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Research on valuation methods for metaverse business companies

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Abstract

As metaverse business gradually spreads across industries against the backdrop of the 2020 pandemic and the Korean New Deal policy, the appropriate future value of companies pursuing metaverse business is being discussed. Traditionally, profitability-based valuation methods such as the DCF (Discounted Cash Flow Model) method are applied when calculating the future value of general companies, and these existing methods are used when evaluating the value of companies pursuing metaverse business, a new growth industry. Applying it as is has its limitations. Presenting future corporate value by applying an appropriate valuation method that matches the characteristics and circumstances of the Metaverse business is essential for activating financing for industrial growth and the investment decisions of investors who supply funds. Accordingly, this study reflects the characteristics of the metaverse business based on previous research on corporate valuation methods and analysis of the three-year (2020 to 2022) financial status and corporate trends of 113 domestic listed companies that have promoted the metaverse business. A corporate valuation method was proposed. As a result of the

research, the majority of companies promoting metaverse business have just been commercialized and are in a deficit before monetization, so among the existing valuation methods, PSR(Price to Sales Ratio), a multiplier method suitable for negative cash flow, is used and applied. It was concluded that it would be appropriate to seek. In addition, this study derived a method to reflect the Metaverse interest index and Metaverse business sensitivity in PSR in that the future value of the Metaverse business is created by expanding the ecosystem according to the public's interest and sensitivity. Moreover, since the Metaverse business shows similar characteristics to venture companies, a method of applying the company value discount rate by considering the company's maturity and interest rates as risk factors was proposed.

Keywords : valuation method, metavers business, venture capital,
metaverse corporate valuation method, corporate valuation method

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1. Introduction

As non-face-to-face culture became routine due to COVID-19, public interest in Metaverse increased as users' technical acceptance and needs for virtual environments expanded. In response to public interest, companies are looking for new business opportunities or pursuing projects using the metaverse. In particular, the Metaverse ecosystem is expanding by exploring business opportunities and promoting marketing using Metaverse, focusing on the games, entertainment/media, distribution/consumer goods, mobility, and IT industries where interaction with consumers is important from a marketing perspective. The government is no exception to interest in the metaverse. The government announced the Korean New Deal Policy 2.0 in July 2021 as a national development strategy to recover the sluggish economy due to COVID-19 and solve the problem of job shortage. The Korean version of the New Deal policy is a national strategic economic revival project that will invest a total of about 100 trillion won by 2025, and was largely established as the Digital New Deal and Green New Deal. The Digital New Deal is a strategy to cope with the future society by digitizing industries in line with the 4th Industrial Revolution. As strengthening the D.N.A ecosystem, upgrading non-face-to-face infrastructure, fostering new hyper-connected industries such as Metaverse, and digitalizing SOC were announced as the four major tasks, market attention focused on Metaverse-related industries. Afterwards, 5.4 trillion(KRW) in policy funds for small and medium-sized enterprises was provided to promote the Korean New Deal, and in January 2022, a policy to foster hyper-connected new businesses through

Metaverse was announced through the pan-government joint 'Metaverse New Business Leading Strategy'. Through this, the government's policy commitment to building a Metaverse platform ecosystem was expressed, and the financing market for Metaverse-related industries expanded.

The certification effect of government intervention following the injection of policy funds created an environment in which private investment funds' preference for venture capital investment increased. This led to the rapid growth of the domestic venture investment market, and as of the end of 2021, new venture investment performance was approximately KRW 7.6802 trillion, an increase of approximately 78% compared to the previous year. n addition, as the non-face-to-face market received attention due to the impact of COVID-19, approximately 2.4 trillion won, or 31.6% of new investment, was invested in the ICT service industry, and among the ICT service industry, the Metaverse-related industry in particular received great attention.

However, from the second half of 2022, the venture investment market has shrunk due to the spread of negative outlook on the global economy, a reduction in the size of policy fund investment resources, a decline in the attractiveness of return compared to venture investment risk due to rising interest rates, and bottlenecks due to the deterioration of the recovery market. It was found that among the listed (or scheduled to be listed) companies from the second half of 2022, when the venture investment market began to shrink, a significant number of companies are pursuing metaverse businesses. This means that the metaverse business is continuously expanding, and the need for fair value evaluation has increased for metaverse business companies during the financing process for the following reasons.

