Visualizing sustainable growth and quantifying the impacts reflected in share prices

–Creating a common set of outcome labels using generative AI–

Contents

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Summary and conclusions

1. In the research we present here, we use the term "intrinsic value" to describe the company-specific portion of a given firm's market capitalization that cannot be explained with reference only to financial information and macro-level variables. We interpret this intrinsic value to be the wellspring of a company's sustainable growth. We learn through analysis that while longer-term growth expectations are factored into the intrinsic value portion of companies' share prices in North America and Europe, the share prices of Japanese companies do not—on average—reflect such growth expectations. However, we also learn through measurement that companies mentioned in the impact reports issued by asset management companies generally have positive intrinsic value, which suggests to us that impact investors, who typically have long investment horizons, assess the substance of companies' intrinsic value and make investments in companies that they expect will see sustainable growth.
2. Companies often explain the impacts they realize in terms of outcomes, but investors have often observed that making lateral comparisons across companies is complicated by the highly company-specific character of the outcomes looked at. In this paper, we use generative AI to help us create a standardized catalog of outcome indicators. We then feed the text of company websites into the generative AI and ask the AI to extract appropriate outcome indicators from the catalog. Using the outcome indicators thus selected, we produce a model of the value creation process for the company in question and make visible the substance of its intrinsic value. On top of that, we develop an equity valuation model that uses the outcome labels extracted from the standardized catalog as explanatory variables. Using this, we break down the intrinsic value component and measure the value associated with each of the various impacts reflected in companies' share prices.
3. It is also our belief that being able to use standardized outcome labels as a means by which to discuss individual companies' value creation processes in the context of dialogue between investors and companies ought to be a highly effective means by which to showcase the intrinsic value that many Japanese companies already quietly possess. We think that making that intrinsic value plain and visible should help lift expectations for continuous growth in a way that becomes reflected in companies' share prices and makes Japanese companies more competitive. Investors, meanwhile, can make their investment portfolios more sustainable by focusing on impacts and investing in companies that seek to achieve sustainability across society as a whole.
4. The catalog we have created, and the outcome labels within it, are still at the prototype stage, but by putting some earnest work into refining it, our hope is that, in the near future, we can turn this approach into a genuinely useful tool by which to evaluate impacts. Being able to clearly delineate how highly the market values each of a company's business strategies and innovations with social or environmental impacts could help broaden the base of investors interested in impacts and could lead to an increase in the amount of risk money allocated to impact projects, which in turn should help advance the work of addressing societal challenges.

I. Introduction

1. The work of lifting P/B multiples and continuously creating value

Japanese companies in general have been trading at chronically low P/B multiples, and this has recently come to be viewed as a problem in need of addressing. About half of all companies on the TSE Prime Market and about 60% of companies on the TSE Standard Market are currently saddled with ROE below 8% and a P/B below 1x. In an attempt to bring about a change in this situation, the Tokyo Stock Exchange (TSE) issued a document in March 2023 titled "Action to Implement Management that is Conscious of Cost of Capital and Stock Price". The document takes the form of a list of requests presented to listed companies, urging them to draw up plans to remedy the problem and to disclose those plans. It may well be that some companies trading below their book value are simply not getting adequate recognition from investors for their growth prospects. On the other hand, it has been argued that another reason for the low valuations is that many Japanese companies are failing to adequately disclose the actual value of their non-financial information on sustainability.

P/B can be expressed as the product of ROE multiplied by P/E. From the perspective of a given company whose stock is trading at a low P/B, it is important to have a clear understanding of whether the low valuation is traceable to poor capital efficiency or to low growth expectations—something that can be done with reference to P/B multiples for industry peers. An ROE level that might be reasonable in one industry may not be attainable in another, but ROE is something that companies can lift to some extent through their own efforts. P/E, in contrast, depends on the market's perceptions, which makes it important for companies to also be adept in disclosing information and in engaging in dialogue with investors. Japanese companies' fundamentals have improved remarkably over the past decade, making Japanese equities an asset worth holding for the long term. On their own, however, strong fundamentals do not in any way guarantee higher market valuations. To boost the P/B multiples at which their shares trade, companies need to do more than simply bring about improvement in their earnings performance; it is incumbent upon management teams to also clearly communicate with investors regarding their growth prospects and the risks to their businesses.

P/E can be approximated with the formula 1 ÷ (cost of shareholders' equity – sustainable growth rate), and can thus be calculated from the difference between the market-implied cost of shareholders' equity (as reflected in market share prices) and the expected rate of profit growth. A company hoping to lift its P/E would do well to take the two-pronged approach of driving the cost of shareholders' equity down by curbing business risks through ESG risk management while also working towards higher sustainable growth by pursuing innovations that can have a positive impact in resolving environmental and societal issues.

Over the past few years, Japanese firms have enthusiastically engaged in ESG risk management with the aim of boosting their ESG scores. But efforts on the ESG front are not something that can be expected to immediately lead to more rapid growth in earnings. Simply put, risk management by itself seems unlikely to yield higher growth expectations in the market.

2. Intrinsic value and impact

1) Quantifying intrinsic value

In the research we present here, we use the term "intrinsic value" to describe the portion of a company's market capitalization that cannot be explained by means of financial information or macro-level variables. We view this intrinsic value—representing the value specific to a particular company—as the wellspring of sustainable growth. We start by estimating intrinsic value by means of a quantitative model. We choose three metrics to represent value already made manifest in financial data: the debt ratio, the dividend on equity (DOE) ratio, and the short-term growth rate. We then construct a multiple regression model (formula (1) below) that adds an industry dummy and a country dummy to these three metrics, and we use this to estimate price-to-sales (P/S) ratios. The universe analyzed is the set of MSCI ACWI Investable Market Index (IMI) constituents, narrowed down to companies for which the combination of country, exchange, and currency is shared by at least 20 companies (including the company in question), excluding companies listed in China and Hong Kong as well as companies with negative shareholders' equity. The coefficient of determination for this model is 0.4487.

$$\log(PSR_{i,t}) = A_1 \times debt\ \ ratio_{i,t} + A_2 \times DOE_{i,t} + A_3 \times short\ \ term\ \ growth\ \ rate_{i,t} + industry\ \ dummy_i + country\ \ dummy_i \quad (1)$$

Individual companies' actual P/S ratios and market capitalizations will be either higher or lower than the estimates output by the model. The difference between the actual P/S and the estimated P/S represents a company-specific something that is not captured by the available financial information or macro-level variables (in the form of the company's industry or country). We suspect that non-financial information explains most of this company-specific difference. Multiplying this difference by forecast sales yields an estimate of intrinsic value, which can be read as an expression of the expectations the market has placed on a given company.

2) The relationship between intrinsic value and longer-term growth expectations

Next, we take our estimates of intrinsic value and investigate whether they are indeed reflective of longer-term growth expectations.

Our starting point here is an analysis of the relationship between the estimates of intrinsic value output by our model (for dates in the past) and the rates of growth actually achieved thereafter, for a group of global companies heavy on companies listed in Europe and North America. In Figure 1, estimates of intrinsic value as of 2010 are plotted along the horizontal axis, and rates of corporate growth achieved over the subsequent 12 years are plotted along the vertical axis. The resulting scatter plot shows that companies measured to have higher intrinsic value did in fact tend to subsequently have higher long-term rates of growth in sales. What we take from this is that estimates of intrinsic value derived from the share prices of global companies (with an emphasis on companies listed in Europe and North America) are indeed reflective of the market's longer-term growth expectations.

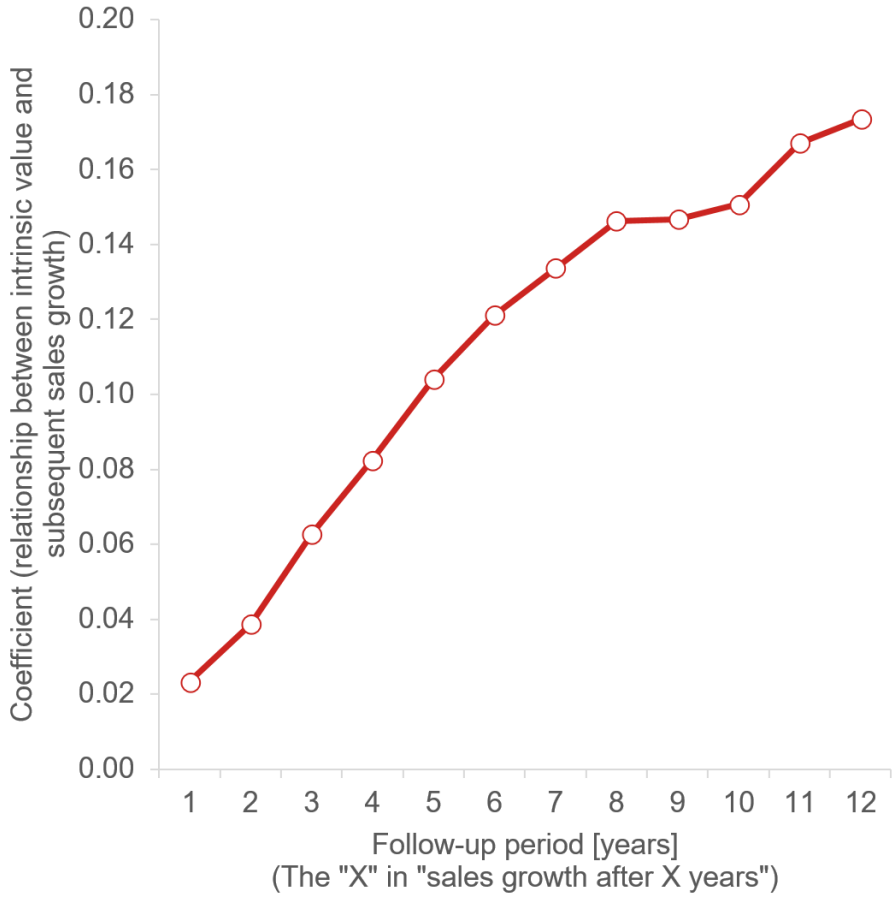
Figure 1. Relationship between intrinsic value and subsequently realized sales growth rates among global companies

Note: The universe analyzed is the set of MSCI ACWI Investable Market Index (IMI) constituents as of 30 June 2010, narrowed down to companies for which the combination of country, exchange, and currency is shared by at least 20 companies (including the company in question), excluding companies listed in China and Hong Kong as well as companies with negative shareholders' equity. Chart includes 2,720 companies for which FactSet consensus forecasts are available. Sales growth calculated from the latest sales figures available as of 30 June 2010 and the latest sales figures available as of 30 June 2022.

Source: Nomura Securities, based on data from FactSet and Capital IQ

We then look at whether longer term growth expectations have historically been reflected in intrinsic value for a variety of time spans subsequent to the point of measurement. Figure 2 is a plot of regression coefficients for follow-up periods ranging from one year to 12 years. The regression coefficient from Figure 1 (0.1734) is included in Figure 2, as the value for the 12-year follow-up period. What we see in this chart is that for each 1ppt increase in intrinsic value as a share of market capitalization, a company's sales at the end of a five-year follow-up period will on average be approximately 0.10% higher than average sales among the constituents of the benchmark (MSCI ACWI IMI). When the follow-up period is extended to 10 years, each 1ppt increase in intrinsic value tends to correspond to a 0.15% increase in sales over the benchmark average.

