

Investment Potential Analysis on Chinese Stock Market in Metaverse- Take VR Industry as a Sample

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ABSTRACT

In March 2021, the success of Roblox listed on the New York Stock Exchange brought Metaverse into public view and set off a wave in the stock market. Benefitting from this, the VR industry as the pioneer industry of Metaverse meets the development chance again. However, it is unclear whether the new concept and VR industry are worth investing in for the investors chasing hot points. This research paid more attention to the Chinese stock market and so this paper applied PEST in an investment environment assessment and selected two companies as samples and analyzed their performance in the past nine months with CAPM. Concluding from the analysis, the investment environment was positive and there were investment opportunities. Besides VR industry can be trusted to some degree.

Keywords: Metaverse, VR industry, investment analysis, Chinese stock market

1. INTRODUCTION

1.1. Background

On March 10th Roblox listed New York Stock Exchange, and its price increased by 54 percent this day. It brought the concept 'Metaverse', which was created by Neal Stephenson in his science fiction Snow Crash, into public view. Soon a wave of Metaverse was set off in the stock market. Among the stocks, Facebook, which was already renamed as Meta in October, was the most popular one and created a new record of the market value of nearly ten thousand dollars. In the meantime, Chinese leading companies, such as Baidu, started to expand business on Metaverse as well. This series of events and the appearance of the wave seem familiar just like VR a few years ago. What is deserved to be mentioned is that Metaverse is a superior concept and the VR industry is included in Metaverse's industry chain. In more detail, VR technology is the bridge linking the real world and the virtual. Therefore, VR is regarded as the gate and the pioneer industry of the Metaverse.

1.2. Related Research

Lee and his colleagues introduce the development process of a new multi-technological social form, Metaverse, from five perspectives including network infrastructure, management technology, basic common

technology, virtual reality object connection, and virtual reality convergence, and more detailed concepts like blockchain and virtual economy were introduced as. More importantly, the research agenda and challenges of Metaverse were discussed at the end as well [1]. This research had a review on the business model and the ecosystem of the metaverse especially paid attention to the service concerning Metaverse. In this research, supporting software and hardware, AI cloud service, and platform were thought to be the important field in Metaverse. Through this, the research revealed how Metaverse produces profit and leads the market. In other words, this research also showed the development and investing direction of Metaverse [2]. MAM Abdelmaged explored how virtual reality was applied to various fields such as healthcare, entertainment, tourism, education, and retail industries and introduced different application occasions by samples. In this way that VR technology has significant potential in a variety of businesses and so VR has a positive future with developing technologies and more situations where need VR to help prove services [3].

Sun and his colleagues assessed the impact of COVID-19 on the Chinese stock market and investigated whether individual investors' sentiment influences return. It is shown that the pandemic had an overall negative effect on the Chinese stock market and there was a stronger positive correlation between individual investor sentiment and stock returns than usual. However,

industries related to pharmacy, digitalization, and agriculture are boosted under adverse circumstances [4]. Researchers were inspired by the media coverage premium in the U.S. market and discovered that this anomaly also exists in the Chinese market. Furthermore, companies without news, nor positive ones nor bad ones, have significant positive expected returns. And the conclusion is that news sentiment anomalies are not caused by the short-term momentum effect and are robust in the Chinese stock market [5]. This research investigates the risk and performance characteristics of NFT-based startups listed on the cryptocurrency exchange. It started by proposing a new clarification of existing NFT ranging from NFT blockchains through NFT metaverse to NFT DeFi. Next, it established four significant factors and also indicated that the NFT segment of the cryptocurrency market led the market recovery following the mid-2021 crash [6]. This study quantitatively measures the Chinese stock market's reaction-Chinese stock market returns and turnover rates were positively predicted by sentiments with both platforms, to sentiments regarding the Novel Coronavirus 2019. This research developed two sentiment indices which were real-time and forward-looking from over 6 million data. And the study discovered that both the pandemic and peoples' sentiment have influenced the Chinese stock market [7]. This research tried to conduct a study of CAPM in Chinese stock market and its main goal was to the practicability of CAPM in Chinese stock market. And the conclusion was that CAPM model can be applied in empirical analysis and theoretical study, which provides an effective analysis method to this paper[8].