First, since the metaverse industry is a newly emerging knowledge and digital-based technology industry, an appropriate corporate value evaluation method that reflects this is needed. Second, among new technology industries, the definition of the industry in Metaverse has not yet been clearly defined, and there are various perspectives and evaluations of business characteristics. In the case of general ICT service, bio, distribution and commerce companies, there is room to borrow traditional related company evaluation methods when evaluating the value, but since Metaverse is a new concept industry, it is not easy to find an industry to sample. Therefore, if the existing corporate valuation method is applied to the metaverse business as is, it will not be easy to create market consensus, which may lead to greater controversy compared to other industries. Third, due to the very early stage of the industry, existing valuation methods that do not reflect the uniqueness of the metaverse business, where it is difficult to estimate future value through past performance due to the lack of quantitative evidence and time series data, may be used in the financing process. Third, despite the difficulty in estimating future value through past performance due to the lack of quantitative evidence and time series data due to the nature of the very early industry, metaverse business companies utilize existing valuation methods in the financing process. In this case, metaverse business companies face the risk of a funding crisis and decline in corporate value due to unfavorable evaluation. Fourth, as the number of companies applying metaverse to business is increasing across industries, it is expected that the number of companies requiring appropriate evaluation will increase in the future. In terms of providing metaverse companies with benchmarks for corporate growth strategies and management strategy guidance for business sustainability, a corporate value assessment method that reflects the characteristics of the metaverse

industry can be considered essential

Accordingly, this study intends to conduct the following research to derive a corporate valuation method that reflects the characteristics of the metaverse business. First, this study seeks to analyze existing corporate valuation methods through prior research. Second, we will derive the characteristics of the metaverse business by analyzing the financial status of companies that promoted the metaverse business from 2020 to 2022 among domestic listed companies. Third, based on this, a corporate value evaluation method that reflects the characteristics of the metaverse business will be proposed to calculate the appropriate corporate value of metaverse business companies.

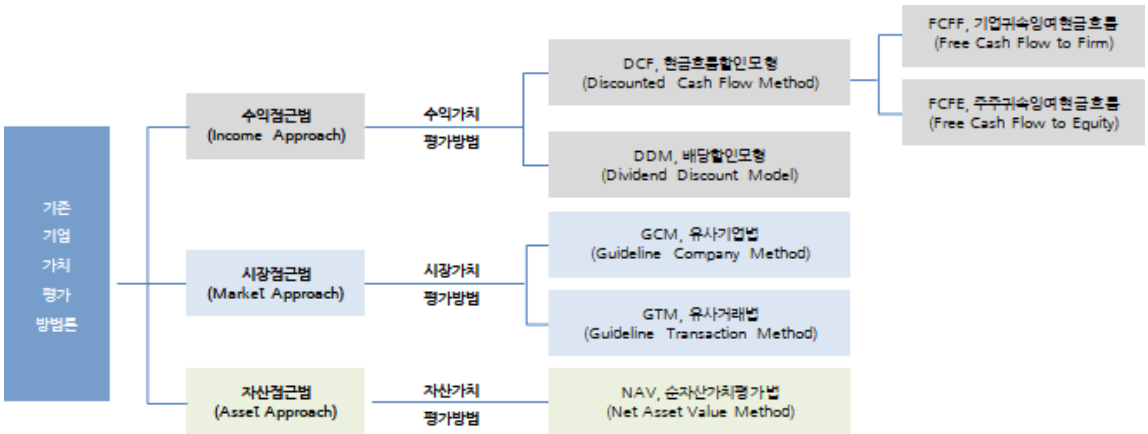
2. Theory

2.1 Research on corporate valuation methods

Summarizing existing studies on corporate valuation methods, as shown in Figure 1, they are generally divided into three types: profit valuation method, market value valuation method, and asset value valuation method.

Se-kyung Oh (2002) explains that it can be classified into a model for evaluating general corporate value, a method for evaluating it by dividing it into quantitative and

Figure 1. *Overview of corporate valuation method*



non-quantitative factors, and a scoring method. In this study, General valuation methods are divided into the following three types. The multiple method, which finds the value by comparing it with the multiplier of similar companies; the cash flow discount valuation method, which finds the company's value by calculating the company's future cash flows and then discounting them at an appropriate discount rate; and the logic of real options to apply the logic of real options to determine the company's value. This includes the Real Option Method, which finds the value of a company by evaluating the value of its options.

