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Media Exposure and Generation Z ‘s investment behavior

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by

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Abstract

The purpose of this research is to find the relationship between the media exposure rate among Generation Z, their financial literacy, and their portfolio allocation preference. It is designed to be an explanatory research using the survey strategy. Primary data from Yahoo finance and questionnaire will be used for analysis. After analyzed the relationship between media exposure, financial literacy and portfolio allocation, recommendations on forming an efficient portfolio are given based on sample stimulation. The major findings indicate that there is a positive relationship between media exposure rate among Generation Z and their financial literacy, and a positive relationship between financial literacy and their portfolio allocation ability.

Key words: Generation Z, Financial Literacy, Media Exposure, Portfolio Optimization, Monte Carlo Stimulation.

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Introduction

In such an era as the COVID-19 pandemic has been a global menace to human beings, the global economy has been greatly affected, and the negative impact may further be amplified with the uncertain trend of the pandemic (Leduc and Liu, 2016). As the result of economic globalization, all the stock markets around the world have been impacted by the COVID-19 (Ashraf, 2020). Especially for Chinese stocks, not only are they influenced by the pandemic but are also facing severe political pressure in China. Given the risks rendered by the pandemic as well as the crackdown from the Chinese government, it will be a challenge for investors to form a portfolio with those US-listed Chinese stocks. There may be significant differences among the investor groups among all affected investors according to their age group. As one of the most technologically advanced generations, people who are classified as Generation Z are projected to have access to a wealth of information, including stock investment. Therefore, they are regarded as a subject that can represent major investors' characteristics in the post-epidemic era. Also, study has shown that herding behavior, risk-averse, and risk perception positively affect people's investment decisions (Rosdiana, 2021). While those factors are related to the financial literacy, when facing the rising Generation and their technology, it is also very important for people to understand how the usage of internet impacts this connection in the case of gaining a further understanding of the new investors upcoming.

The investment strategy of Generation Z participating in the stock market urgently needs to be studied, and one of the most important entry points is their level of information reception. From the perspective of information inequality, this research wants to study whether the financial literacy level of Generation Z will be affected by their media usage, which will affect

their portfolio allocation when participating in the stock market. This is very important, because Generation Z will gradually become the main force in the stock investment market in the post-epidemic era. Even if some people have not actively participated in the stock market so far, to a large extent they will participate in it in the future. Therefore, under such mainstream pressure, Generation Z needs to know what factors are affecting their stock investment decisions.

The link between "media exposure" and "Generation Z's portfolio allocation" will be the subject of this research. As a moderator variable, financial literacy will be investigated. This research would be extremely beneficial to Generation Z when it comes to investing. As the network gradually absorbs people's lives, and the contemporary mass media is a significant controller who controls the course of the network, the modern mass media is a significant controller who dominates the course of the network. As a result, understanding the impact of media exposure on today's young people's buying habits can help them make better decisions. In addition, this study will narrow the coverage of customers in Zhejiang, China, among the younger generations (Generation Z). To put it another way, the data collecting artifacts for this study will be limited to students in the Zhejiang region to secure the research's boundaries and to utilize this as a sample for data analysis.

This study also conducted an experiment on the classic problem that GenerationZ may encounter when it is dedicated to asset allocation, that is: how to allocate the proportion of assets. By randomly selecting five stocks and using the establishment of Monte Carlo model in Python 3, the result is simulated and analyzed. This output also provide a helpful reference for Generation’s future asset portfolio.

Literature Review

Generation Z

Generation Z, or the generation of Post-Millennial, was born between 1995 and 2010, after Generation Y or Millennial (Oblinger & Oblinger, 2005). Those kids who growing up in a digital environment, is heavily reliant on the advancement of technology, which influences how they interact, play, and study. (Grail, 2011). Globalization, outsourcing, foreign investment, and the expansion of digital technology are all key external elements that this generation is exposed to. Globalization has had a tremendous impact on Generation Z's personalities, behaviors, and characteristics (Luntungan et al., 2014). According to Grail's research, Generation Z expects to be constantly connected to the world via the internet, which also impact their decisions and expose them to a wider range of information and ideas. In other words, Generation Z was born into a world where financial institutions were easily accessible since digitalization has had a huge impact on a variety of businesses, including the financial sector. In the financial field today, numerous investing innovations have been introduced, and financial information is now widely available, increasing the opportunity for Generation Z to invest. Meanwhile, this generation are not enslaved by technology, meaning they will face not only increasing financial product, service, and market complexity, but also higher financial risks in the future. (Utami & Sitanggang, 2021). Thus, it's necessary to find out what factors are influencing the investing decisions made by the Generation Z.

Media Exposure

Media exposure is defined as “the extent to which audience members have encountered specific messages or classes of messages/media content” (Slater, 2004, p. 168). Today's advancing technology has completely altered the nature of media. Traditional media are no longer as powerful as they once were, but new media (such as online games, short films, and social media) have had a significant influence on Generation Z's lives. Despite this, there is no agreement on the optimal method for reliably quantifying media exposure, particularly among teens. Jordan et al., (2007) define media exposure as the frequency and content bias of media consumption in the growing era of social media. Years later, Hamer et al. (2017) expand on the notion for teenagers by referring to content-based media exposure (C-ME), which is determined by the amount of antisocial and risk behavior material that an individual is exposed to. They found that high levels of social media material exposure are associated to behaviors like wanting personal well-being and sensation, and that guys are more likely than girls to build a distinct uniqueness. Investors are affected by media exposure in a variety of ways, one of which is financial literacy.