Figure 2. Relationship between global companies' intrinsic value and subsequent sales growth for follow-up periods of varying durations

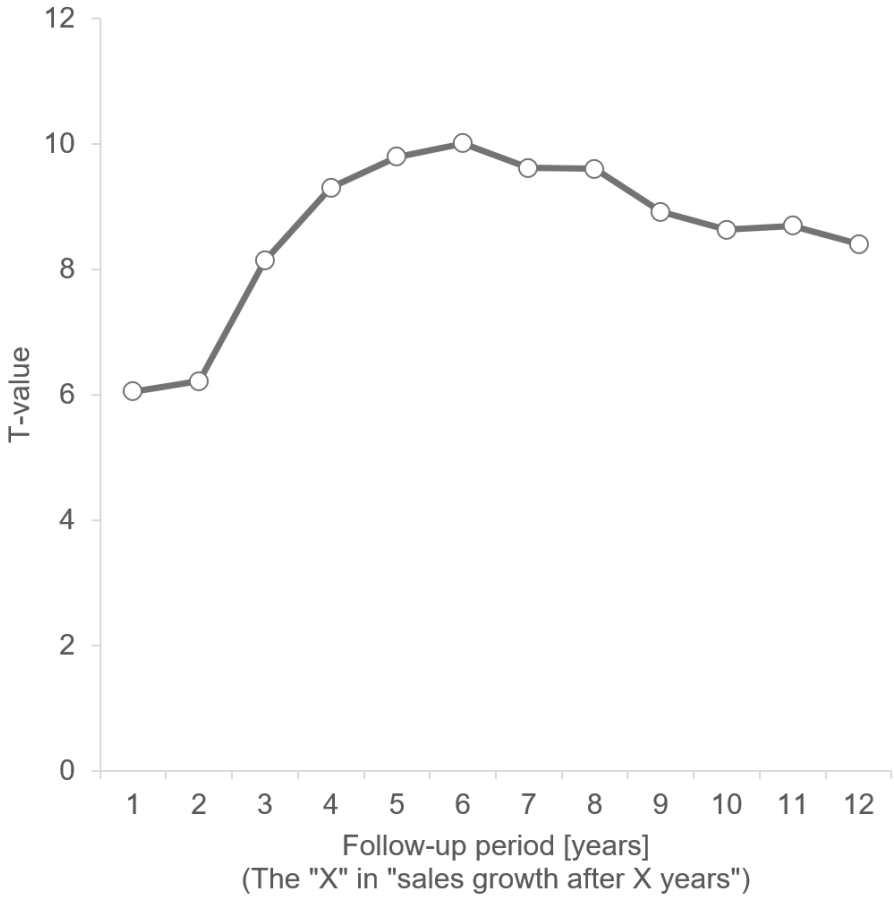


Note: Coefficients in a regression of intrinsic value as of 2010 against rates of sales growth measured at X years after 2010 using the latest available sales results at each point in time, where the X values of 1–12 correspond to the years 2011–2022.

Source: Nomura Securities, based on data from FactSet and Capital IQ

Figure 3 shows the t-values for each of the follow-up periods. This further shows that the relationship between intrinsic value and subsequent growth obtains regardless of the follow-up period chosen. Also, although all of the analysis presented thus far has used 2010 as the base year, we have reliably arrived at similar results when using other base years as well.

Figure 3. T-values for the relationship between global companies' intrinsic value and subsequent sales growth for follow-up periods of varying durations



Note: T-values for the coefficients in a regression of intrinsic value as of 2010 against rates of sales growth measured at X years after 2010 using the latest available sales results at each point in time, where the X values of 1–12 correspond to the years 2011–2022.

An absolute t-value of 2 or higher indicates that the mean difference between the two samples analyzed is statistically significant.

Source: Nomura Securities, based on data from FactSet and Capital IQ

These results show that globally—and for whatever chosen span of time—there is a statistically significant relationship between intrinsic value and longer-term growth potential, and that the longer the span of time examined, the stronger the relationship becomes.

We have chosen to use P/S ratios in our analysis because this measure, unlike the price-to-earnings (P/E) ratio, can be used in analyses of loss-making companies, thus allowing for a broader look at market assessments of companies' growth potential. We did develop a similar model built around P/E, however, which yielded a coefficient of determination of 0.3844. A P/E-based analysis thus uncovers a relationship between intrinsic value and growth potential that is similar to what our P/S-based model finds.

We also ran the same analysis on Japanese companies. As with our model for global companies, we constructed a multiple regression model (formula (2) below) that estimates P/S ratios using three financial metrics (the debt ratio, the DOE ratio, and the short-term growth rate) and an industry dummy (while leaving out the country dummy for obvious reasons). The explanatory power of this model is even higher than that of our global model, with a coefficient of determination of 0.5259.

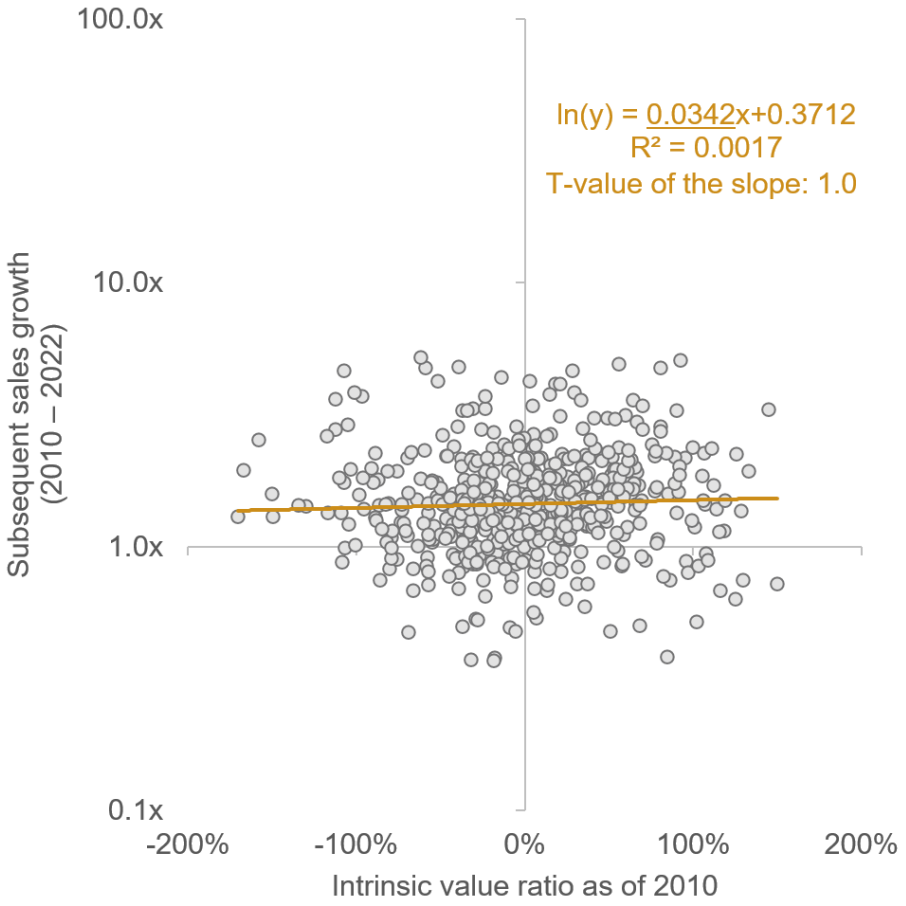
$$\log(PSR_{i,t}) = A_1 \times debt\ \ ratio_{i,t} + A_2 \times DOE_{i,t} + A_3 \times short\ \ term\ \ growth\ \ rate_{i,t} + industry\ \ dummy_i \quad (2)$$

Using this model, we then sought the relationship between Japanese companies' intrinsic value as of 2010 and their rates of growth over the following 12 years. We found no statistically significant relationship here (Figure 4). We re-ran the analysis for other follow-up periods but were unable to find a statistically significant correlation in any of them (Figure 5).

We also developed a model for Japanese companies based on P/E. The model's findings are similar to what we found with the P/S model, with a coefficient of determination of 0.3910 and no statistically significant correlation between intrinsic value and subsequent growth.

What this suggests to us is that, on average, forward growth expectations do not factor much into Japanese companies' share prices, leaving Japanese companies to trade at lower P/B multiples than their peers in Europe and North America.

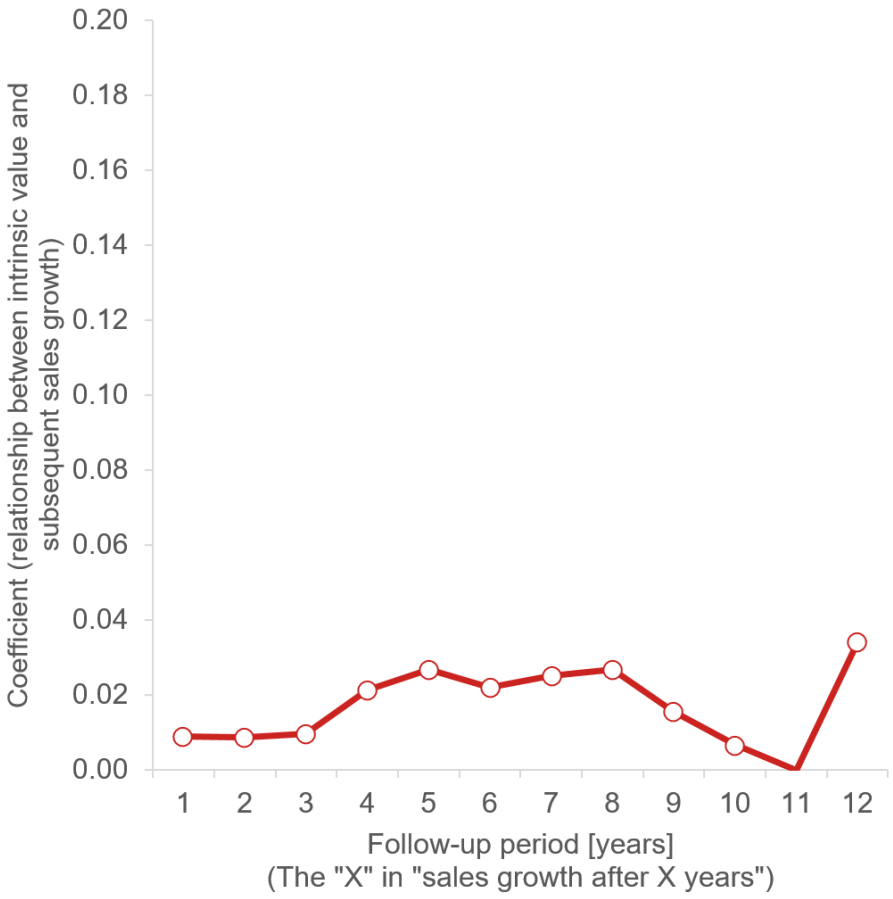
Figure 4. Relationship between intrinsic value and subsequently realized sales growth rates among Japanese companies



Note: The universe analyzed is the set of companies listed on the TSE as of 30 June 2010, narrowed down to the 569 companies for which FactSet consensus forecasts are available and which had positive shareholders' equity and a market capitalization of at least ¥10bn. Sales growth calculated from the latest sales figures available as of 30 June 2010 and the latest sales figures available as of 30 June 2022.

Source: Nomura Securities, based on data from FactSet and Capital IQ

Figure 5. Relationship between Japanese companies' intrinsic value and subsequent sales growth for follow-up periods of varying durations



Note: Coefficients in a regression of intrinsic value as of 2010 against rates of sales growth measured at X years after 2010 using the latest available sales results at each point in time, where the X values of 1–12 correspond to the years 2011–2022.