Younghee Ko(2012) divides it into revenue valuation method, market valuation method, and asset valuation method. In addition, the study explained that the valuation methods commonly used in practice include comparative analysis, discounted cash flow method, and financial ratio analysis. Tae-wan Kim and Jae-hong Yoon (2012) divide methodologies for technology value evaluation into quantitative methods and qualitative methods. The quantitative method is an approach that measures the value of technology in direct monetary value, and the market approach, cost approach, and profit approach are presented as evaluation methods using money. Choi Hwan-seok (2016) analyzes traditional evaluation methods and corporate valuation methods. Traditional evaluation methods were explained as market approach, cost approach, and profit approach. The corporate valuation method was presented as a comparative valuation method with similar listed companies, a comparative valuation method with similar transactions, a discounted cash flow method, an option valuation method, an asset valuation method, a replacement cost valuation method, and a stock market price valuation method. Hyo-Jeong Lee et al. (2021) explained that theoretical corporate valuation methodologies largely include the Income Approach, Market Approach, and Cost Approach. Based on the analysis discussed so far, corporate value evaluation methods can be classified as shown in Table 1 below.

2.2 Venture capital corporate valuation methods

Venture capital, which mainly invests in new growth companies, uses a method that combines existing corporate valuation methods with qualitative evaluation indicators for investment target companies.

Hyo-jeong Lee et al. (2021) pointed out the limitations of existing traditional and theoretical corporate valuation methods in that they do not reflect new growth companies or recent industrial paradigm changes. Venture startups have the characteristic that future uncertainty and non-financial information affect corporate value and do not generate profits. Therefore, it was explained that the Berkus valuation method, scorecard valuation method, risk factor summation method, First Chicago

Table 1. *Corporate valuation method*

Valuation Method	content
DCF (Discounted Cash Flow)	Profit valuation based on expected cash flow generated from corporate operating activities and WACC estimation
FCFF (Free Cash Flow to Firm)	Earnings valuation based on estimation of free cash flow and discount rate attributable to the company
FCFE (Free Cash Flow to Equity)	Earnings valuation based on estimation of free cash flow and discount rate attributable to shareholders
DDM (Dividend Discount Model)	Present value of future dividend cash flows
GCM (Guidline Company Method)	Relative value evaluation using stock price and profit indicators of similar companies
GTM (Guidline Transaction Method)	Relative value assessment using transaction prices from recent transactions of similar companies
NAV (Net Asset Value)	Evaluate holding assets and liabilities by returning them to market value

Mehod, venture capital valuation method, and real option valuation method are used as corporate valuation methods for venture startups.

In addition, it was found that various methods are being discussed to find a corporate valuation method suitable for the business characteristics and company size of small and medium-sized venture companies and startups. Se-kyung, Oh (2002) observed that venture companies and Internet companies have very different cash flow structures and risk structures from other companies, and that cash flow predictions for early venture companies and Internet companies are difficult and most have negative cash flows. Accordingly, the study argued that it would be better to evaluate corporate value using the multiple method or the comparable method. In addition, it is suggested that even in the case of venture companies or Internet companies, it is common to use the discounted cash flow method (DCF method) in the stage immediately prior to public disclosure (Pre-IPO stage).

Sang-wook Kang, Young-seok Yang, and Su-hee Yang (2017) proposed the DCF-Plus valuation method, a new quantitative valuation model that is based on DCF but can be more commonly used in early-stage corporate valuation. This is an evaluation method that combines the variables suggested by the Butkus evaluation method and the scorecard evaluation method by modifying and transforming them as variables that have a significant impact on the future value of a company before generating profits.

Based on the previous research analyzed above, the venture capital corporate value evaluation methods can be summarized as shown in Table 2 below.