Here, though the C-ME has a limitation of measuring Generation Z using corresponding media exposure features only and the concept of financial literacy may be influenced by many other factors (e.g., political environment, economic development etc.), the financial literacy among Generation Z are indeed undergoing a revolution.

Financial Literacy and Portfolio Optimization.

Utami and Sitanggang (2021) has proved young people who exhibit financial literacy will most likely acquire the correct, accurate, effective, and efficient techniques for making investment decisions. Financial literacy refers to an individual's capacity to comprehend how money works in today's world, or how they manage and invest their money. (Abdeldayem, 2016). As defined by the Organization for Economic Co-operation and Development, financial literacy includes not only knowledge and understanding of financial concepts and risks, but also the skills, motivation, and confidence to apply that knowledge and understanding to make effective decisions.

Lusardi (2019) mentioned that there are three mean concepts inside financial literacy: *"(1) numeracy as it relates to the capacity to do interest rate calculations and understand interest compounding; (2) understanding of inflation; and (3) understanding of risk diversification*". Although it is difficult to translate these three concepts into measurable variables, a standard set of questions based on these concepts has been developed by Lusardi and Mitchell (2011).

In a research done among Greek Students, researchers find that Male students, students who keep spending records and students whose father is well educated are all shown to be more financially savvy. The research also suggest that financially educated students are better prepared to deal with a financial shock (Philippas & Christos Avdoulas, 2020). Though some other research finds no support for the expected positive link between financial literacy and stock market participation (Grohman, 2018). Financial literacy and investment experience were still found favorably related with cryptocurrency investment. (Zhao & Zhang, 2021). The better the household's financial literacy, the higher the household's asset allocation evaluation score.

Because families with better financial literacy pay more attention to economic and financial news and are more likely to seek investing advice from professionals (Lu et al., 2021). It is worth noting that although the discussion on financial literacy covers many dimensions, there is limited literature arguing whether financial literacy is positively related to the ability of portfolio allocation.

Based on what's mentioned above, this paper hypothesis the following:

H1: The media exposure is positively related to the level of financial literacy

H2: The level of financial literacy is positively related to the ability of portfolio allocation

The application of Monte Carlo in portfolio optimization

Portfolio allocation is one of the most sensational problems in the modern market. To reach an ideal portfolio allocation solution, a trader must be able to regularly diversify and reallocate funds among the securities in their portfolio to maximize profit while minimizing risk (Charemza & Majerowska, 2000).

Hence, people started to find some solution to this problem though multiple angles. In the past, several works have been introduced, such as programming, numerical analysis, etc. For instance, a model comparable to the capital asset pricing model (CAPM) was produced, which was based on the maximization of traders' utility functions subject to expected price restrictions, where the observed returns are compensated for the emergence of constraints (Markowitz, 2012). However, due to scientific and technological issues at the time, the model's inventor indicated that the model's detection was limited, and the data available throughout the model construction process was insufficient.

When it comes to the 2000s, the birth of neural network has made supervised machine learning popular on the stock market (Abe, 2018). The forecasting function of the supervised machine learning helps the investors to develop a predictive model by using existing historical data, which is very beneficial and convenient for further decision making. In the academic field today, there are lots of research in the application of neural network in the financial range. In 2021, to tackle portfolio allocation, researchers even presented an adaptive, sentiment-aware deep deterministic policy gradients technique that learns not just from past stock price patterns, but also from market sentiment (Koratamaddi et al., 2021).

Many academics utilize Monte Carlo models to simulate and forecast different asset portfolios while employing neural networks to explore portfolio allocation solutions. For example, Cesari and Cremonini (2002) employ Monte Carlo model to show that no investment strategy is dominant in all market situations. Chen, et, al. (2021) develops a hybrid model named IFAXGBoost for stock price prediction, which is incorporated into the mean-variance model with the assistance of Monte Carlo model to generate an optimal portfolio.

This research will compare the stimulation result on portfolio return of several combination to conclude a more efficient why for Generation Z to form their portfolio. Monte Carlo Model programmed in python will be applied to the testing result and form a benchmark bundle that could be used for evaluating Generation Z's bundle return.

This subobjective will analyze how the difference between the portfolio returns, making comparison and conclude an effective portfolio in the selected stock market. Because of the limitation of research time, this study mainly considers a strategy that most young people will adopt in the investment process, that is, all the stocks are equally distributed in a portfolio. Despite the fact that investor behavior varies in real life, this study aims to undertake a difference analysis of the return rate using Monte Carlo simulation analysis and the stock data used in the experiment. The Monte Carlo model will select the combination with the highest return （greatest Sharpe ratio）and lowest volatility, compare the return to other hypothetical combinations. It will reveal the differences in portfolio returns caused by different stock weights in the portfolio, as well as discuss some coexisting considerations. For the experiment outcome, this study hypothesis the following:

H3: Equally weighted portfolio performs better than the portfolio base on market share.

Methodology

Research Design

Generally, this explanatory research will employ SPSS statistic and python 3 modeling to analyze the data gathered through questionaries. The questionaries would include questions testing the conceptualized factors on internet media exposure, financial literacy, and investment decision.