Source: Nomura Securities, based on data from FactSet and Capital IQ

3) Intrinsic value and impact

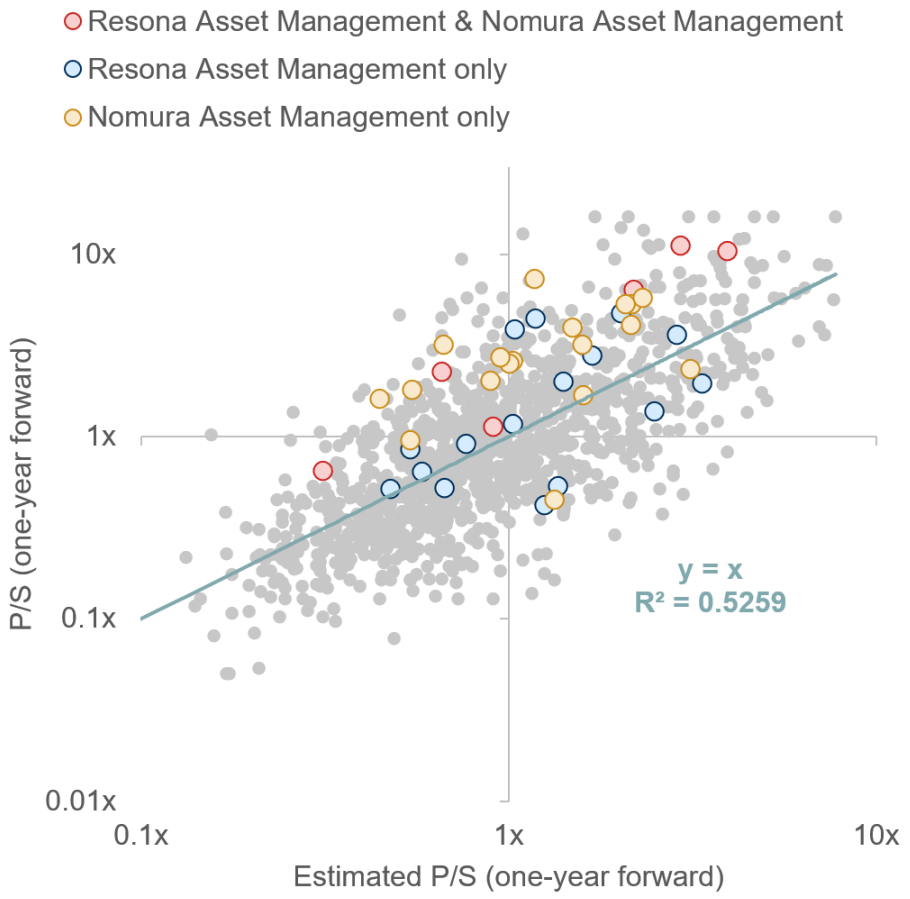
The above analysis shows that, *on average*, longer-term growth expectations have not been reflected in Japanese companies' share prices. However, we find it hard to imagine that this is actually true of all Japanese companies. The question is one of determining what sorts of Japanese companies have share prices that are reflective of the market's longer-term growth expectations for them. In looking for an answer to this question, we turn to the impact reports issued by asset management companies engaged in impact investing, looking specifically at the included calculations of intrinsic value for Japanese companies.

The purpose of impact investing is to make investments that have a positive impact on the environment or society while also generating economic investment returns. The companies targeted for investment by impact investors tend to be firms that possess innovations that make it possible to address societal and environmental challenges while also generating profits, by

lowering the cost of creating those beneficial societal and environmental outcomes. These innovations can take many forms, including groundbreaking ideas or technologies, transformative business models, or creative ways of achieving differentiation from the existing market. Whatever the specifics, the innovation is something that is viewed as the engine of sustainable growth for the company in question, and our thinking is that this corresponds to the intrinsic value we have been discussing here. Japanese companies mentioned in impact reports are presumably being recognized as targets for investment precisely because they possess such innovations that facilitate sustained growth. To investigate this idea, we look into whether the Japanese companies mentioned in asset managers' impact reports have positive intrinsic value by our chosen measure.

In Figure 6 below, the P/S ratio estimates output by our model (formula (2)) are plotted along the horizontal axis, and forward P/S multiples as actually measured are plotted along the vertical axis, with the dots in all cases representing the Japanese companies included in our analysis. On top of that, we add dots for the companies discussed in the impact reports issued by two major asset management companies.

Figure 6. Intrinsic value of companies included in asset managers' impact reports



Note: As of 30 June 2022. Excludes financial companies. Values for P/S, the debt ratio, the DOE ratio, and the short-term growth rate that differ from the mean by more than three standard deviations in either direction are replaced with the value at three standard deviations. Companies included here are the 24 companies mentioned in Nomura Asset Management's report and the 25

companies mentioned in Resona Asset Management's report, narrowed down to the 22 companies for which FactSet consensus forecasts are available.

Source: Nomura Securities, based on data from FactSet

The companies represented by circles above the diagonal line are those trading in the market at P/S ratios higher than the P/S ratio estimates output by our model, which is to say that companies above the diagonal line have positive intrinsic value, while those below the line have negative intrinsic value. The companies represented by red circles appear in the impact reports of both of the asset management firms included in this analysis; all of these have positive intrinsic value. It is also apparent from the chart that companies included in one or the other of the two impact reports are valued by the market as having positive intrinsic value in more instances than not. What we take from this is that "impact companies" are those that are viewed by the market as having a positive impact, and for which that impact is linked to corporate value. Investors' belief that these companies can achieve sustainable growth may explain why impact companies' shares are priced in a way that reflects a positive rate of expected growth.

In conventional equity investing, a potential target for investment need only be assessed along two axes: risk and return. Impact investing adds impact as a third axis along which one must weigh an investment. Whereas risk and return are mostly assessed in terms of economic value based on financial information, it seems reasonable to conclude that impact investors also have to look at the non-financial side of things in making their decisions, specifically by delving into the non-financial information that accounts for a company's intrinsic value and then investing in companies for which that intrinsic value points to the potential for sustainable growth. In Section II of this paper, we take a conceptual look at how impact can be measured, drawing on perspectives from the world of impact investing.

3. What our research attempts to do

In our research, we attempt to isolate the company-specific slice of corporate value left over after subtracting the value explainable by means of financial information and macro-level variables. We then apply the label of "intrinsic value" to this residual value and attempt to visualize and quantify it.

In the impact investing world, visualization often involves the use of outcome indicators. However, investors have pointed out that outcomes and impacts are often highly company-specific in a way that complicates lateral comparisons. As a way of coping with this problem, we focus on startup firms as subjects of analysis, as their businesses are often simpler in structure than those of publicly listed companies. This simplicity makes for more readily expressible impacts. In studying these startups, we attempt to arrive at a set of standardized outcome measures that facilitate side-by-side comparisons. Then, using this common set of standardized outcome indicators, we generate models of the value creation process and attempt to visualize the content of the intrinsic value that is the wellspring of a company's sustainable growth. We deploy generative AI as a tool throughout this analytical process.

We then use this common set of outcome indicators to break down the intrinsic value component of listed companies' share prices, estimate the value associated with each outcome indicator, and attempt to elucidate the mechanism of share price formation from both financial and non-financial angles.

After that, we consider the practical significance of impact visualization, both in dialogue between investors and listed companies and with regard to as-yet-unlisted venture firms. We also look into how valuation approaches can be refined by quantifying the impacts reflected in share prices.

Finally, we explore the unaddressed challenges in the approach we spell out here, and consider some possible practical applications. We also comment on the societal significance of being able to measure the value of non-financial information while using commonly employed valuation models.

II. Existing approaches to impact visualization

In this section, we go over the existing approaches to impact visualization used in the impact investing world, and give some thought to what sorts of common indicators would be best used for the purpose of visualizing impacts.

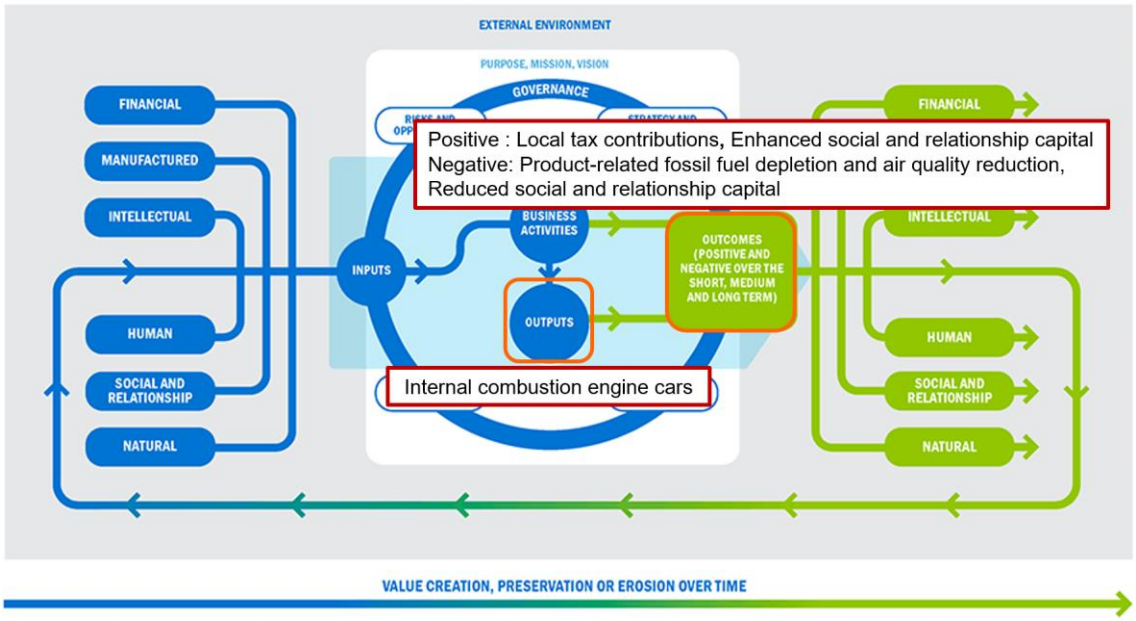
1. A framework and logic model for the value creation process

Starting with their annual securities reports for the fiscal year 2022, all listed Japanese companies—regardless of the market on which they are listed—are now obligated to make disclosures detailing their thinking on the topic of sustainability and the sustainability-related initiatives they are undertaking. Most notably, all listed companies are being asked to make disclosures regarding their human capital that include a human resource development policy, an internal environment development policy, a list of measurable non-financial indicators (inputs/outcomes), targets for those non-financial indicators, and progress towards those targets. The key point for our purposes here is the push for disclosures with respect to outcomes.

In their integrated reports, many companies broadly explain how their businesses create value, using the value creation process framework. In many such examples, however, outputs and outcomes are commingled, and the disclosures are slanted towards presenting information that leaves a positive impression.

To address these problems, the updated International Integrated Reporting Framework specifically defines outputs as "an organization's key products and services" and outcomes as "the internal and external consequences (positive and negative) for the capitals as a result of an organization's business activities and outputs." Figure 7 is an example of what the difference might look like for an automobile manufacturer. In this example, the output is simply automobiles, while on the outcome side, positive outcomes include contributions to the community through the payment of taxes and improved customer satisfaction, and negative outcomes include the depletion of fossil fuels and degraded air quality.