Table 2. *Venture Capital Corporate Valuation Method*

Valuation Method	content
Berkus Method	A method of calculating corporate value based on evaluation of key business factors such as a startup's business idea, prototype completeness, quality of the founding team, product launch, and sales situation. A method of determining the final value of a startup by calculating and integrating the value and risk of each business element from $0 to $500,000.
Scorecard valuation method	A method of determining the value of a start-up company by comparing and adjusting it with the value of start-up companies in the same growth stage (same industry, same region, etc.) that have attracted angel investment.
Risk factor summation method	12 risk factors (management risk, business stage risk, legal risk, production and manufacturing risk, sales and marketing risk, investment attraction risk, competition risk, technology risk, litigation risk, global risk, reputation risk, and potential profitability risk) How to calculate corporate value by considering.
First Chicago Method	A method of evaluating corporate value based on a weighted average by assigning weight to the DCF value to three valuation scenarios such as 'success-average-failure'
Venture capital method	An ROI-based value calculation method for investors oriented toward the investment return and recovery perspective of venture capital, a method that calculates the expected rate of return (Investor Desired ROI Multiple) by dividing the final recovered investment amount (Exit Value) by the corporate value after investment (Post Value)
Real option pricing model	A method in which the value of investment opportunities in new growth companies is viewed as similar to a call option. Evaluation using various methodologies based on assumptions such as Black-Scholes, discrete model, decision tree, etc.

As previously analyzed, various methods are being explored and applied for corporate valuation of new growth venture companies similar to the Metaverse business. However, there are limits to applying this directly to the metaverse business. Accordingly, this study analyzes the characteristics of the metaverse business and proposes a corporate value evaluation method that reflects these characteristics.

3. Method and Analysis

In this study, we intend to apply the following method to derive a metaverse business corporate valuation method. First, the characteristics of the metaverse business are derived by analyzing the three-year financial status and corporate trends of companies that promoted the metaverse business from 2020 to 2022.

In addition, based on the characteristics of the derived metaverse business, we plan to examine corporate valuation methods to calculate the appropriate corporate value of metaverse business companies.

According to the Korea Venture Investment Investment Asset Evaluation Guidelines (2011), when calculating the fair value of equity securities among investment assets invested by VC (Venture Capital) or PE (Private Equity), the equity securities are divided according to the presence or absence of an active market; Afterwards, the fair value is evaluated based on the principle of applying the valuation technique at the top of the valuation hierarchy system first. Therefore, in this study, as shown in Table 3, we will analyze companies that are set as metaverse theme stocks among domestic listed companies based on ‘market price evaluation’, which is the highest and most reliable method in the valuation hierarchy of equity securities.

Table 3. *Equity securities valuation hierarchy (Selection of evaluation method)*

Marketability	Evaluation Methodology	Methodology Description	Reliability
Yes	market valuation	Equity securities with market prices, such as listed stocks	reliability increase
No	3rd party transaction valuation	Existence of recent transaction prices between independent third parties	
	Comparative evaluation of similar companies	There are similar listed companies that can be compared Positive cash flow	
	Evaluation by other reasonable methods	Discounted Cash Flow Industry Valuation Benchmarks Net Asset Based Valuation etc.	
	Milestones Evaluation	Use when higher level methodology cannot be applied. Based on the acquisition cost, evaluation is made by considering post-management milestones and reflecting impairment losses.	uncertainty increase

As shown in Table 4, this study defined companies set as metaverse theme stocks as metaverse business promotion companies and selected companies subject to evaluation. In this study, we investigated the annual financial performance of metaverse business companies from 2020 to 2022 using evaluation items and evaluation indicators centered on major financial and investment indicators. In this way, the characteristics of the metaverse business were derived by analyzing corporate trends through quantitative financial status evaluation.

Among domestic KOSPI and KOSDAQ listed companies that can be evaluated for marketability, there are a total of 128 companies belonging to metaverse-related theme stocks (NFT, metaverse, virtual reality, augmented reality, virtual currency, blockchain) as of October 6, 2023. Among these, 113 companies were selected as the subjects of this

study, excluding companies with sales of more than 3 trillion won as of the second quarter of 2023 and companies whose annual financial performance was difficult to confirm. These were defined as companies subject to evaluation to derive the financial characteristics of the metaverse business. Since Metaverse is a new growth industry in its very early stages, Metaverse business companies have the characteristic of not having a long period of time to pursue business in earnest and begin commercialization. Accordingly, in this study, as shown in Table 5, growth, profitability, liquidity, activity, and soundness are composed of evaluation items, and evaluation indicators for each evaluation item are selected to analyze the characteristics of the metaverse business.