In detail, the method used in this paper mainly consists of the generation of factors on main variables through questionaries, linear regression model, Monte Carlo model, and the calculation of the Sharpe ratio. The generation of factors on main variables refers to create meters that can represent the independent variable and moderator variable, that is, Generation Z's media exposure and financial literacy. The meters would transfer those qualitative variables into numbers so that their connection could be measured quantitively. The Monte Carlo model is combined with the calculation of Sharpe ratio to conceptualize the Generation Z's investing return. Like the method of exhaustion, Monte Carlo simulation will assign different weights to each asset and derive as many conditions as possible. In the range of Chinese stocks that is listed in the US stock market, 5 – 10 stocks will be randomly selected, then from a utilized efficient frontier with a 100,000-time stimulation to acquire multiple combinations of weights with the variety of returns and risks for a particular portfolio. The efficient frontier would show the combination that acquires minimum volatility, which is benchmark one. And the Sharpe ratio of each combination would be calculated to find the benchmark two with highest Sharpe

ratio. The benchmarks formed is used to compare with the equally weighted group to find its position among the different returns.

The linear regression model is used to further analyze the meters collected from questionnaires which would fully present the participants' sample characteristics and the result from the model would show the impact of media exposure (independent variable) on financial literacy (moderator variable) and the impact of financial literacy on Generation Z's investment return (dependent variable).

Data Collection

For the benchmark used to conceptualize the dependent variable, the primary data gathered from the questionnaire and Yahoo Finance will be analyzed. The data used for benchmark calculation come from the Yahoo, which is consists of historical data from 5 - 10 Chinese stocks listed in the US market. Ideally it will contain the historical information from the past 5 years. The raw data contains six variables: open price, high point, low point, close price, adjusted close price and volume. The following table shows an example of one record of the dataset.

Table 1

Date	Open	High	Low	Close	Adj Close	Volume
2016-07-14	44.624001	44.987999	44.209999	44.306000	44.306000	13379000
2016-07-15	44.504002	44.549999	43.928001	44.080002	44.080002	11171000
2016-07-18	43.928001	45.417999	43.660000	45.250000	45.250000	17060500
2016-07-19	45.000000	45.820000	44.950001	45.051998	45.051998	15575500

2016-07-20	45.293999	45.959999	45.000000	45.672001	45.672001	12842500

All the raw data in this section will be recalculated into compounded daily return using python 3 before it was injected into the Monte Carlo model. The compound return is defined as:

$$CompoundReturn = ln\left(\frac{V_{t+1}}{Vt}\right) \tag{1}$$

The result would consist only the daily compounded returns, differentiating the timeline and company (Figure 1).

Figure 1

```
In [196]: StockReturns = AC_228_df.pct_change().apply(lambda x: np.log(1+x)).dropna()
          stock_return = StockReturns.copy()
          # print the first 5 lines of stock returns
          print(StockReturns.head())

                   BLDP      BLNK      HYLN      LAZR       NIO      NKLA  \
Date
2020-08-18  0.022902 -0.031749 -0.031091 -0.015297  0.017637 -0.042430
2020-08-19  0.003766 -0.079310 -0.005655 -0.002894 -0.016926  0.018271
2020-08-20 -0.058043 -0.174101  0.014637  0.019139 -0.020116 -0.038102
2020-08-21  0.074203 -0.154991  0.108300 -0.003799  0.024374 -0.039103
2020-08-24  0.016509  0.171231  0.290687  0.081286  0.058456 -0.017423

                  PLUG        QS      TSLA      VLDR
Date
2020-08-18  0.045663 -0.004049  0.027643  0.003849
2020-08-19  0.066641 -0.004065 -0.004546 -0.002748
2020-08-20  0.001464  0.006091  0.063572 -0.023386
2020-08-21 -0.055653 -0.008845  0.023768 -0.011901
2020-08-24 -0.046704  0.000715 -0.017608  0.091988
```

Then this outcome would be injected into Monte Carlo model to run a 100,000-time stimulation, and show the efficient frontier, finding the portfolio combination with highest Sharpe ratio or lowest volatility. The annual sharp ratio is defined as:

$$SharpeRatio = \frac{E(R_a) - R_f}{\sqrt{Var(R_a)}} \tag{2}$$

where R_a is the annualized asset return, R_f is the risk-free return which will be assumed as constant.

For the questionnaire data, all of them will be collected through the convenience sample survey strategy. The reason for taking this method is because researcher's time is restricted, and his personal network capital is frequently constrained by space. More accurate sampling methods cannot be utilized by researchers in specific circumstances. However, given the necessity for sample size, the simplicity of screening surveys combined with the snowball effect would bring significant positive quantitative improvements to the test samples. According to the official statistical data from the government of Zhejiang province, the number of people who aged 14 – 24 claims to be 1,420,385. Thus, this range will be the overall population targeting at Generation Z in Zhejiang Province, and the estimated sample size should reach 400 response, with 95% confidence.

Research Structure

The structure of the data here may limit strategy selection because the independent variable is media exposure rate, which cannot be changed by the researchers, implying that an experimental approach will not work well. In other words, the researchers' involvement is reduced in this case. As a result of the nature of the data, the survey approach makes the data more likely to be collected and appreciated for this research. The cross-sectional design will be used since all variables will be affected by time and all data should be collected at a single point in time to keep the study on track.

Analysis and Findings

Sample Characteristics

As shown in table, the distribution of the collected sample data is relatively even. All data are valid. The ratio of men to women in the questionnaire is approximately 1:1. This is a good performance, indicating that the questionnaire data collected by the researchers is sufficient to support the differences between genders.