Figure 7. International Integrated Reporting Framework diagram of the value creation process with specific examples for an automaker added

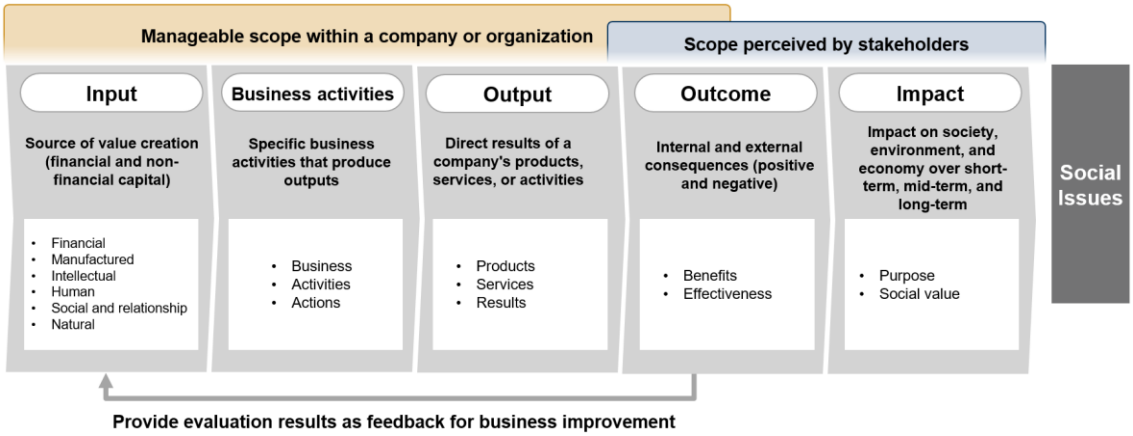


Source: Nomura Securities, using a graphic from the International Integrated Reporting Council (IIRC)

This value creation process framework is based on a logic model, and it is one tool used by impact investors to assess investments along the third axis (which is impact, the other two axes again being risk and return). This tool is in widespread use around the world to help investors sketch out companies' business models as the first step in visualizing impacts.

In Figure 8, we lay out the definitions used in a typical logic model. Here, outcomes are defined simply as "effects on stakeholders", while impacts are defined as "effects on society, the environment, and the economy in the short, medium, and long term". Long spans of time are required to measure how far society has progressed as a result of some impact, and external factors interact with the impact in complex ways. There are thus a great many problems one encounters in trying to measure an impact and manage it as a KPI. This makes impacts poor choices for KPIs. In actual practice, the recommendation is to use outcomes or outputs for one's KPIs instead. Indeed, the SDG Compass, developed by the Global Reporting Initiative (GRI), the United Nations Global Compact (UNGC), and the World Business Council for Sustainable Development (WBCSD), recommends that companies manage their businesses against outcome or output indicators. Assessments of outcomes or outputs can then be used as feedback to be put to work in improving the business so that the company can realize sustainability by means of its business activities.

Figure 8. Definitions in a typical logic model



Source: Nomura Securities

2. Examples of impact visualization by means of outcome indicators

The unfortunate truth about the outcome-based disclosures related to human capital that companies have submitted in their securities reports to date (up through November 2023) is that most of them in fact do not go beyond the output level. The entire point of measuring outcomes in the human capital domain is to incorporate employee capital (skills and capabilities) into the company's organizational capital and thereby drive organizational growth and create value (outcomes). To execute its business strategies, a company needs to define its personnel requirements, and then based on those requirements draw up and execute concrete strategies for securing, retaining, and developing the needed human resources. Outcome indicators measure the results of these strategies.

European companies are at the vanguard in this area, and one of the leading companies among those is the German firm SAP, which has gone through three steps in its visualization of non-financial information: the disclosure of non-financial information, the quantification of non-financial information, and the assignment of monetary values to non-financial information. The first step was to begin disclosures of information at the output level. In the second step, the company formulated its own outcome indicator called the Business Health Culture Index (BHCI), calculated from such output indicators as employee leadership and stress levels. This outcome indicator was created as a means of explaining the results of the output indicators to shareholders. Finally, in the third step, the company analyzed the relationship between its BHCI and its operating profit and revealed that each 1pt improvement in the BHCI adds about ¥11.7bn–¥13.0bn to its operating profit.

In Japan as well, some companies are now beginning to examine the financial impact of their non-financial initiatives. Ajinomoto, for example, has linked up output indicators related to its investment in human capital to proprietary outcome indicators called ASV indicators (abbreviated from "Ajinomoto Group Creating Shared Value") that measure employee engagement. It then monitors and discloses the improvement it observes, expressed as a value of consolidated sales per hour (consolidated sales divided by the number of employees multiplied by the total number of hours actually worked). Nissin Foods Holdings, meanwhile, has employed something called Value Tree Analytics (VTA)—similar to a logic model—to ascertain whether the outputs of its human

capital initiatives lead to improvement in its business KPIs (which are comparable to outcome indicators), or whether there is a correlation at all. The company had previously conducted a value relevance analysis that traced the pathways by which the outputs and outcomes generated by human capital feed through into improved corporate value, and the deployment of VTA allowed the company to validate this story with reference to actual initiatives it has in place.

Many companies are trying out a variety of approaches to these questions of how to express non-financial information in monetary terms and how to identify links between non-financial information and corporate value, but the reality is that an effective approach has yet to be established. What the various approaches being tried have in common, however, is the attempt to express non-financial information in the form of outcome indicators. Institutional investors focused on longer-term performance make their investment decisions after performing comparisons with other companies from both financial and non-financial angles. Proprietary outcome indicators can be a useful and important way for companies to show off their individuality, much like figure skaters in the free skating segment of a competition, but investors also need the equivalent of the short program—a system under which companies make disclosures under a common set of rules for the sake of like-to-like comparisons.

3. Existing outcome indicator classifications and the problems with them

Taking all of the above on board, we argue that outcome indicators make sense as the components of a common set of indicators to be used in visualizing impacts. However, because outcome indicators as they exist now are expressions of corporate individuality, the choices of indicators can vary considerably from company to company. In addition to the open-ended sorts of outcome indicators in use now, we think that a catalog of common outcome indicators that companies could choose from among would make it possible to make apples-to-apples comparisons among different companies' social and environmental impacts. If investors find such a set of common outcome indicators easy enough to use that the system eventually gains widespread adoption, we might expect to see the market develop a deeper understanding of—and heightened interest in—impact investing.

In the next section of this paper, we attempt to create just such a standardized catalog of outcome indicators, but before we proceed to that, below we look at some of the indicator inventories that are already available.

1) IRIS+

The most well-known of all the global catalogs of impact metrics at present is IRIS+, which professes to be "the generally accepted system for measuring, managing, and optimizing impact". The theme-based classification system used by IRIS+ starts with 17 major impact categories (agriculture, air, etc), which are then subdivided into impact themes (like "smallholder agriculture") and further broken down into lists of strategic goals for each theme. Strategic goals have already been determined for many of the selected themes, but some themes are still under development. Although the system offers an inventory of measurables called the IRIS Catalog of Metrics, the number of metrics included is overwhelming (more than 700), and outcome indicators and output indicators are commingled. This makes these metrics difficult to use as labels that convey a given company's individuality.

2) United Nations Impact Radar

The United Nations Environment Programme Finance Initiative has developed something it calls the Impact Radar (Figure 9). This is a system based on the UN's Sustainable Development Goals (SDGs), and in that respect it seems somewhat ill-suited as a classification scheme for companies in more economically developed countries.

Figure 9. The United Nations Impact Radar

Source: Nomura Securities, from the United Nations Environment Programme Finance Initiative

3) Keidanren impact metrics

On 14 June 2022, the Japan Business Federation (Keidanren) announced a set of 84 impact metrics intended as a tool for furthering dialogue between companies and investors, with the idea of *purpose* as the starting point. The Keidanren's materials define impact metrics as "metrics showing the social and environmental changes and effects produced by business operations and activities". And the list includes both cross-sectional metrics (which address impacts across various social issues and can be used across industries) and issue-based metrics (that examine impacts on individual issues). There are 16 cross-sectional metrics including not just financial indicators but also measures such as the number of jobs created and improvement in energy efficiency. Among the issued-based metrics are 34 resilience impact indicators (which relate to community development and the like) as well as a set of healthcare impact indicators. All have been designed so as to be easily adopted by Japanese companies, as the Keidanren's aim is to encourage

companies to make disclosures in accordance with these metrics so that companies and investors can have a common language to use in their dialogues about sustainability. If there is sufficient uptake, we think the Keidanren's framework may help further the cause of constructive dialogue, but we see room for improvement as well, as the assessments are subjective, and no concrete numerical targets have been established. Also, because the companies would be making the disclosures of their own accord, the trustworthiness of those disclosures could be called into question.

III. Visualizing intrinsic value

Starting with the existing frameworks that we outlined in Section II, in this section we make an attempt at visualizing intrinsic value by means of a set of common outcome indicators. We use generative AI to help us create a new catalog of indicators to take the place of existing indicator classifications. Our first step in doing this is to prime the generative AI with some conceptual background knowledge about outcome indicators, and then have it generate a list of outcome indicator candidates with reference to companies' explanatory materials. We then have the AI go through the lists of outcome indicators it has produced to construct a standardized catalog of outcome indicators. Then we prompt the AI to select outcome indicators from among those in the catalog that align with the characteristic features of individual companies. Finally, we take the extracted list of outcome indicators and use it as the starting point for generating models of the value creation processes for specific companies. We employ generative AI at each step in this process, and perhaps the most striking aspect of what we discover is that it is now possible, in some cases, to create a purpose-built catalog of indicators at a cost so low that it could be justified even if the results were to be treated as disposable.

1. Creating a catalog of standardized outcome indicators

1) Using generative AI

Generative AI is an applied type of machine learning in which the AI, after being trained on a corpus of digital content, generates creative, novel outputs in response to prompts. One subset of generative AI systems are large language models (LLMs), which are trained on large volumes of text data and which can perform a variety of language processing tasks.

Generative AI systems differ from earlier forms of AI in that they require much less preparatory work. In a conventional AI project, one had to gather training data with the desired correct responses, train the AI system with that data, and then evaluate the system for its usefulness in real-world business situations. Gathering adequate quantities of training data in advance was costly, and many systems thus developed ultimately made no sense from a cost-benefit standpoint. In contrast, generative AI systems are widely expected to find use in a range of business applications, as they can generate outputs to a reasonable standard of quality even without any training specific to one's business.

That said, it is fairly common for generative AI systems to generate outputs that are not as expected. Getting appropriate outputs from a generative AI system requires care on the user's part in feeding prompts to the system. The process of researching and developing prompts that draw out the desired outputs has come to be referred to as prompt engineering.

In our analysis here, we use the GPT-4 version of OpenAI's ChatGPT tool.

2) Generating a list of outcome indicator candidates

Given what we know about how generative AI works, our starting expectation is that GPT-4 can be induced to generate a highly convincing list of outcome indicator candidates after being taught what is meant by an "outcome" in this context and after being fed some documentation on the company in question.

The flow we established for generating lists of outcome indicator candidates for individual companies is as follows. First, we instruct GPT-4 to adopt the role of a social impact investor. Then we provide the system with an idea of what we mean by "outcome indicators" and "output indicators". After that, we feed the system some textual information that describes the company in question, and from there instruct the system to generate a list of suitable outcome indicators. For our purposes here, we used the descriptions of companies' businesses given in their annual securities reports as the company-specific textual information for the AI to consider.

Below, we outline the actual prompts we used to induce the AI to generate a list of outcome indicator candidates. At the final step in which we input text data drawn from companies' securities reports, one could choose to input text from some other source instead.

(Note: The generative AI prompts and outputs used in this research were written in Japanese, but are presented here in English translation for the reader's benefit.)

#request

You are {#role}. Please suggest output indicators and outcome indicators in {#format} based on {#business description} while strictly abiding by the following {#rules}.

#role

- Social impact specialist

#rules

- Suggest 10 output indicators and 10 outcome indicators in descending order of importance.
- No explanations of the indicators are required.
- Outputs are the tangible products that result from actions or work. Outcomes refer to the effects ultimately generated by the products, and the amount of value created. Please make clear distinctions between outputs and outcomes.
- Please suggest outcome indicators that correspond to social goals.