Table 4. *Evaluation company for selecting metaverse business companies*

Themed stock	Incorporated companies	Overlapping incorporated companies	A single incorporated companies	Companies subject to evaluation	Incorporated companies
NFT	27	16	11		HYBE, Seoul Auction, Com2us Holdings, etc.
Metaverse	58	26	32		NP, Creverse, Pearlabyss, Wiseitech, etc.
VR	30	21	9		Namuga, Barunson, Hyvisionsystem, etc.
AR	16	12	4		Netmarble, NCsoft, Thinkware etc.
Cryptocurrency	28	13	15		Woori technology investment, KGmobilians etc.
Blockchain	28	11	17		Lotteinnovate, Raonsecure, SamsungSDS etc.
Total	187	99	88	128	

4. RESULTS AND DISCUSSION

4.1 Analysis of financial status and corporate characteristics of metaverse business companies

In this study, the results of analyzing the financial status of Metaverse-promoting companies for three years from 2020 to 2022 are as follows. First, since 2020, when the metaverse industry emerged, metaverse business companies have been showing sales growth. Among all companies, more than 70% of companies have increased sales compared to the previous year from 2021 to 2022, and about 30% of companies have steadily increased sales for three consecutive years since 2020, showing overall sales growth. However, 27% of companies showed a decrease in sales compared to the previous year due to external environmental factors such as a sharp rise in interest rates and economic slump in 2022.

Second, as a result of the analysis, the proportion of companies in deficit has increased due to expenditures exceeding sales, and the ability to generate profits from business activities has weakened. Therefore, companies can be seen as needing to

Table 5. *Evaluation items for deriving metaverse business characteristics*

Evaluation items	Evaluation indicators
Growth potential	Sales growth rate, Asset growth rate
profitability	Operating profit growth rate, operating profit margin, ROE(return on equity)
liquidity	Cash flow from operating activities, Debt growth rate, Cash asset growth rate
activity	Cash flow from investing activities, Cash flow from financing activities, Growth Rate of Tangible Assets, Growth Rate of Intangible Assets
soundness	debt-to-equity ratio, Dependence on borrowings, current ratio, Capital ratio, Capital adequacy ratio, Turnover ratio of borrowing capital

strengthen liquidity management and preemptively manage risks arising from marginal companies. As a result of the analysis, companies with operating profit losses accounted for about 28% of all companies in 2021, but the number expanded to about 34% in 2022. In addition, companies that have been making a profit for three consecutive years account for approximately 45% of all companies, and companies that are experiencing a deficit for three consecutive years account for approximately 12%. It can be analyzed that the importance of revenue-cost management has increased as the average operating profit ratio of companies with operating loss has expanded from minus (-) 20% in 2020 to minus (-) 69% in 2023. There has been an increase in the number of companies whose sales activities do not lead to performance generation. In 2022, 47% of all companies have negative cash flow from operating activities, a significant increase compared to 35% in 2021. The number of companies whose business activities actually lead to losses has increased.

Third, as a result of the analysis, it was found that the majority of metaverse business companies are in need of capital financing as they are facing problems of current survival rather than investing to improve future value. As a result of the analysis, it was found that 76% of companies had a decrease in cash flow from investing activities in 2022 compared to the previous year, and 57% of companies had a decrease in cash flow from financing activities. In 2022, 88% of all companies had a debt ratio of 100% or less, an increase from 77% in 2021. Accordingly, the number of companies that do not spend money on investing in tangible and intangible assets such as production facilities appears to be increasing, and more companies are focusing on debt management rather than financing. This is believed to be due to the fact that it has become difficult to secure operating margins due to the economic downturn and rising interest rates, so

more companies have chosen a survival strategy of managing debt rather than strengthening business activities through increased productivity. Meanwhile, the fact that the number of companies whose debt ratio has fallen can be interpreted as a beneficial phenomenon for improving soundness. However, companies with a debt capital turnover ratio of 1 times or less accounted for approximately 31% of all companies in 2022, an increase from 24% in 2020, and companies with a debt capital turnover ratio exceeding 3 times decreased to approximately 21% in 2022, compared to 25% in 2020. This decline in the debt ratio can be seen as an inevitable effect of increased fatigue in capital raising due to the interest rate burden and decline in investment market sentiment, and a decrease in debt capital raising. In addition, in a situation where it is not easy to raise debt capital, companies will be concerned about whether the expansion of tangible and intangible assets through investment and financing activities can contribute to actual improvement in operating profits

4.2 The direction of corporate valuation method reflecting the characteristics of the metaverse business

As a result of analyzing corporate trends based on the financial status of metaverse business companies from 2020 to 2022, the direction of the corporate valuation method that reflects the characteristics of the metaverse business can be analyzed as follows.