Statistics

		Gender	Age	Consumption Level	FundSource
N	Valid	259	259	259	259
	Missing	0	0	0	0

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	120	46.3	46.3	46.3
	Female	139	53.7	53.7	100.0
	Total	259	100.0	100.0	

However, in the basic information statistics, in terms of income sources, 75.3% of people rely on their families for their income sources, which may bring bias to the research hypothesis verification.

FundSource

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All from Family	195	75.3	75.3	75.3
	Part-Part	38	14.7	14.7	90.0
	All by myself	26	10.0	10.0	100.0
	Total	259	100.0	100.0	

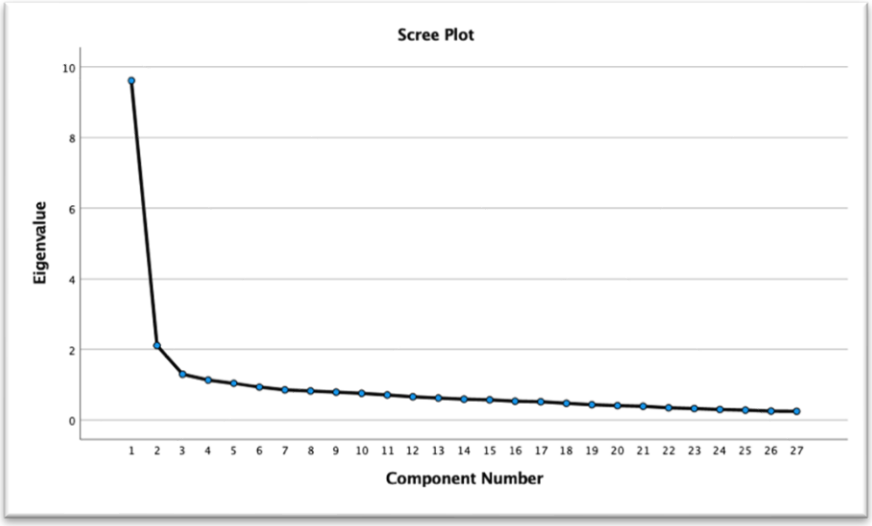
Checking for Validity and Reliability

The KMO value is.989, as indicated in the table, indicating that the data is sufficient for this type of study. The sample size is sufficient. In addition, the Bartlett's test reveals that the variables have a connection. The data is ready to be evaluated since the significant value is less than.05.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.989
Bartlett's Test of Sphericity	Approx. Chi-Square	10395.255
	df	666
	Sig.	.000

According to the original theoretical framework, this research needs 3 factors. When using the screen plot method, the line become flat when it comes to point 3, indicating that there are 3 factors in the research.



After running a rotated components matrix, 19 questions are removed from the list (i.e., MediaExp10, MediaExp6, MediaExp8, MediaExp12, Mediaexp13, MediaExp11, MediaExp7, PortfolioAllo2， etc.). After the removal, the table shows a clean matrix format. And the variance will be examined separately in the following paragraphs.

All questions measuring media exposure factor loaded separately. Seven questions are removed from the list due to the validity problem (i.e., How often do you watch shows about nature or animals and How often do you watch people who help someone). The total variance explained by this variable is 25.33% and the reliability of this factor is found to be efficient with a reliability co-efficient of 0.923.

All questions measuring financial literacy factor loaded separately. Five questions are removed from the list since they might have confused the respondents by showing up in another group in the rotated components matrix. The total variance explained by this variable is 15.86% and the reliability of this factor is found to be efficient with a reliability co-efficient of 0.95.

All questions measuring portfolio allocation factor loaded separately. Seven questions were removed from the list since the voidability issue raised. Four of them are ranged in another group showing a misleading to the respondents and three of them shows a difference of less than 0.2 in two different components. The total variance explained by this variable is 13.74% and the reliability of this factor is found to be efficient with a reliability co-efficient of 0.926.

As shown in the table, the overall reliability of data is adequate at 0.933 and total variance explained by the three-factor solution is 54.93%, meaning the data selected is valid and reliable.

Table.2 Summary of Data Validity and Reliability

Table.1 Data Validity and Realibility				
Factor	Statement	Factor	Realibility	Variance explained
Media Exposure			0.923	25.33%
MediaExp5	How often do you watch people who shoot at another person?	0.852		
MediaExp1	How often do you watch people who fight?	0.824		
MediaExp3	How often do you watch people who use drugs?	0.82		
MediaExp4	How often do you watch people who destroy someone else's belongings?	0.842		
MediaExp2	How often do you watch people who openly talk about sex?	0.829		
MediaExp9	How often do you watch people who help someone?	0.836		
Financial Literacy			0.95	15.86%
FinLiteracy1	Suppose you had ¥100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	0.841		
FinLiteracy2	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?	0.866		
FinLiteracy3	Please tell me whether this statement is true or false. "A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest over the life of the loan will be less".	0.827		
FinLiteracy4	If interest rates rise, what typically happens to bond prices?	0.853		
FinLiteracy5	Y ou have recently become a parent. Y ou would like to find a solution that would allow your family to have more economic peace of mind in case something happens to you; what do you do?	0.855		
FinLiteracy8	Before buying something, I ask myself if I have paid my necessary expenses.	0.811		
FinLiteracy10	Before signing a financial contract, I carefully read its contents.	0.849		
FinLiteracy13	I am careful to distinguish between necessary and unnecessary expenses.	0.835		
Portfolio Allocation			0.926	13.74%
PortAllo1	How long have you been hodling stock portfolios?	0.863		
PortAllo3	How do you prefer your trading strategy?	0.828		
PortAllo6	You would always investing using a stock portfolio rather than a single stock.	0.867		
PortAllo8	You would invest the stocks you are actually not familiar with.	0.835		
PortAllo10	You are inclined to one section when oprating stock portfolio.	0.84		

Checking for normality.