#format

- JSON
- The JSON object must have two keys: outputs and outcomes
- Values must be in a list format, with 10 output indicators and 10 outcome indicators

#business description

[Business description given in the company's securities report]

Below, we show that the above process yielded in terms of outcome indicator candidates for automotive companies (Figure 10) and software services companies (Figure 11). The results do give one a sense of each company's particular characteristics, but there are also places where similar

ideas are merely being expressed in different terms. The results do not rise to the level of a catalog of common indicators. More work needs to be done to create a standardized catalog.

Figure 10. Outcome indicator candidates for automotive companies

Company	Outcome indicator candidates
Company A	Reduction in CO2 emissions, Improvement in vehicle safety, Reduction in number of vehicle accident fatalities and serious injuries, Reduction in number of vehicle breakdowns, Improvement in employee health and happiness, Number and quality of jobs created…
Company B	Reduction in greenhouse gas emissions, Improvement in safety performance assessments, Improvement in vehicle fuel economy, Reduction in number of product recalls, Number of jobs created, Employee diversity index….
Company C	Motorcycle production volume, EV production volume, Reduction in CO2 emissions, Number of jobs created, Reduction in number of serious injuries and fatalities resulting from accidents, Percentage of vehicle components that are reusable…

Source: Nomura Securities

Figure 11. Outcome indicator candidates for software services companies

Company	Outcome indicator candidates
Company X	Expansion of digital inclusion, Contribution to social innovation, Reduction in CO2 emissions, Advancement of work style reforms, Success in ensuring social safety…
Company Y	Improvement in societal fairness, Expansion in support for the elderly, Number of successes in resolving social issues, Number of instances of support for the socially disadvantaged, Improvement in IT literacy, Number of instances of technological support in developing countries…
Company Z	Improvement in energy efficiency, Reduction in poverty, Jobs created, Improvement in accessibility, Reduction in cybercrime…

Source: Nomura Securities

3) Generating a standardized catalog from among the outcome indicator candidates

To create a standardized catalog, we then fed the outcome indicator candidates for a total of 69 companies (a mix of automotive companies and software services companies) back into GPT-4 and asked it to organize them by concept. In this particular instance, we gave GPT-4 a list of 690 items, made up of the 10 outcome indicator candidates generated for each of the 69 companies included.

Below is an example of the prompt used to instruct GPT-4 to arrange the outcome indicator candidates into a standardized catalog organized by concept.

#request

I would like to organize the {#outcome indicator list}. Please output your response in {#format} while obeying the {#rules}.

#rules

Please sort through the indicators in the {#outcome indicator list} and combine those with the same basic meaning into one. For example, please treat "reduction in CO2 emissions" and "reduction in greenhouse gas emissions" as the same thing.

The indicators in the {#outcome indicator list} do not all occupy the same conceptual layer. Please organize them so that superordinate concepts and subordinate concepts are clearly differentiated.

#format

Bulleted list. However, please output the list in a form that makes the relationships between the conceptual layers clear.

#outcome indicator list

[Outcome indicators for all of the companies included]

Figure 12 presents the standardized catalog of outcome indicators for automotive companies and software services companies output by GPT-4 after this conceptual organizing step. If companies were to select outcome indicators from this sort of catalog and then make disclosures of information on value creation in accordance with them, investors might find it easier to make cross-company comparisons. This might also spur more understanding and interest in impacts, and ultimately help make it so that a company's intrinsic value can become more fully reflected in its share price.

Figure 12. List of outcome indicators after standardization

Catalog of standardized outcome indicators	(Category)
Reduction in greenhouse gas emissions, Recycling rate	Environmental
New jobs created, Industry reform through new business creation	Contribution to the economy
Improvement in automobile safety, Reduction in traffic accidents, Improvement in transportation efficiency	Transportation
Improvement in the livelihoods of people with disabilities, Improvement in product durability, Improvement in health & safety awareness, Improving the reach and convenience of electronic payments	Improvements in convenience & safety
Improvement in digital literacy, Narrowing of the digital divide, Strengthened information security	Realization of a digital society
Improvement in customer satisfaction, Achievement of supply chain transparency, Improvements in working conditions and employee diversity, Employee education & training, Improvement in employee satisfaction, Advancement of work style reforms, Improvement in financial literacy	Corporate management
Improvement in the quality & efficiency of public services, Improvements in social infrastructure	Social contribution

Source: Nomura Securities

2. Extracting outcome labels from the standardized catalog and generating a value creation process

1) About the venture companies analyzed

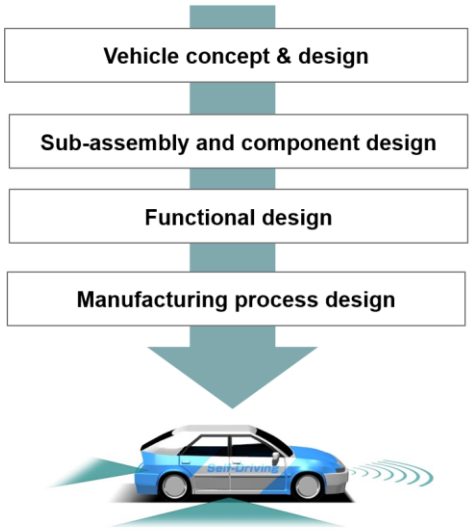
Next, we prompted GPT-4 to select outcome indicators suited to individual companies from among the items in the catalog of outcome indicators we just created. We will refer to the outcome indicators selected by GPT-4 as "outcome labels".

In this instance, we ran this process for two venture companies in the self-driving car space, which would thematically appear to be an area of high social impact. Both companies examined are in the business of expanding the market penetration of self-driving cars, but they differ in their approach to self-driving vehicles, in their targeted customer bases, in their earnings models, and in the drivers of their earnings growth.

Venture A is a vertically integrated company that produces self-driving cars from beginning to end, from design through manufacturing (Figure 13). As a company that aspires to be an actual commercial automaker, it has to be engaged in the design process from the basic vehicle design down to the finer details, and it needs to acquire the production capacity for vehicle manufacturing. Its customers are the individuals and businesses that use automobiles, and its earnings come from the sale of vehicles to these customers.

Figure 13. Venture A's business model

Item	Description
Business domain	Design, development, and manufacture of self-driving cars
Targeted customers	Automobile users (individuals and businesses)
Earnings model	Vehicle sales
Earnings growth driver	Growth in the number of vehicles sold



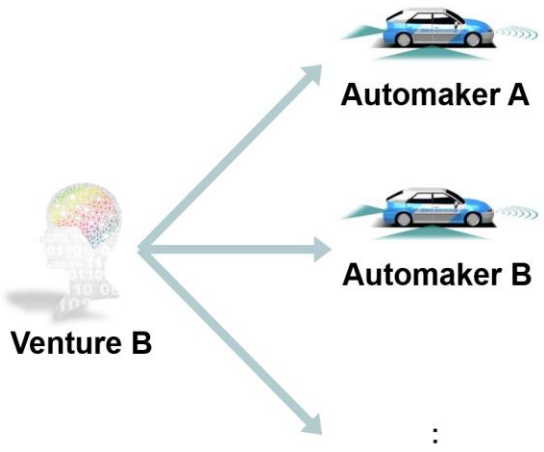
Source: Nomura Securities

Venture B is a platform company that provides the software needed for self-driving cars to work (Figure 14). Its customer base is made up of existing automakers, which make use of Venture B's software to enable autonomous driving functionality in the vehicles they manufacture. Its earnings

come from software licensing fees, and its earnings grow in tandem with growth in the number of customer firms and the number of vehicles in which the software is used.

Figure 14. Venture B's business model

Item	Description
Business domain	Development of an autonomous driving software platform
Targeted customers	Automakers
Earnings model	Licensing fees
Earnings growth driver	Growth in the number of companies using the platform



Source: Nomura Securities

2) Extracting outcome labels

Now we turn to an examination of whether GPT-4 can help us to visualize the difference between the two venture companies by means of labels in the form of outcome indicators. After feeding GPT-4 the text of each company's website, we asked it to select suitable outcome indicators for each company from among the options in the catalog. Below is the prompt we used to do this.

#request

You are {#role}. Please use the {#outcome indicator list} and make suggestions in {#format} while strictly abiding by the following {#rules}.

#role

Social impact specialist

#rules

Please refer to the {#business description} and suggest outcome indicators that would appear to be important.

#format

Bulleted list.

#outcome indicator list

[Standardized list of outcome indicators]

#business description

[Text of venture company's website (main page)]

Figure 15 shows the outcome indicators that GPT-4 selected from the catalog; these are the outcome labels for each company. The outcome indicators "improvement in automobile safety", "reduction in traffic accidents", "improvements in social infrastructure", and "improvement in transportation efficiency" all appear to be about contributions to the popularization of self-driving cars, and all are common to both companies. Beyond those, however, other outcome indicators selected by GPT-4 differ between the two companies in ways that get at the precise differences between the two companies' businesses.

The outcome indicators for Venture A include "reduction in greenhouse gas emissions", "improvement in product durability", and other indicators suited to a company that manufactures and sells actual vehicles. In contrast, one of the outcome indicators selected for Venture B is "improvement in digital literacy", which captures something of the company's identity as a seller of software.

Figure 15. Outcome labels for Venture A and Venture B as selected by a generative AI

Company	Outcome labels
Venture A	Reduction in greenhouse gas emissions, New jobs created, Industry reform through new business creation, Improvement in automobile safety, Reduction in traffic accidents, Improvement in transportation efficiency, Improvement in product durability, Strengthened information security, Employee education & training, Improvement in the quality & efficiency of public services, Improvements in social infrastructure
Venture B	New jobs created, Industry reform through new business creation, Improvement in automobile safety, Reduction in traffic accidents, Improvement in transportation efficiency, Improvement in digital literacy, Strengthened information security, Employee education & training, Improvement in employee satisfaction, Advancement of work style reforms, Improvements in social infrastructure

Note: Outcome labels in red are those that were selected for only one of the two companies

Source: Nomura Securities

3) Generating a value creation process

Finally, we have GPT-4 generate a value creation process using the outcome labels we just extracted.

Much as with the procedure we used above, we asked GPT-4 to play the part of a social impact specialist, and gave it background information on what a value creation process is. We then presented it with the list of selected outcome labels and instructed it to generate a model of the value creation process. The prompt we used to do this looks like this:

#request

You are {#role}. Please generate a value creation process for an enterprise in accordance with the following {#rules}. Please output the value creation process in {#format}.

#role

- Social impact specialist

#rules

- A value creation process is something that expresses what sort of value an enterprise creates for the environment, for society, and for its stakeholders as a result of conducting its business activities after inputting capital. It has four elements: (1) inputs, (2) business activities, (3) outputs, and (4) outcomes.
- (4) outcomes are defined as {#outcome indicator list}.
- Please refer to the {#business description} and {#outcome indicator list}, and based on those give suggestions for the (1) inputs, (2) business activities, and (3) outputs. Present your answers not in sentence form but as a bulleted list.

#format

- Bulleted list.
- Please include entries for each of these four headings: (1) inputs, (2) business activities, (3) outputs, (4) outcomes.