In 2021, the venture capital investment market gave generous valuation scores to companies operating in new growth industries that were growing outwardly to preemptively occupy the market or increase market share. However, in 2022, unlike before, there was a shift towards investing in companies with substantial profits rather

than companies with external growth. This direction can be seen to include the following reasons. First, although high multiples were assigned to growth potential following the venture investment craze, the investment market has learned over the past two years that the profitability of many new growth companies is not yet visible. And, the market realized that it would take longer than expected for the metaverse to become popular or profitable within the industry. Additionally, it is important to note that an environment of rising interest rates has been created in which corporate bonds with similar risks can bring greater returns than stock investments in metaverse companies.

Metaverse business companies have the characteristic that it is difficult to calculate corporate value by assigning profit-based multiples such as EV/EBITDA or PER because many companies are in the red because they do not generate profits. Therefore, using sales-based multiples can be helpful in calculating meaningful corporate value. However, as investment market sentiment has turned to a conservative evaluation centered on corporate fundamentals, assessing corporate value by assigning multiples based on sales runs the risk of being seen as overestimation. For companies that are showing operating profits despite a difficult business environment, presenting corporate value using revenue-based multiples to appeal investment attractiveness can be an effective way to raise funds.

The majority of Metaverse business companies in the early stages of industry formation are in deficit and can only be in a negative state based on the profitability index considered important in existing corporate valuation. Nevertheless, the metaverse business has the characteristic of placing a higher proportion of corporate value on the future when digital transformation spreads rather than on the present. Accordingly, there are limitations in applying the classic theory of existing corporate valuation methods,

which is the sum of the present value of future cash flows generated by a company, to Metaverse companies. Despite these limitations, the importance of corporate fundamentals suggested by corporate valuation methods can still be considered effective despite changes in the business environment. Therefore, this study seeks to reflect the existing corporate valuation method and apply it in a way that suits the characteristics of Metaverse companies, as shown in Table 6 below.

Table 6. *Direction of valuation method for metaverse businesses companies*

Considerations	Detail
Purpose of establishing valuation method	Establishment of evaluation standards for appropriate corporate value that will serve as the basis for judgment on financing to provide stable, continuous, and smooth supply of capital for the growth of the metaverse industry
Early industrial characteristics	Metaverse companies are evaluated based on the PSR (Price to Sales Ratio), a multiplier suitable for negative cash flow among existing corporate valuation methods, as there are many companies with operating profit deficits that have only recently begun to be commercialized.
Future valuation ratio	Considering that the metaverse business, which is in the pre-monetization stage, has virtually a current value of '0', the proportion of growth indicators reflected in the corporate valuation method has been increased.
Venture company characteristics	When raising funds, venture companies assign different corporate values depending on the growth stage, so it reflects the step-by-step financing method and considers the discount rate according to the company's maturity.
Market sentiment sensitivity	Considering that the Metaverse industry is sensitive to changes in the external environment such as the economy and interest rates, we consider ways to frequently reflect and evaluate Metaverse-related market trends and sentiments.

4.3 Proposal of Metaverse corporate valuation method reflecting Metaverse business characteristics

4.3.1 Metaverse interest index reflected in PSR (Price to Sales Ratio)

This study constructed the 'PSR.m' model as follows to examine the valuation method of metaverse business companies.

PSR.m = [PSR x Metaverse interest index increase/decrease multiple compared to the previous year] x Metaverse business contribution:

- Metaverse Interest Index : Provided by Google Trends, standardized according to the degree of keyword search execution within a specific period and displayed on a scale of 0 to 100.
- Metaverse business contribution : Qualitatively evaluates the contribution of sales of companies subject to valuation to the Metaverse business and assigns a value between 0 and 1.