According to Hair et al (2010) and Byrne (2010), if the Skewness is between -2 to 2 and Kurtosis is between -7 to 7, the data is normal. Thus, the data used in the research is normal.

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PortfolioAllocation1	259	3.90	1.254	-1.082	.151	.102	.302
PortfolioAllocation3	259	3.89	1.204	-1.020	.151	.097	.302
PortfolioAllocation6	259	3.85	1.246	-.943	.151	-.156	.302
PortfolioAllocation8	259	3.83	1.225	-1.054	.151	.206	.302
PortfolioAllocation10	259	3.84	1.250	-1.009	.151	.036	.302
MediaExposure1	259	3.86	1.217	-1.064	.151	.188	.302
MediaExposure2	259	3.85	1.209	-.968	.151	.010	.302
MediaExposure3	259	3.79	1.222	-.922	.151	-.093	.302
MediaExposure4	259	3.86	1.240	-.998	.151	.022	.302
MediaExposure5	259	3.85	1.196	-.980	.151	.093	.302
MediaExposure9	259	3.83	1.220	-.970	.151	.026	.302
FinancialLiteracy1	259	3.87	1.173	-.985	.151	.105	.302
FinancialLiteracy2	259	3.89	1.196	-1.010	.151	.035	.302
FinancialLiteracy3	259	3.90	1.204	-1.059	.151	.199	.302
FinancialLiteracy4	259	3.81	1.273	-1.017	.151	-.044	.302
FinancialLiteracy5	259	3.84	1.180	-.909	.151	-.110	.302
FinancialLiteracy8	259	3.84	1.230	-.941	.151	-.136	.302
FinancialLiteracy10	259	3.81	1.227	-.908	.151	-.109	.302
FinancialLiteracy13	259	3.86	1.231	-1.001	.151	.034	.302
Valid N (listwise)	259						

Hypothesis Testing

H1: The media exposure is *positively* related to the level of financial literacy

This hypothesis is accepted. The p value is less than 0.05 when doing a regression analysis based on the results of factor analysis, as shown in table 3. The R square value of 0.864 in the model summary table (table 4) suggests that media exposure accounts for 86.4 percent of the variation in financial literacy. The standard coefficient beta value is 0.93, indicating that a one-unit increase in media exposure leads to a 0.93-unit rise in financial literacy. This demonstrates a strong and unambiguous positive association.

Table. 3

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.136	.610		3.502	<.001
	MEDIAEXPOSURE	1.486	.037	.930	40.464	<.001

a. Dependent Variable: FINANCIALITERACY

Table. 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.930[a]	.864	.864	2.58501

a. Predictors: (Constant), MEDIAEXPOSURE

However, the meaning given by the numbers should be omitted by its abnormal value. Though this is a very good result that shows a significant relation between these two variables, the value of 0.864 is obviously too high that rings a bell that there will be something misleading in the model. Since the model is analyzing the relationship between media exposure and financial literacy, which are both subjective feelings based on the participants, an abnormal high value would indicate there is other variables that are not taken into consideration. Thus, this hypothesis is only partly accepted. It's not correct to state the value presented by the linear regression is precise enough, there will be certain bias that is affecting this result.

H2: The level of financial literacy is positively related to the ability of portfolio allocation

The hypothesis is accepted. By applying a regression analysis, the p value is lesser than 0.05 as shown in table 5. The model summary table (table 6) shows that R square value is 0.871 which indicates that 87.1% in portfolio allocation ability variation is explained by level of financial literacy. The standard coefficient beta value is 0.933 which shows that an increase in one unit of financial literacy level will lead to an increase in 0.933 unit of ability of portfolio allocation. This shows a positive relationship. Thus, the financial literacy factor has a significant strong positive relationship with the ability to exercise portfolio allocation.

Table. 5

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.525	.391		1.345	.180
	FINANCIALITERACY	.606	.015	.933	41.687	<.001

a. Dependent Variable: PORTFOLIOALLOCATION

Table. 6

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.933[a]	.871	.871	1.63573

a. Predictors: (Constant), FINANCIALITERACY

Again, limitations are clear in this result, different from H1, the high relevancy here should be accepted since the questions used in the questionnaire are set only to test how often respondents use portfolio allocation in their daily investments, while the linear regression model shows that a respondent with higher financial literacy level would use such a strategy more frequently in their daily investments.

H3: Equally weighted portfolio performs better than the portfolio base on market share.

- **Raw Data**

This hypothesis testing will be based on the data gathered from Yahoo finance, 10 stocks are randomly selected in the market and 5 of them will finally be chosen to form a portfolio which is used to test difference among the portfolio returns. The ten randomly selected stocks are: TSLA, KO, WMT, AAPL, NKE, AMZN, NATR, GOOGL, JPM, GE. As shown in the methodology part, the raw data contains six variables: open price, high point, low point, close price, adjusted close price and volume. Based on the close price, the return for each trading day will be calculated first, and then transform into compounded return.

