see an increase in companies experiencing an increase in average returns. Thus, even though the beginning COVID-19 generates a negative impact, this condition did not continue and instead, the market in Indonesia recovered.

CONCLUSION

Based on the results of the analysis and discussion in the previous section, several things could be concluded, which are:
1. This study resulted in the average value of MAD, Ex ante Sharpe ratio and Adjusted R Squared from the Fama and French Three Factor Model, the Carhart Four Factor Model

and the Fama and French Five Factor Model in predicting stock returns on the Indonesian stock market for the period of 2017 to 2021. The MAD values generated are 0.091272, 0.091155, and 0.089930 respectively. For sharpe ratio values, the value of 0.013115, 0.010792, and 0.011091 are obtained. Meanwhile, the adjusted R Square value are 0.215014, 0.214614, and 0.224454 respectively.
2. Fama and French Five Factor Model is the calculation model with the highest accuracy. The level of accuracy and adjusted R Square can be increased by using data from the period during the COVID-19.

Our team propose the following recommendation to academia:
1. Further research using the panel regression approach is needed.
2. This study utilizes the Indeks Kompas100 as one of the systemastic risk variable and one of the stock beta component. To obtain more accurate calculation results, researcher are advised to use the IDX Composite index as one of the systematic risk variables and one of the stock beta calculators. The reason for this suggestion is because all related parties in the Indonesia Stock Exchange uses IDX Composite as a component of calculating the beta of shares, and it is hoped that future research will be more accurate compared to this research.
3. Analysis of risk adjusted performance can be developed using other methods, such as Jensen Portfolio Performance Measure, Sortino Performance Measure, and other methods.

Recommendation to industry:
1. During COVID-19, investment managers can use Fama and French five factor model with data from COVID-19 period for better accuracy of expected return calculation in Indonesian stock market.

REFERENCES

A. Mulyo Haryanto, Wisnu Mawardi (2021). Impact of COVID-19 News on Performance of Indonesia Stock Market. *Universal Journal of Accounting and Finance,* 9(2), 226 - 231. DOI: 10.13189/ ujaf.2021.090212. Acaravci, Songul Kakilli, Karaomer, Yunus, 2018, The Comparative Performance Evaluation of the Fama-French Five Factor Model in Turkey, İşletme ve İktisat Çalışmaları Dergisi

Aharoni, G., Grundy, B., Zeng, Q., 2013. Stock returns and the Miller Modigliani valuation formula: revisiting the Fama French analysis. *Journal of FinancialEconomics*, 110, 347– 357.

Banz, Rolf W., 1981, The relationship between return and market value of common stocks, *Journal of Financial Economics,* 9, 3-18.

Basu, Sanjoy, 1983, The relationship between earnings yield, market value, and return for NYSE common stocks: Further evidence, *Journal of Financial Economics,* 12, 129-156.

Carhart, M., 1997. On persistence in mutual fund performance. *Journal of Finance,* 52, 57–82.

Ekaputra, I.A. and Sutrisno, B. (2020) 'Empirical tests of the Fama-French five-factor model in Indonesia and Singapore', Afro-Asian J. *Finance and Accounting*, Vol. 10, No. 1, pp.85–111.

Fama, Eugene F & French, Kenneth R, 1992. The Cross-Section of Expected Stock Returns, *Journal of Finance, American Finance Association*, vol. 47(2), pages 427-465, June.

Fama, Eugene F & French, Kenneth R, 2015. A five-factor asset pricing model, *Journal of Financial Economics*, Volume 116, Issue 1,

Hiroshi Konno & Tomoyuki Koshizuka (2005) Mean-absolute deviation model, IIE Transactions, 37:10, 893-900

IDX (2021) IDX Stock Index Handbook V1.2, 2021

Jegadeesh, Narasimhan and Titman, Sheridan, 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance,* 48 (1).

Meisa, I, D.; Nadya.; Andriani, N.; Priscilia, E, Y.; and Dewi, L, L. (2021) Financial Market Data Versus Accounting Data: Persistent Patterns in Explaining Stock Returns in the Indonesian Capital Market During the COVID-19 Pandemic. *Review of International Geographical Education (RIGEO)*, 11(5), 3218-3224. doi:10.48047/rigeo.11.05.212

Saleh, Mustaruddin. (2020), Empirical Testing of the Five-Factor Model of Fama and French in Indonesia as an Emerging Capital Market. In: *Journal of Economics and Business*, Vol.3, No.1, 19-28

Nugraha, Akbar 2019. Analisis Perbandingan Risk Adjusted Performance Model Tiga Faktor Fama dan French, Model Empat Faktor Carhart, dan Model Lima Faktor Fama Dan French. Unpublished Thesis. Universitas Gajah Mada.

Sharpe, W. F. (1994). The Sharpe Ratio. The *Journal of Portfolio Management*, 21(1), 49–58.