1.3. Problems and Solutions

As this article mentioned above, the VR industry is the pioneer industry and it meets the chance again in the current wave. Today VR technology has been applied in various situations like education and medical situations. The prices of the stocks associated with Metaverse are on the increase, but specific performances remain studied especially VR companies. It is still unknown whether VR companies also perform well as the whole market or VR industry is worth investing in as one of the hot points because Metaverse as a new concept in the stock market just appeared for a short time. This research paid more attention to the Chinese stock market so this study selected two leading companies in the VR industry in China and figure out their price changes and use PEST and Capital Asset Pricing Model to analyze them to answer the questions mentioned above. In this way, this article can also provide some advice on whether Metaverse or more specifically, the VR industry is worth investing in and how to find the right stock in this new round of investment heat to investors.

2. ANALYSIS METHODS

2.1. PEST

PEST analysis means macro environment analysis, consisting of Political factors, Economic factors, Social factors, and Technological factors, which analyze the four major external environmental factors to evaluate the present and future situation of a firm or a company.

Political factors mainly include policies, the attitude of the government, and local laws. Political factors are the basics of the market and the competition so they can have a great influence on the firm's performance.

Economic factors mainly include Gross Domestic Product (GDP), interest rate, inflation, employment rate, per capita disposable income, and market demand. Economic factors affect the firms' present and future as well as the size of the future market.

Two of the most influential Social factors are population environment and cultural background.

Technological factors mainly include new technology, patent protection, the speed of technological transformation.

With PEST analysis, an overview of the environment of the Chinese stock market and the current situation. And development prospect of VR industry and specific firms can be get which may help explain the change of stock prices.

2.2. Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) was developed based on Modern Portfolio Theory by William Sharpe, John Lintner, Jack Traynor, and Jan Mossin in 1964. The CAPM described the expected return of an asset and a measure of the risk (β) with a linear relationship. As a single index model, CAPM simplified the calculation of portfolio selection and is more suitable for theoretical research and practice.

Because the CAPM was a development on the Markowitz Model (MM), CAPM has the same assumptions with MM and another six: (1) no taxes nor transaction cost; (2) no inflation nor change of discount rate; (3) all investors have the same and the only holding period; (4) all investors can borrow or lend unlimited money at risk-free rate; (5) all investors can get enough market information timely for free; (6) all investors have the same probability distribution of asset return; (7) large number of investors, each with individual wealth smaller than their total wealth and their trading has no influence on the asset prices.

The above assumptions indicated that all investors are rational and the capital market is the perfect market.

In one-factor CAPM, the expected return of an asset can be estimated as:

$$E(r) = r_f + \beta \cdot (r_m + r_f) \tag{1}$$

where $E(r)$ is the expected return on asset, r_f is the risk-free rate, r_m is the expected return of the market, and β is the Beta Coefficient, reflecting the systematic risk of an asset and measuring the sensitivity of an asset or a portfolio to the volatility of the whole market.

β can be calculated by the following formula:

$$\beta = \frac{\text{Cov}(r_a, r_m)}{\sigma_m^2} \tag{2}$$

where $\text{Cov}(r_a, r_m)$ is the coefficient of asset return and market return, and σ_m^2 is the deviation of the market return.

If β is on a high level, investors will require a higher expected return for higher risk.

The CAPM is widely used in asset pricing. The risk premium can be calculated through CAPM, in another word, through CAPM investors can evaluate whether the price matches the risk of the asset. If investors hold a positive attitude to the futures market, a higher Beta coefficient asset or portfolio should be chosen for the higher beta can bring a higher return.

2.3. Data Preparing

The steps of data preparing are followings: (1) Searched for the latest list of top firms in the VR industry (2021 China VR Top 50 Enterprises List) and selected the ones on the Chinese stock market, at last, 2 firms were picked; (2) For the stocks search for each index change. And for the stocks that may be on the different stock markets, each of the stock market indexes is also needed; (3) Chose the weekly data and calculated the monthly increase, expected return, the market return, the deviation of the market return, and the coefficient of asset return and market return for each stock, and expected return of the single stock is calculated; (4) The risk level of each stock can be shown by comparing each beta coefficient with 1.0; (5) Searched for the 5 firms' profit in the past four quarters, and forecast on their future tendency of the next period can be done with the calculated monthly increase; (6) With all the data, research conclude whether one stock or more worth investing and the same as the whole industry.