The raw data has following limitations that might bring certain bias to the outcome.

1. To avoid the impact of Covid-19 and match the data in the timeline, time range for the data collected is limited to 24 months (2016 - 04 to 2018 - 04). Though it makes the data more comparable, the reduction in length might be insufficient to draw a conclusive statement. Thus, this study used daily historical data to test the hypothesis.
2. Since the ten companies are randomly selected, the company specific risk is not taken into consideration. And it's inevitable during the analyzing process.

- **Processing Raw Data – Step 1 Calculates the correlation matrix for these 10 stocks**

Although the individual risks of the firm cannot be avoided as these 10 stocks were chosen at random using Python's random selection program, it is still necessary to lessen the bias between them using correlation selection. As a result, the first stage in processing the data collected from Yahoo Finance will be to create a heat map of the stock price correlation of these ten stocks and then pick the five most irrelevant stocks out of the ten. Here, the correlation

coefficient is calculated among each pair of variables and shows as a summary in the heat map. The equation of correlation coefficient shows as follows, where ρ stands for the correlation coefficient, $COV\ (X,Y)$ stands for the correlation between two variables, σ stands for the standard deviation for each variable.

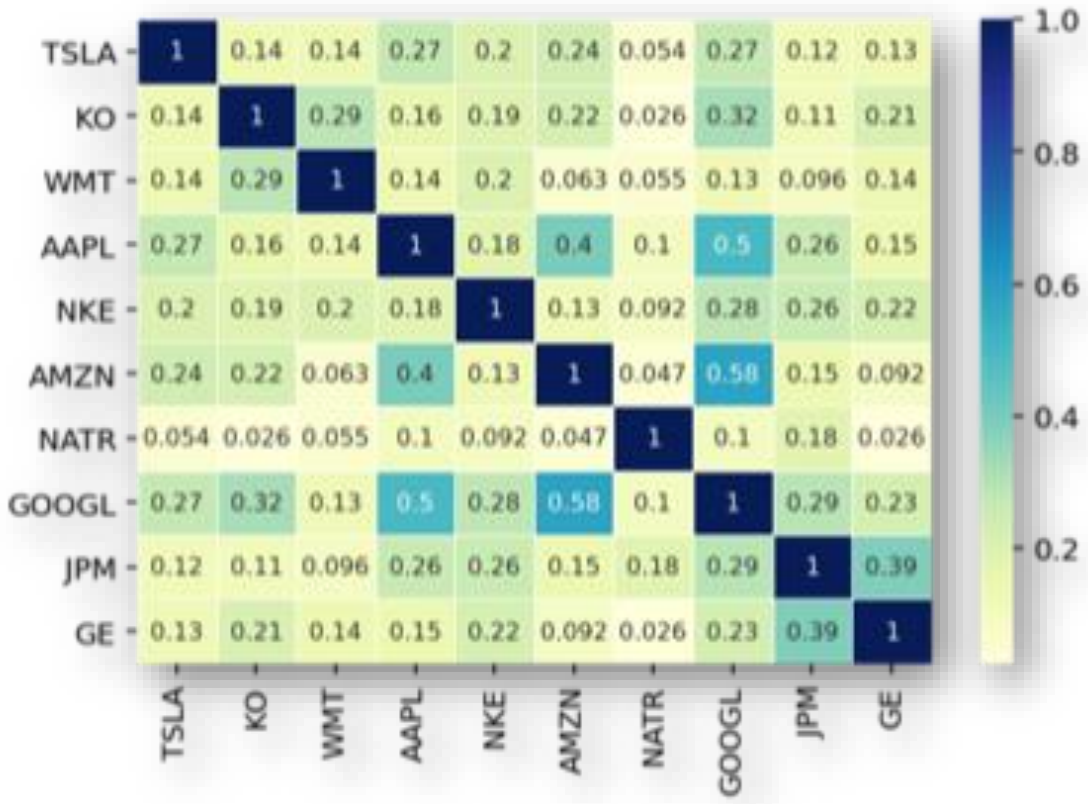
$$\rho(X,Y) = \frac{COV\ (X,Y)}{\sigma_X \sigma_Y} \tag{2}$$

As the correlation between two variables is defined as the 'expected value of the product of the deviations of X and Y from their respective means, that is:

$$COV\ (X,Y) = E[(X-\mu_X)(Y-\mu_Y)]$$

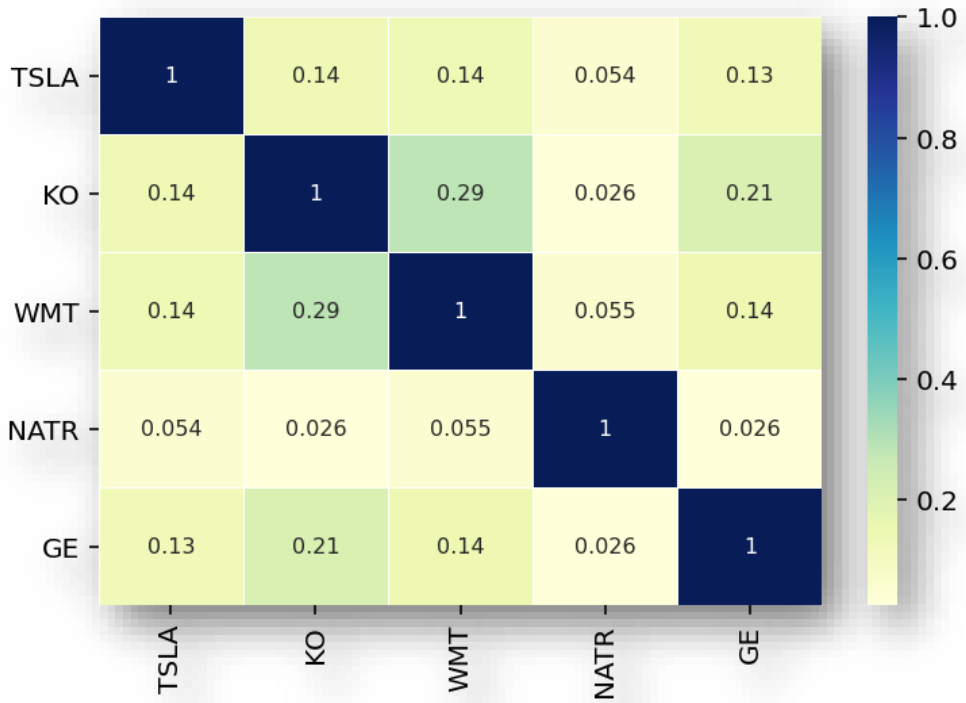
The correlation coefficient between each stock shows as follows:

Table. 7



By calculating the sum of correlation coefficient and find the number with five least combinations, the results show (2.558297, 2.669991, 2.242657, 1.680481, 2.589233), which stands for TSLA, KO, WMT, NATR, GE.

Table. 8



- **Processing Raw Data – Step 2 Generating portfolio.**

Regarding the sequence of the five stocks with the lowest correlation, five different weights will be applied to the historical data of these five stocks to create five experimental portfolio weights. The cumulative portfolio returns will be used to judge the validity of the study's hypothesis. The five portfolios are: 1) given weight, 2) average weight, 3) market share base weight, 4) weight that can reach minimal risk, 5 different portfolios

The first three portfolio will be generated using arrangement function in python 3. For the given weight group, the weight is set to be [0.32, 0.15, 0.10, 0.18, 0.25]. For the equally

weighted group, each stock would take 0.2 weight in value. And for the market share base weight portfolio, the weight will be determined by the following equation:

$$\text{Stock weight in portfolio} = \frac{\text{Stock Market Value}}{\sum Stock\ Market\ Value}$$

Portfolio 4 and 5 will be created using efficient frontier generated by the Monte Carlo stimulation. Monte Carlo simulation is a statistical method used to simulate large amounts of variation combinations. This method simulates the proportion of each stock in the portfolio and will choose the value for each input at random, finally display the efficiency frontier of all combinations by setting the number of simulations to 100,000 and output the return. The result directly shows the point with minimum risk, with is the point shows at the most left in the efficient frontier, as shown in table 9. And the corresponding weight is: [0.06989534 0.58887484 0.15285539 0.00995645 0.17841799]. After calculating the Sharpe ratio for each combination from the stimulation, the portfolio with the highest Sharpe ratio will also be given in the efficient frontier, as shown in table 10. The corresponding weight is: [0.27513496 0.03444978 0.57809091 0.10520214 0.00712222].

Table. 9

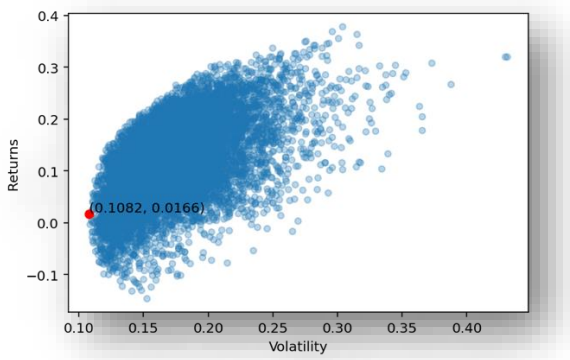
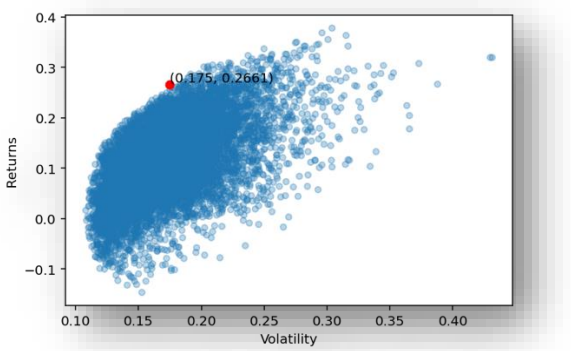
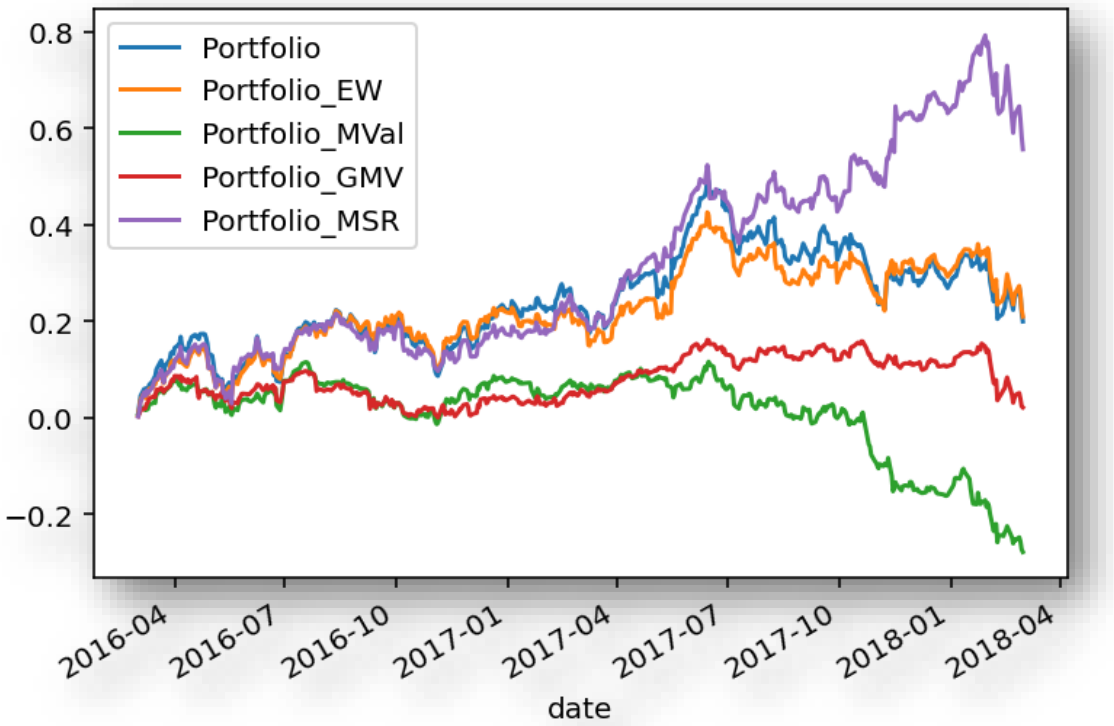