#outcome indicator list

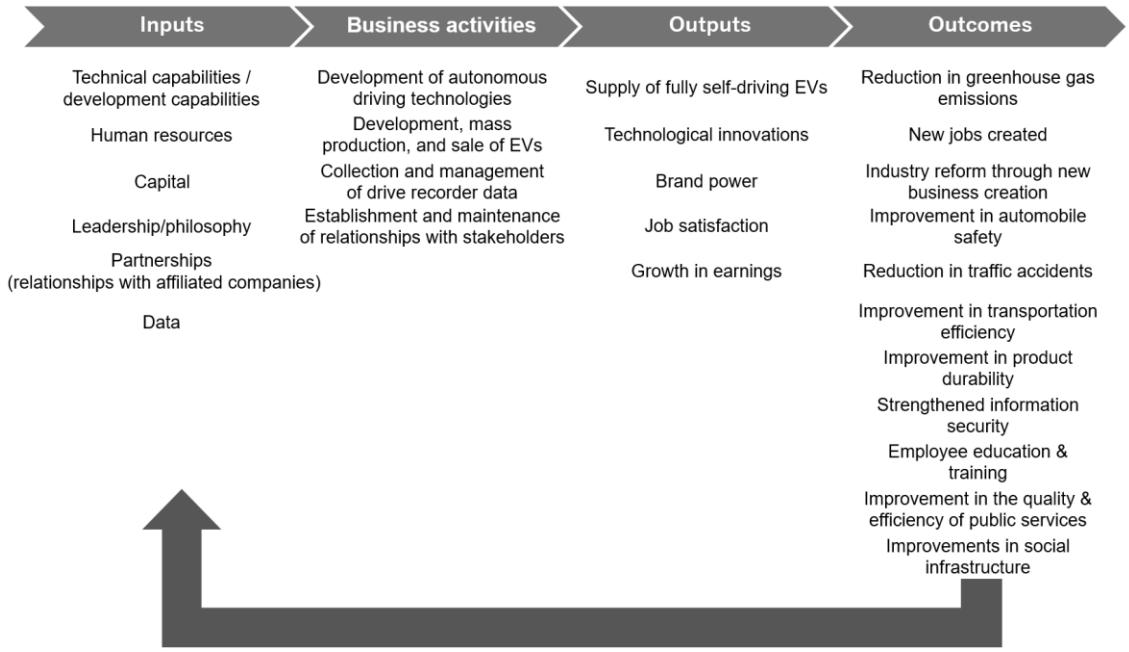
[List of outcome indicators that the generative AI selected for the company in question]

#business description

[Text from the company's website]

Figure 16 is the value creation process that GPT-4 generated for Venture A. Under "business activities", GPT-4 has suggested "development, mass production, and sale of EVs", reflecting the business model of Venture A, which aspires to be a full-fledged automaker that manufactures self-driving cars in-house. Similarly, the list of outputs includes "supply of fully self-driving EVs".

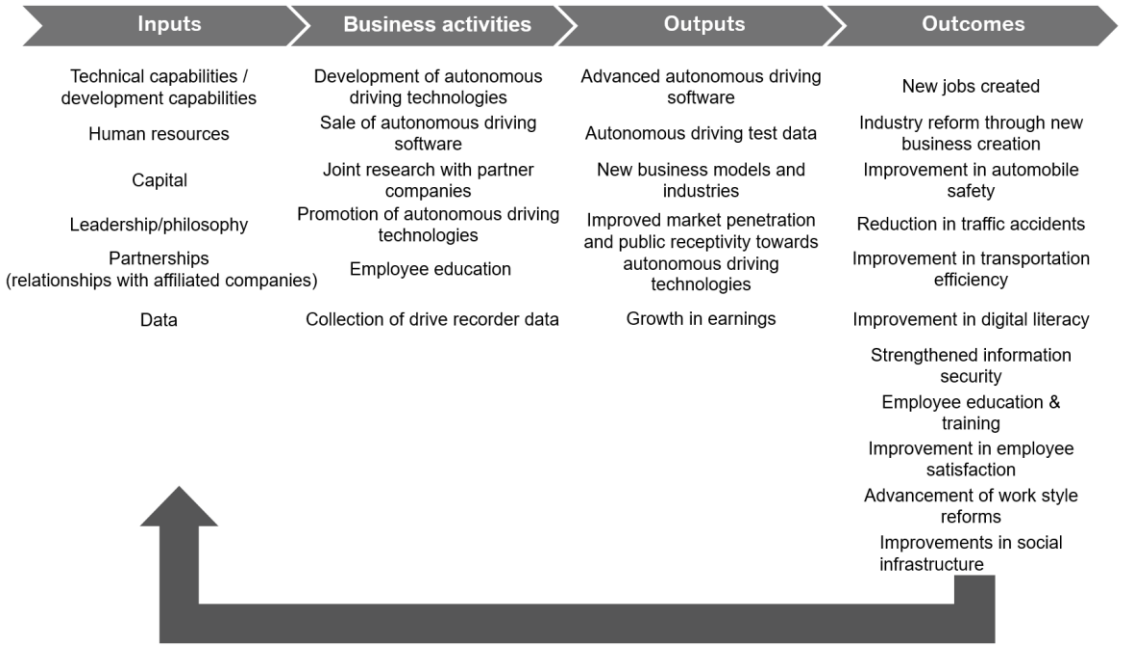
Figure 16. Value creation process that a generative AI produced for Venture A



Source: Nomura Securities

Figure 17 is the value creation process created for Venture B. For this company, GPT-4 has suggested "sale of autonomous driving software" under "business activities" in a nod to the company's business model, which involves the creation of a platform for the provision of software needed for self-driving cars. Also, the suggested outputs include "advanced autonomous driving software". The generative AI seems to have appropriately described how Venture B's business activities ("development of autonomous driving technologies" and "sale of autonomous driving software") lead to the creation of "advanced autonomous driving software" as an output.

Figure 17. Value creation process that a generative AI produced for Venture B



Source: Nomura Securities

If one were to decide that the results produced by the AI were not suitable, the problem could be addressed in a number of ways: a human could manually edit the output, or could prompt the AI to revise the outputs through further dialogue, or could re-run the process from scratch by changing the content of the original prompt. All of these can be done easily. The value creation process models generated through the AI-based process spelled out here seem to be wholly adequate as starting points for internal discussions within a company.

3. Remaining challenges and the way forward

Because the attempt we have made here to produce a standardized catalog of outcome indicators draws on examples from two fairly broad categories (automotive companies and software services companies), the catalog we created does not seem to work especially well to capture the fine particulars of individual businesses. It may be that by producing a catalog using the examples of companies in more narrowly defined sectors, one could get a clearer picture of the sector-specific impacts that are the wellsprings of sustainable growth. It would also be helpful, we think, to use this approach to extract outcome labels for a larger number and variety of industries. Identifying extracted outcome labels that are shared across multiple industries is arguably one way to identify some of the key social issues running through Japanese society.

The approach we have taken here does away with the arbitrariness introduced by humans in that it relies on a generative AI tool to produce a standardized catalog with reference to information from company disclosures. The process is also notable for requiring very little in the way of manual labor or time, as the AI is also used to extract outcome labels suited to particular companies from among those in the catalog, and to generate the value creation process models. Combining the catalog of standardized outcome indicators made by means of generative AI with the existing catalogs

discussed in Section II opens up some further practical applications. For example, one way to pair this AI-based approach with Keidanren's impact metrics would be to use this tool to generate a broad value creation process model and then select the individual Keidanren impact metrics that are the best fit for each of the outcome labels in it. We propose that one effective way for companies to engage in constructive dialogue with investors might be to gauge how much value each outcome label contributes to the company's stock price (using the method detailed in the next section), and based on that develop a company-specific value creation story using the Keidanren impact metrics that best correspond to each of those labels.

IV. Using outcome labels to quantify the impacts reflected in share prices

In this section, we attempt to quantify the value of impacts reflected in companies' share prices, analyzing intrinsic value from an equity valuation standpoint using the outcome labels extracted from the standardized catalog we created in Section III. As discussed above, we picture this approach as eventually being used in analyses that cut across industries, but as an initial foray we choose here to focus on companies in the software services sector. Our hope is that the reader will find the results of our analysis to be a useful reference, with the caveat that the analysis we perform here is essentially a prototype, run on a narrowly defined universe.

1. Estimating the P/B premium or discount

We have put together a quantitative model that explains P/B multiples for 29 Japanese software services companies (a group that includes system integrators, software-as-a-service (SaaS) companies, and other software services companies) in terms of ROE and short-term growth rates (formula (3) below). We will refer to this as the "ROE and short-term growth model". The coefficient of determination for this model is quite high, at 0.68, but the P/B multiples output by the model do differ somewhat from the companies' actual P/B multiples. We will refer to this error as the "P/B premium or discount", and analyze it by means of the abovementioned outcome labels.

$$PBR_{i,t} = A_1 \times ROE_{i,t} + A_2 \times short\ \ term\ \ growth\ \ rate_{i,t} \quad (3)$$

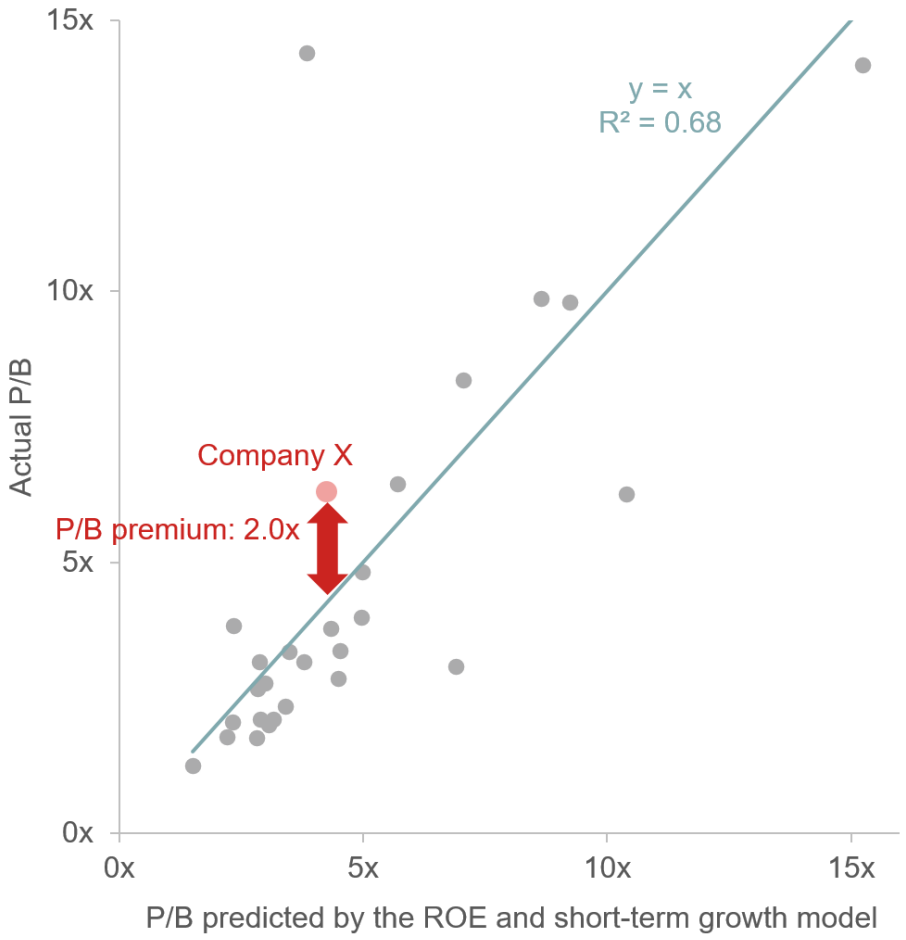
$$\text{ROE} = \text{one year forward net income forecast} \ / \ \text{shareholders' equity}$$

One year forward net income calculated as the weighted average of the current-year net income forecast and the next-year net income forecast

$$\text{Short term growth rate} = \text{next year sales forecst} \ / \ \text{current year sales forecast} - 1$$

The predicted P/B multiples for each of the companies studied, as output by our ROE and short-term growth model, are plotted along the horizontal axis in Figure 18. The actual P/B multiples are plotted along the vertical axis. Points that land above the diagonal line represent companies for which the actual P/B multiple is higher than the multiple predicted by the model. Company X, for example, trades at a P/B that is 2.0x higher than the predicted value. One way to read this is to say that the market values the stock at a 2.0x P/B premium to what can be explained by ROE and the short-term growth rate alone. Points that land below the diagonal line, in contrast, represent companies that trade at a P/B discount.