3. RESULTS

3.1. PEST Analysis

3.1.1. Political Factors

So far this year (2021), China has reformed various industries with great determination, especially the real estate industry. In the past decade, the real estate industry absorbed a great amount of capital just like a reservoir because of its positive expectation in the future. However, in 2021, the Government restricted the unbridled expansion of the Real Estate Industry by rolling out a series of policies to ensure livelihood housing. This initiative dealt a heavy blow to the real estate industry and was regarded as the signal of industrial transformation and upgrading as well as the signal of encouraging capital to inject into scientific-technological innovation industries, for example, the VR industry.

By December 2021, 8 policies or documents focused on the VR industry were introduced. Among these, the white paper released at World Conference On VR Industry 2021 in December encouraged the deep development of the VR industry to boost new economic growth.

The above information indicates that when the Government pays enough attention to the VR industry with a large amount of capital withdraw from the real estate industry. VR industry is the next key point worth investing in.

3.1.2. Economic Factors

Here three indexes are taken into account, including GDP, national urban surveyed unemployment rate, and per capita disposable income of residents.

According to the National Bureau of Statistics, the changes of three indexes are below.

Table 1. First three-quarters GDP in 2021

Year	2021		
	Q3	Q2	Q1
seasonal value (Hundred million Yuan)	290963	282857	249310

Table 2. First three-quarters GDP in 2020

Year	2020		
	Q3	Q2	Q1
seasonal value (Hundred million Yuan)	264976	248985	205727

Table 1 and 2 show the first three-quarters of GDP in 2021 and 2020. Obviously, in 2021 GDP keeps growing. And benefits from the government's effective epidemic prevention measures, the domestic economy has gradually recovered from the impact of COVID-19 when comparing the data of 2021 with the 2020s. With the recovery of the economy, the environment of investment is also improved.

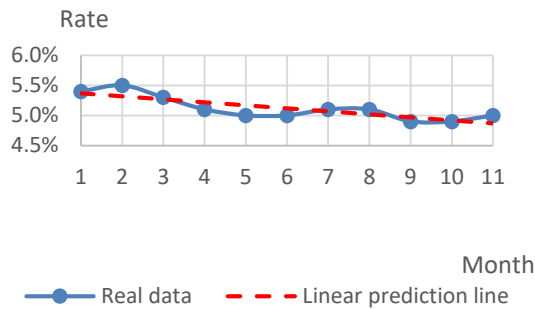


Figure 1. National urban survey unemployment rate (By November 2021)

Figure 1 shows the 2021 national urban survey unemployment rate by November. Although the number of the rate fluctuates, it can be considered overall smooth. In the past eleven months, the rate reduced by 0.4%. What's more important, the slope of the linear prediction trend line is negative, which means this rate will keep decreasing as time goes by and the national economic environment is stable and improved.

Table 3. Per Capita Disposable Income of Residents (2021)

Year	2021		
	Q3	Q2	Q1
cumulative value (Yuan)	26265	17642	9730
seasonal value (Yuan)	8623	7912	9730
cumulative growth (%)	9.7	12	13.7

Table 3 and 4 show the per capita disposable income of residents of 2021 and 2020. As the information mentioned above, with the economic recovery, the per capita disposable income of residents of 2021 increased steadily, especially compared with the same period of

2020. Because of the growth of income, residents may probably increase investment interest.

Table 4. Per Capita Disposable Income of Residents (2020)

Year	2020		
	Q3	Q2	Q1
cumulative value (Yuan)	23781	15666	8561
seasonal value (Yuan)	8115	7105	8561
cumulative growth (%)	0.6	-1.3	-3.9

3.1.3. Social Factors

In recent years the government has emphasized the importance of scientific-technological innovation, and people have become interested in high-new technology as well. When Roblox was listed in March 2021 and led a wave of 'Metaverse', people were attracted by this new conception soon and were ignited to invest in this widely-accepted conception. By now the investors still keep a positive attitude to this new conception.

However, considering the negative effect of the ongoing epidemic, people may prefer to save rather than investing and this idea seems unchanged until the epidemic of Covid-19 is under control worldwide.

3.1.4. Technological Factors

In recent years VR technology has developed continuously, especially after the outbreak of Covid-19. With more indoor activities and online meetings during the lockdown period, more utilization and developing direction of VR were revealed. Workrooms, a testing VR meeting application released by Facebook in August 2021, is one of the pieces of evidence. At the same time, one of the Chinese leading VR company Baidu released the first open VR framework platform in China. In December, another famous company Huawei successfully applied for a new pattern on VR display. Certainly, VR technology is becoming mature gradually and the VR industry has great innovation potential.