Table. 10



After getting the five weights, the cumulative portfolio returns are calculated for each group and summarized as follows:

Table. 11



The result gives a lot of information worth thinking about.

It's surprising that the portfolio with the highest Sharpe ratio (Portfolio_MSR) is matching the trend of portfolio with equally weighted. And the difference only becomes obvious after one year of holding. The core idea of the Sharpe ratio is the ratio of return to risk, that is, the relationship between the return of a specified sample and the risk it takes over a period. In the output, the performance of the return from the equal weighted group is matching that of the high Sharpe ratio group in the previous stage, which indicates that the risk is similar between the two groups in the selected samples. Such a result might also be influence by the sample itself, look at the weight in the Portfolio_MSR, the setting is [0.27513496 0.03444978

0.57809091 0.10520214 0.00712222], where TSLA and WMT takes more than 85% in the total value of the portfolio, in other words, these two companies with outstanding performance might have taken over the performance of the portfolio. Also, the hypothesis is obviously accepted as the performance of portfolio weighted based on market value (Portfolio_MVal) is much worse than the portfolio equally weighted (Portfolio_EW). However, the result also shows that the portfolio which gives the lowest volatility performs better than the market value group, this is certainly showing the effect of company specific risk inside the portfolio. In the regular situation, the portfolio with minimal volatility (Portfolio) should show a lowest return performance.

Conclusion

Through a questionnaire survey, this article found that there is an obvious positive correlation between media usage and financial literacy. The level of financial literacy also represents the level of ability to allocate assets in the process of reinvestment. Combining the quantitative results of the five stocks selected in the previous section within 24 months, this study makes the following recommendations based on the findings of this experimental sample and Generation Z's investing performance： 1) For persons who consume more media daily and have a larger risk tolerance, the approaches described in this article can be utilized to try to simulate the best Sharpe ratio combination for investing. 2) For persons who have a difficult time managing risks, evenly spreading the value of their portfolio's stocks does not imply equally sharing risk, thus careful consideration is required before evenly allocating their investment. 3) In the investment ratio of a portfolio, market share cannot clearly serve as an indicator of return. As a result, market share should be discounted to some extent while constructing a portfolio.

Limitations and Contributions

- **Limitation**

There are some possible limitations in this study which must be mentioned.

First, the result is possibly influenced by other variables independently. For instance, the income level and personalities of participants, the bias generated by Monte Carlo modeling inherited from supervised learning features. Those are some variables out of the consideration. Second, the data collection process would bring certain bias to the research outcome since the community under tested is limited to the Zhejiang Province, and the result applies not to other

provinces in China. Third, convenience sampling itself would bring some bias to the raw data, the sampling size should reach 400, while in the actual situation it only reaches 259. Insufficient sample size will bring obvious deviations to the experimental results. The most obvious is that in the H1 test process, there is an abnormally high correlation between the two variables.

For the stimulation testing being considered, there will be some industrial variable influencing the outcome since the number being tested is limited strictly to 5 companies, the huge difference and correlation within the industries might predetermine the outcome of the returns。

- **Contribution**

With Generation Z steadily becoming the major player in the investment industry, this article examines one of Generation Z's most prominent characteristics: the impact of media exposure, portfolio allocation ability, and financial literacy. It also shows the readers a strategy when forming asset portfolio by using accessible historical data. At the same time, unlike sophisticated trading prediction, this article's simulation technique is based on historical Yahoo Finance data to create several asset allocation portfolios for reference, which is more friendly to for readers with basic programming and financial knowledge.

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