Figure 18. P/B multiples predicted by the model vs actual P/Bs



Source: Nomura Securities

2. Analyzing the P/B premium or discount using outcome labels

1) Extracting outcome labels that explain the P/B premium or discount

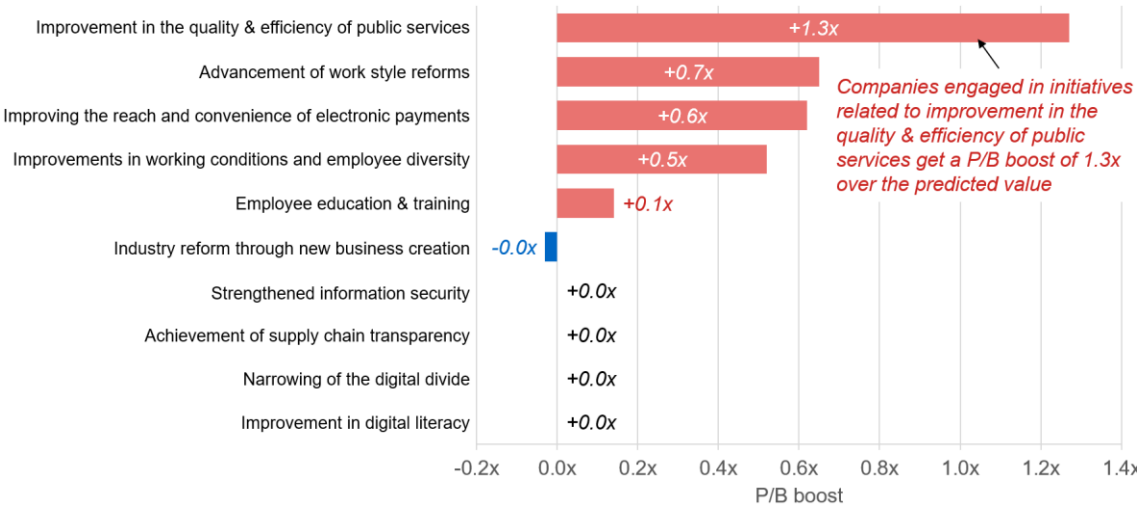
Next, we attempt to identify what sorts of outcomes are responsible for these observed P/B premiums and discounts. Outcomes are intimately tied in with the impacts that companies have on society and the environment, so in attempting to isolate the relevant outcomes, we are hoping to discover which sorts of corporate initiatives the market values the most in terms of the specific impacts that those initiatives relate to.

For this analysis, we created a model that uses the outcome labels as factors to explain the P/B premium or discount. We will refer to this as the "outcome label model". To be specific, we use a machine learning algorithm called DART (for Dropouts meet Multiple Additive Regression Trees), which is one type of gradient boosted regression tree algorithm. Using GPT-4, we refer to the business descriptions given in companies' securities reports, and assign a 1 to each outcome for which the company appears to be engaged in relevant initiatives, and a 0 to each outcome for which there appear to be no such relevant initiatives. Because we have opted for a limited sample population, we whittle down the overall standardized catalog of outcome indicators to the 10

outcome labels that GPT-4 determines to be especially relevant to the sample population. We then analyze what contribution each of the outcome labels makes to the P/B premium or discount.

Figure 19 presents the 10 outcome labels that GPT-4 has selected on the vertical axis. In our findings, the outcomes that make positive contributions to the P/B premium are, in descending order of contribution, "improvement in the quality & efficiency of public services", "advancement of work style reforms", "improving the reach and convenience of electronic payments", "improvements in working conditions and employee diversity", and "employee education & training". We also find that the stocks of companies without any initiatives corresponding to the chosen outcome labels trade at a 1.2x P/B discount to the value predicted by the ROE and short-term growth model. In the analysis of P/B premiums and discounts for individual companies that follows, we treat this lower P/B level (after the 1.2x discount) as the baseline, and then look into the extent to which each outcome label pushes up the P/B from there.

Figure 19. List of 10 outcome labels extracted by generative AI and the contribution each makes to the P/B premium (or discount)



Source: Nomura Securities

The software services industry helps users perform more efficiently through the use of computer technology. For this industry, the outcome labels estimated to contribute positively to P/B premiums include "improvement in the quality & efficiency of public services", "advancement of work style reforms", and "improving the reach and convenience of electronic payments". These outcome labels can be read as items that can help improve Japan's overall business efficiency and help relieve labor shortages. Japan's population has begun shrinking, and it may be that the market has decided that these outcomes merit the assignation of a valuation premium in that they can help boost the country's growth and sustainability over the longer term.

On the other hand, our findings indicate that the outcome labels "strengthened information security", "narrowing of the digital divide", and "improvement in digital literacy" do not contribute to P/B premiums. While these outcome labels do seem to represent things that contribute to improvements in business efficiency, they also appear to apply generically to software services companies across the board. This may explain why these outcome labels were not singled out as

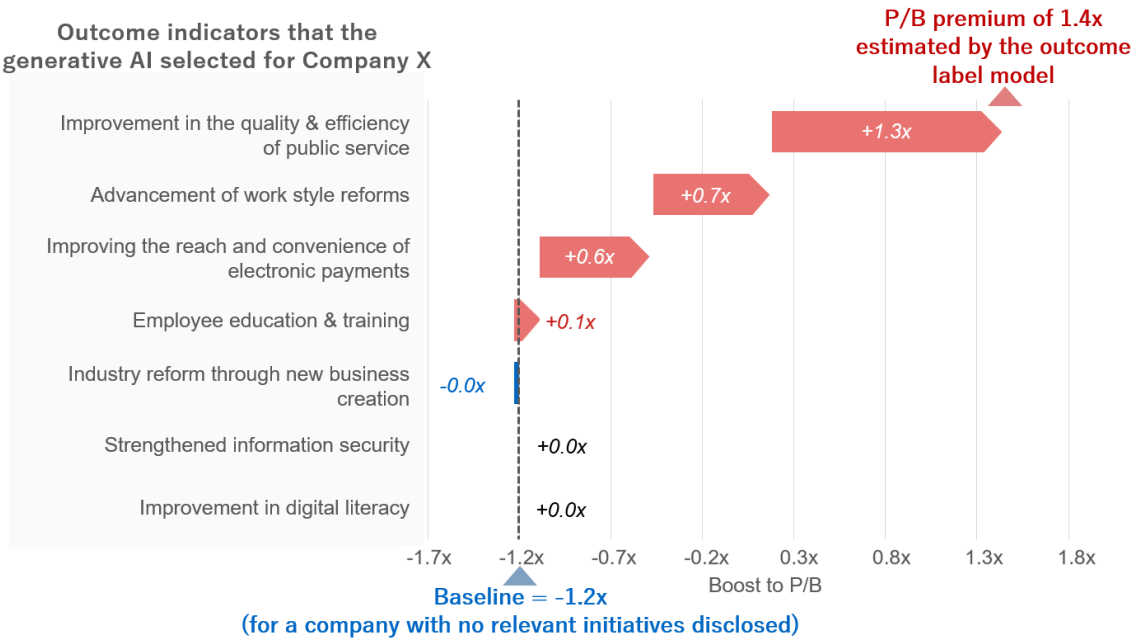
points by which to differentiate one software services company from another in horizontal comparisons. Much the same can be said of the outcome label "industry reform through new business creation".

Next, we present the results of an attempt to use these 10 outcome labels to break down the P/B premiums or discounts assigned to individual stocks.

2) Example of a P/B premium broken down by outcome label

Figure 20 presents the results of our attempt to break down the P/B premium for Company X using these outcome labels. Among the labels that GPT-4 picked for Company X were "improvement in the quality & efficiency of public services", "advancement of work style reforms", "improving the reach and convenience of electronic payments", and "employee education & training". These are labels that were determined to be making positive contributions to the P/B premium, so what our findings show is essentially a stack of factors all making positive contributions. GPT-4 also picked the label "industry reform through new business creation", but because this was judged to be a slightly negative element, this label is treated as making a negative contribution to the P/B premium for Company X. Starting from the baseline of a company that has no disclosures of initiatives relevant to any of the outcome labels, the accumulation of the contributions from the outcome labels for Company X adds up to a P/B premium of 1.4x, which is to say that the outcome labels explain about 70% of the P/B premium of 2.0x at which Company X's shares actually trade (over the value predicted by our ROE and short-term growth model).

Figure 20. Outcome label breakdown of the P/B premium estimated for Company X



Note: The baseline used is the example of a company with no disclosures of initiatives relevant to any of the outcome labels (a P/B discount of 1.2x)

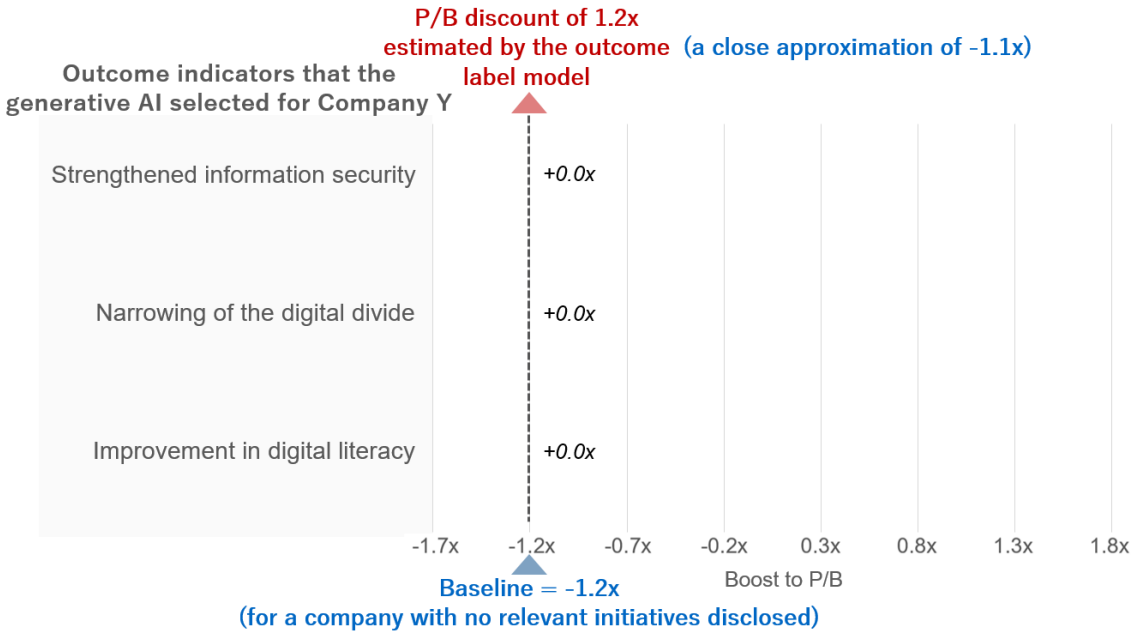
Source: Nomura Securities

3) Example of a P/B discount broken down by outcome label

To make a contrast with the example of Company X given above, we now present an analysis for Company Y (Figure 21).