3.2. CAPM Analysis

3.2.1. SZSE Component Index

To apply the CAPM to analysis, the market return is essential. The two stocks selected are both listed on the Shenzhen Stock Exchange. In this case, the SZSE component index is chosen as the market index. Figure 2 is the change of the index in the past nine months.

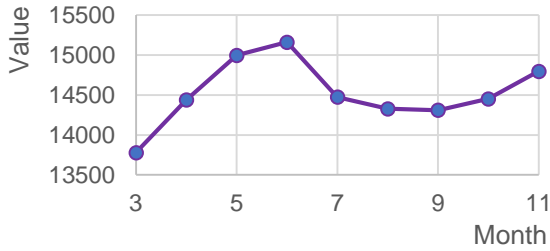


Figure 2. Change of SZSE Component Index

3.2.2. Risk-free Return

In China, the government bond yield is widely used as the risk-free return. And in this case, 1-year maturity China government bond yield is chosen and Figure 3 is the change of the yield rate in the past nine months, the same period as the market index.

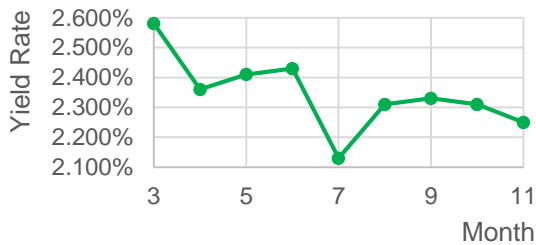


Figure 3. Change of Yield Rate (Annualized)

3.2.3. Goertek

Goertek, as a scientific-technological innovation enterprise established in 2001, was listed on the Shenzhen Stock Exchange in 2008. According to the latest '2021, China VR Top 50 Enterprises List' Goertek ranks third, and so Goertek is a leading company in the Chinese VR industry.

The data selected spans from March 1st, 2021 to December 3rd, 2021. Figure 4 shows the change of Goertek price and Table 5 and 6 show some important data of Goertek.

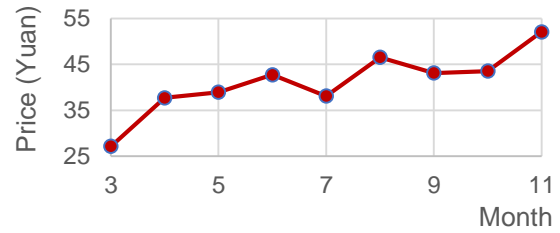


Figure 4. Change of Goertek Price

Table 5. Important Calculation Result I (Goertek)

Index	Risk-free Return (Daily)	Market Return (Daily)	Average Return (Daily)
Value	0.024%	0.008%	0.297%

Table 6. Important Calculation Result (Goertek)

Index	σ_m^2	Cov	β	Expected Return (Annualized)
Value	0.024%	0.008%	0.297%	0.014%

3.2.4. iFLYTEK

iFLYTEK was established in 1999 and listed on the Shenzhen Stock Exchange in 2008 as well. According to the latest '2021 China VR Top 50 Enterprises List' iFLYTEK ranks ninth. It is another company that should not be ignored in the VR industry. Figure 5 shows the change of iFLYTEK price and Table 7 and 8 show some important data of Goertek.

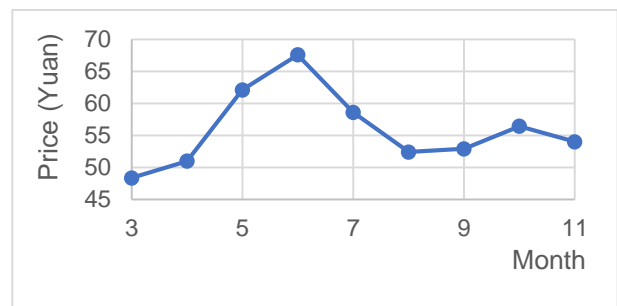


Figure 5. Change of iFLYTEK Price

Table 7. Important Calculation Result I (iFLYTEK)

	Risk-free	Market	Average
Index	Return (Daily)	Return (Daily)	Return (Daily)
Value	0.024%	0.008%	0.076%

Table 8. Important Calculation Result II (iFLYTEK)

Index	σ_m^2	Cov	β	Expected Return (Annualized)
Value	0.014%	0.00017	1.1771	2.078%

4. DISCUSSION

4.1. Market Index and Risk-free Return

When comparing the change curve of the market index and the government bond yield, it is interesting to find that their trends are contrary by and large. The SZSE component index first grew and reached the peak in June, and then decline a bit in the next three months. Next, it returned to increase from September to November. When focusing on the value of March and November, it is clear that the index of November is nearly 1000 higher than March. On the whole, the market index has been on the rise.