The PSR.m valuation method utilized PSR (Price to Sales Ratio, Market Capitalization to Sales), a market valuation method multiplier that evaluates value using sales among valuation methods. In addition, metaverse business has the characteristic of reacting sensitively to market interest(sentiment) and influencing the company's internal capabilities. Accordingly, in this study, the PSR was structured as a method of calculating corporate value by reflecting the Metaverse interest index and weights that qualitatively evaluated the contribution of the Metaverse business to sales.

4.3.2 Application and evaluation of the PSR.m evaluation method

The valuation model presented in this study can be expanded by reflecting risk

factors that reflect exogenous environmental variables in the formula as a discount rate. Metaverse businesses are similar to venture companies, so they respond greatly to external economic conditions and are given corporate value depending on the maturity of the company when raising funds.

Therefore, since the risk premium and liquidity of metaverse business companies must be considered, this study seeks to assign a discount rate to the corporate value using the PSR.m valuation method according to the impact of economic conditions (interest rates) and corporate maturity as shown in Table 9. Among the sector indices at the Korea Exchange(KRX), we compared the trends of the Broadcasting and Communication Index and the Media & Entertainment Index[1] from 2020 to October 2023 with the Metaverse Interest Index and interest rates that constitute the PSR.m evaluation method. As a result of the analysis, it was found that there was a positive correlation with the Metaverse interest index as shown in Table 7, while an inverse correlation was shown with the interest rate as shown in Table 8.

Table 7. *Positive correlation between Metaverse business and Metaverse interest index*

Period	KRX Broadcasting and Communication Index	KRX Media and Entertainment Index	Metaverse Interest Index
2020 ~ 2021	0.68	0.74	1.00
2022 ~ October 2023	0.76	0.88	1.00

[1] As of October 30, 2023, listed companies that make up the KRX Broadcasting and Communications Index include SK Telecom, KT, LG Uplus, and SBS. The metaverse businesses being promoted by SK Telecom, KT, and LG Uplus, which have the highest index composition ratios, include SK Telecom's 'iFriend', KT's 'Genieverse', and LG Uplus' 'Kidstopia'.

Table 8. *Negative correlation between metaverse business and interest rates*

Period	KRX Broadcasting and Communication Index	KRX Media and Entertainment Index	Metaverse Interest Index
2020 ~ 2021	0.04	-0.26	1.00
2022 ~ October 2023	-0.90	-0.86	1.00

Table 9. *Considerations for valuation method of metaverse business companies*

evaluation method	Evaluation (calculation) method	Evaluation (calculation) basis
Existing value evaluation method	PSR (stock price/sales ratio, market capitalization/sales)	Since most metaverse business companies are in the early stages of commercialization and most demonstrate negative cash flow, PSR, which is a multiple based on sales, is appropriate.
Metaverse business evaluation method	PSR.m (PSR Reflection of Metaverse interest index and Metaverse business contribution)	「Corporate value = present value + future value」In this respect, the current value of Metaverse companies is virtually 0, and future value is created by expanding the ecosystem according to the market's interest in Metaverse. The Metaverse interest index uses the Google Trend index (search criteria: Korea, Metaverse / annual average). There is a high correlation between the KRX Media & Entertainment Index and the KRX Broadcasting and Telecommunications Index, which include many companies pursuing metaverse business, and the Metaverse Interest Index. Qualitative evaluation of the degree of sales contribution of the metaverse business in the evaluation target company, giving an evaluation value between 0-1.
metaverse evaluation	Selectively apply discount rates ① and	Since the majority of Metaverse companies have financial structures dependent on financing, it is appropriate to apply

method application	② to PSR.m	a discount rate depending on the characteristics of the funds raised. Apply number ① for financing through the venture investment market, and apply number ② for financing through loans from financial institutions.
discount rate ①	Discount rate applied according to company maturity and financing stage	Metaverse companies show similar characteristics to venture companies due to the nature of the industry in its early stages, and venture companies apply different discount rates depending on the maturity of the company by funding stage when evaluating corporate value. Reflection of investment risk according to the maturity of the company - startup: 90% ~ 80% - seriesA: 80% ~ 65% - seriesB: 65% ~ 50% - seriesC: 50% ~ 40%
discount rate ②	Annual interest rate increase rate (interest rate standard: corporate bond BBB-)	Typically, corporate value (stock price) and interest rates have an inverse relationship. Interest rates are related to the financial cost of a company's debt and are a discount factor for corporate value There appears to be a high correlation between the Korea base interest rate and the KRX Media & Entertainment and KRX Broadcasting and Telecommunications indices, which include many companies pursuing metaverse business. Corporate bond ratings are determined by considering each company's credit rating and risk premium. Given that the Metaverse industry is still subject to growth-oriented valuation, the lowest rating among investment grade corporate bonds, BBB-, is applied.