However, the government bond yield dropped three times in the past nine months and fell to the bottom in July. On the whole, the government bond yield is in decline and opposite to the trend of the market index. This often seems to be the signal of stimulating consumption and investment instead of saving.

Combine with the above analysis, a conclusion can be drawn that the investment environment is positive as expected and opportunities exist when the government bond yield falls.

4.2. Comparison between Goertek & iFLYTEK

The calculation result and the tables show that Goertek and iFLYTEK are similar in some way. However, there are also some obvious differences between the two stocks.

However, On the one hand, the price of both fell as the market index and the government bond yield did. Besides, both Goertek and iFLYTEK have a small coefficient between asset return and market return. And both their β is greater than one and very close to one, separately, 1.0437 for Goertek and 1.1771 for iFLYTEK.

β is close to 1 means the price of the asset follows the market changes and β greater than one means the asset has higher risk than the whole market. It is to say that Goertek and iFLYTEK are both in the rising trend and may have a better return than the average level of the market with higher risks following.

On the other hand, the price of Goertek nearly doubled in the past nine months while iFLYTEK reached the peak in June and next fall back a little. When focusing on the change curves, iFLYTEK is more fit to the market index than Goertek. But the β of iFLYTEK is greater than the ones of Goertek. It seems to be the contrary. A probable reason for this phenomenon is that the price of Goertek keeps rising in the long term and so it is more fit to the market trend. As for iFLYTEK, its price fluctuates more violently in a short time, just like the period from June to July, and so it is not so fitting to the market index like Goertek. What's more, the annualized expected return of Goertek is 2.826%, which is greater than 2.078% for iFLYTEK. If the average government bond yield of 2.378% is used as a standard, Goertek has a better-expected return than iFLYTEK. Exactly, the expected return of iFLYTEK is even less than the risk-free return. As one research pointed out that more than half of individual stocks underperform government bonds over the same period in China[9]. Maybe iFLYTEK is not a good choice for hot investment.

4.3. Overview

It is saying that Roblox was listed in March and the conception of Metaverse spread widely boost investment in China. And soon many big companies rushed into the market. In the above part, Goertek and iFLYTEK were selected to be analyzed, and the results show that even big companies still perform variously in the hot investment market. From the fitness to the market index change to the expected return and potential risk, Goertek is better than iFLYTEK. It is shown that the price of Goertek increased more rapidly with a lower initial price than iFLYTEK, which suggests the investors those small and medium-sized enterprises may have more potential profit in hot investment. And it is also clear that since September the whole investment market, including the VR industry has gradually cooled down, indicating that not all hot points are worth chasing because hot points always change and the enthusiasm may soon fade away.

Concluding from the above analysis, several tips are given to the investors. First, investing opportunities exist when risk-free return falls. Besides, as the pioneer industry of Metaverse, the whole VR industry is in growth and worth investing indeed, but investors should analyze carefully before decisions instead of the blind chase to get a better return.

Admittedly, this paper only selected the data from March to September in 2021 and so there are still some

limits. Whether the VR industry and even Metaverse are worth investing in and how will their future trend be like is remain to be further studied. At least for now, the whole market and VR industry can be trusted.

5. CONCLUSION

This study has figured out the investment potential and investment value of the VR industry as the pioneer industry of Metaverse in the Chinese stock market by applying PEST to analyze the whole investment environment and analyzing the price change and the relevance between the stocks and the market of two selected companies, Goertek and iFLYTEK with CAPM. According to the data and the analysis above, this research concluded that investing opportunities did exist in the past nine months in the Chinese stock market because of the appearance of the concept of Metaverse. Besides, big companies performed variously in the hot investment market, which indicated that medium-sized enterprises may probably have the more increasing potential ones in hot points investment. Although the whole market gradually cooled down since September, the VR industry still can be trusted. And these conclusions can suggest investors to invest more rationally when chasing hot points because a research said that investor herding behaviour is prevalent in Chinese stock market[10]. Frankly, this study has some limits on the selected time series and is consequently not exact. In the future, more detailed and longer-term research on investment concerning Metaverse beyond the VR industry will be conducted and further study may prove Metaverse is worth investing indeed.

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