5. Conclusion and Implications

This study introduces a refined valuation method, PSR.m, an adaptation of the Price-to-Sales Ratio (PSR), tailored to meet the unique challenges of valuing metaverse businesses in their pre-revenue stages. The proposed framework offers critical insights with significant implications for both theoretical exploration and practical application.

First, the PSR.m method highlights the importance of forecasting revenue changes when valuing companies in the early commercialization phase of the metaverse business. It underscores that revenue forecasting ultimately relies on predicting demand, and what makes this approach significant is its incorporation of a metaverse interest index as a forward-looking indicator for demand forecasting.

Second, this research sheds light on the widening gap between the valuation expectations of investors and the financial realities of metaverse-driven companies, a divide that has been exacerbated by the contraction of the capital markets for the metaverse industry since early 2022. This disparity has heightened the difficulty for these companies in securing necessary funding. Therefore, the development of a valuation methodology that faithfully reflects the specificities of metaverse businesses is vital to bridging this gap and stimulating investor confidence.

Third, the PSR.m model leverages the metaverse interest index, which exhibits a strong positive correlation with the performance of metaverse businesses, while accounting for risk premiums that vary according to a company's developmental stage. Additionally, by factoring in interest rate discounts—given their inverse correlation with metaverse business prospects—this method provides a more holistic and forward-looking evaluation framework. Notably, PSR.m enables the valuation of companies that have yet to turn a profit by integrating market

sentiment as a qualitative indicator, thus linking the future growth potential of metaverse companies with investor confidence. This alignment is critical, as it offers a dynamic range of fair value estimates that can facilitate consensus between capital providers and companies. Furthermore, the model's ability to factor in the operational contributions of metaverse-related activities provides a powerful tool for strategic decision-making, particularly in optimizing resource allocation with consideration of operational leverage.

Despite its strengths, the PSR.m method is not without limitations. While it offers the flexibility of adapting to volatile market sentiments and builds on existing valuation frameworks, it lacks comprehensive quantitative metrics for assessing the profitability specifically attributable to metaverse-related operations within a company's overall revenue. To overcome this, future research should focus on the development of a detailed database that captures granular performance metrics of metaverse activities. Such a database would facilitate empirical testing and refinement of the PSR.m model, thereby enhancing its applicability and robustness in real-world valuations.

In conclusion, the PSR.m model offers a sophisticated and flexible approach to valuing companies in the evolving metaverse sector, bridging theoretical insights with practical financial strategy. Its potential to influence both academic discourse and industry practice marks a significant advancement in the field of corporate valuation.

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References

Kang, S., Yang, Y., & Yang, S. (2017). An exploratory study on building a quantitative valuation model for early-stage companies. *Venture Startup Research*, *12*(4), 15-24.

Ko, Y. (2012). *A study on the impact of M&A on a company's financial structure* [Master's thesis, Soongsil University Graduate School of Information Science Department of Financial IT Engineering]. https://www.riss.kr/link?id=T12858653

Kim, T., & Yoon, J. (2012), Case analysis using technology valuation methodology. *Journal of Management Studies*, *33*, 29-56.

Lee, H., Kim, K., Kim, S., & Cha, Y. (2021). *New Valuation Era, Valuation of New Growth Companies*. (Report No. 143). Samjeong KPMG Economic Research Institute., https://kpmg.com/kr/ko/home/insights/2021/07/issuemonitor_143.html

Oh, S. (2002), *Development of a Korean-style valuation model for venture companies and Internet companies*. Korea Institute of Finance.

Choi, H. (2016), *Research on improving the arm's length valuation method of intangible assets* [Master's thesis, Department of Patent Law and General Law, Chungnam National University Graduate School]. https://www.riss.kr/link?id=T14056102

Korea Venture Investment. (2011). *Korea Venture Investment Asset Evaluation Guidelines*. Korea Venture Investment.