In Company Y's case, GPT-4 assigned no labels judged to contribute to a P/B premium, so the appropriate P/B premium as estimated by the outcome label model ended up being the baseline itself, or -1.2x. The actual P/B at which Company Y's stock trades was 1.1x lower than the P/B predicted by our ROE and short-term growth model, and this error is a very near match for the -1.2x output by our outcome label model. All of this may indicate that Company Y is not making adequate disclosures related to the outcome labels that the market rates most highly, and that the shares are trading at a discount as a result.

Figure 21. Outcome label breakdown of the P/B discount estimated for Company Y



Note: The baseline used is the example of a company with no disclosures of initiatives relevant to any of the outcome labels (a P/B discount of 1.2x)

Source: Nomura Securities

V. The practical significance of visualizing and quantifying impacts

1. Significance in furthering constructive dialogue between investors and listed companies

The impacts that are the wellspring of sustainable value creation are highly company-specific. Companies have to date been fairly free-ranging in their commentary on impacts, in part out of a desire not to be forced into a one-size-fits-all scheme. Investors, on the other hand, noting that the available information on impacts is primarily qualitative, have been complaining that it can be quite hard to make lateral comparisons between companies, and that it is therefore difficult to fold the information on impacts into assessments of corporate value. Given that reality, our aim in this paper has been to use a logic model framework to come up with a set of standardized outcome-level indicators that capture these highly company-specific impacts.

We think that making the intrinsic value of companies more visible by means of these outcome indicators can help advance the cause of fruitful dialogue between investors and companies. A company that can present a tangible sense of its impact on society can expect to draw in people with whom the company's objectives resonate, thereby adding to its base of shareholders and fans. Moreover, we think that the recent attention being given to ethical consumption can benefit companies whose businesses involve addressing societal issues, as these companies may attract more support from customers and consumers, which in turn can boost their sales and the power of their brands. On top of that, companies that also look likely to achieve sustainable growth in sales and profits should be able to attract loyal shareholders in the form of ESG investors and impact investors with long horizons. Companies with a base of stable shareholders should find themselves better able to cope with market fluctuations and uncertainty, and that stability should help to lower their share price volatility.

Investors, meanwhile, can make their investment portfolios more sustainable by focusing on impacts and investing in companies that seek to achieve sustainability in their own operations and across society as a whole. In speaking with impact investors outside Japan, one opinion we have heard is that pre-specified indicators can serve as a clear objective for dialogue, and that this helps drive companies to improve their operations in a way that enhances corporate value. The result is the emergence of a positive correlation between impacts and corporate value.

The standardized outcome labels that we have produced here, while still in need of improvement, are something that we think could function as a tool to stimulate fresh dialogue regarding the intrinsic value of companies. Sustainable growth is made possible by robust corporate disclosures and the presence of high-quality dialogue between companies and investors. If more and more institutional investors take an interest in outcome KPIs and impact KPIs in addition to the usual financial KPIs, and if we start to see more engagement that rests on the assumption that these other KPIs will be referenced in business decision-making, we would then expect to also see more Japanese companies becoming the subject of higher expectations for sustainable growth.

2. Significance with respect to as-yet-unlisted venture firms

We think that venture companies may find a common set of outcome labels to be a highly effective framework within which to discuss their impacts, starting well before they go public. Venture firms are often founded through a willingness to take risks for the sake of resolving some societal issue, but it often happens that these companies find it difficult to explain the actual social impact that resolving the chosen issue would have. These companies often lack the time and human resources needed for thorough explanations. The use of standardized outcome labels would give these companies an effective means by which to help investors understand what problem the company is trying to solve, and what impacts a solution to that problem might have on society. This would make it easier for investors to discern the intrinsic value of venture companies, and could lead to more activity in the venture investment space.

For the sake of sustainable growth in Japan's economy, it is important not just to increase the number of "unicorn" companies valued highly at the time of their initial public offerings, but also to encourage sustainable gains in the corporate value of companies after they have gone public. As discussed in Section II of this paper, publicly listed companies are being encouraged to make disclosures at the level of outcomes. Highly individualized startups that want to earn fair valuations after they go public might find it helpful to take steps well before their initial offerings to tell a growth story that references concrete numbers and data and presents a picture of their efforts to generate impacts.

Also, an oft-cited problem with capital markets in Japan is that there is a divide running through the market, with pre-IPO investors on one side of the line and post-IPO investors on the other. One of the functions of securities brokerages is to manage the smooth handoff from one set of investors to the other. We think that the tool we have developed here can help companies to realize the enhancement of corporate value seamlessly as they make the transition from private to public.

3. Significance for equity valuations

Relative valuations have an important role to play in a variety of situations. However, attempts at relative valuations that mechanistically determine the universe of companies to compare using standard industry classifications often yield results that are intuitively unsatisfying. Such approaches also fail to make clear distinctions between companies with significant longer-term exposure to some particular impact and those without. In practice, then, it is quite common for analysts and investors to define their own comparison universes as they see fit. For example, one can consume textual information about business risks and opportunities and then define a universe of companies that look comparable based on one's reading of that information, but any analysis of that universe will be compromised by the arbitrariness that creeps into the universe selection process. Even if one were to set that problem aside, it is also the case that it would be impossible to assemble a list of companies that are comparable in *all* respects—now more than ever, given the degree to which Japanese companies have diversified. The obvious solution to this problem would be to use a multi-label model that assigns multiple labels to individual companies, and then use the set of all companies as the universe for analysis. But it is unrealistic to expect humans, with their inbuilt limitations, to assign multiple labels to each and every listed company.

In this paper we have proposed what is essentially a multi-labeling framework that systematically assigns multiple outcome labels to individual companies with the help of a generative AI. We think this approach may be the solution needed for the problem spelled out above. By isolating the contributions made by each variable, a valuation model that employs multiple outcome labels as explanatory variables can make it clear how highly the market values each of a company's business strategies and innovations with social or environmental impacts. This model would also let investors perform individual company valuations that take into account both financial and non-financial information. This would have significant implications for valuations of individual companies, first in that stock valuations would capture something of a company's specific character in terms of its impacts, and second in that one would have an objective means by which to draw out information about how the market as a collective values companies' specific initiatives with respect to important social and environmental impacts. In the section that follows we look at how this approach might apply to mergers & acquisitions.

4. Applications in M&A valuations and other areas

Relative valuations are commonplace in the M&A realm as well, where one often hears valuation multiples for same-industry peers referenced in discussions of whether a particular company is overvalued or undervalued. However, a company whose business is ambitiously designed to achieve substantial social or environmental impacts over the longer term could easily end up looking highly overvalued relative to industry peers when using some off-the-shelf valuation measure like one-year forward P/E. By combining the conventional use of valuation multiples that capture overvaluation or undervaluation relative to sector peers with the framework outlined in this paper, investors should have a means by which to look at companies making forays into similar potential markets and judge whether they are overvalued or undervalued. The approach we have presented here allows one to access the market's collective intelligence, for instance in seeking to determine how highly the market rates a particular approach to tapping a specific potential revenue pool, and in sorting out whether a particular company is rated more highly than others in its pursuit of that approach. We think that the availability of access to that collective intelligence can contribute greatly to furthering the understanding of future-oriented efforts to address societal challenges.

Looking ahead, we may see more M&A actions geared specifically towards realizing impact synergies is it becomes easier to assess positive impacts in a logical way based on an accumulation of knowledge about impacts from a variety of perspectives. Many startups exist specifically to address a societal issue of some kind, but getting the business off the ground is often hugely expensive and time-consuming. Also, because of the time needed to deal with the societal issue, the timeline for the realization of impacts can be quite long. There is a significant risk, then, that funding could dry up before the impacts are realized, but putting the startup under the umbrella of a large company can increase the likelihood of the impacts being realized eventually. Japan's Cabinet Secretariat has issued a five-year plan for startup development that that includes the observation that sustainable growth becomes more likely if startups can license their new technologies out to high-quality listed companies. If a diverse array of companies with different technological proficiencies and different business models can come together and cooperate, we would expect them to be able to generate synergies and act quickly in attempting to tackle societal challenges. Improving the quality of impact assessments and building up a storehouse of

knowledge on the subject can, we think, help a great deal in helping to bring about that kind of society.

VI. In conclusion: What needs doing and what lies ahead

In the first half of this paper, we attempted to develop a standardized set of outcome labels to use in assessing impacts. This work is still at the prototype stage, but by putting some earnest work into refining it, our hope is that, in the near future, we can turn this approach into a genuinely useful tool by which to evaluate impacts. Our take on "standardization" is that it involves applying labels to as many companies as possible using the same set of standards; we do not think that the work of assessing impacts necessarily requires a fixed labeling scheme. If anything, good labeling schemes need to be able to make distinctions among companies based on what sort of initiatives are being undertaken to tap what revenue pools, for example, and what sort of strategies or business models are being adopted in the interest of capturing market share. The task now is to establish a flow for generating satisfying labeling schemes that meet this requirement and that apply horizontally across all industries.

One of the biggest lessons learned in our research thus far is that the use of generative AI has radically expanded the range of possibilities for flexible and customized labeling. Recent advances in prompt engineering make what we are attempting to do here look achievable, and we intend to proceed quickly with development.

It is also our belief that being able to use standardized outcome labels as a means by which to qualitatively and quantitatively discuss individual companies' impacts and value creation processes in the context of dialogue between investors and companies ought to be a highly effective means by which to showcase the intrinsic value that many Japanese companies already quietly possess. We think that making that intrinsic value plain and visible should help lift expectations for continuous growth in a way that becomes reflected in companies' share prices and makes Japanese companies more competitive.

In the second half of this paper, we measured the value of impacts built into share prices by applying these standardized outcome labels to a conventional valuation method. Impact investing involves long time scales and considerable risk, and this makes it difficult to deductively arrive at fair standards by which to judge risks and returns. Even so, we think that impacts can be assessed within a conventional risk & return context. The critical thing is to measure the impacts rooted in non-financial information using capital market yardsticks that traditional investors can accept. Progress on that front could broaden the base of investors interested in impacts and could lead to an increase in the amount of risk money allocated to impact projects. We think it would be a societally significant outcome if, in the future, risk money could be supplied under a fair set of conditions to businesses that aim to realize social and environmental impacts while also generating substantial economic returns. By accumulating more know-how in the area of impact assessment and refining the flow of dialogue and analysis involved, we hope to play a part in supporting the allocation of risk money—on fair terms—to projects that could have a substantial impact on society.

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Appendix A-1

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Margin transactions are subject to a sales commission of up to 1.43% (tax included) of the transaction amount (or a commission of ¥2,860 (tax included) for transactions of ¥200,000 or less), as well as management fees and rights handling fees. In addition, long margin transactions are subject to interest on the purchase amount, while short margin transactions are subject to fees for the lending of the shares borrowed. A margin equal to at least 30% of the transaction amount (at least 33% for online transactions) and at least ¥300,000 is required. With margin transactions, an amount up to roughly 3.3x the margin (roughly 3x for online transactions) may be traded. Margin transactions therefore carry the risk of losses in excess of the margin owing to share price fluctuations. For details, please thoroughly read the written materials provided, such as listed securities documents or documents delivered before making a contract.
Transactions involving convertible bonds are subject to a sales commission of up to 1.10% (tax included) of the transaction amount (or a commission of ¥4,400 (tax included) if this would be less than ¥4,400). When convertible bonds are purchased via OTC transactions (including offerings), only the purchase price shall be paid, with no sales commission charged. However, Nomura Securities may charge a separate fee for OTC transactions, as agreed with the customer. Convertible bonds carry the risk of losses owing to factors such as interest rate fluctuations and price fluctuations in the underlying stock. In addition, convertible bonds denominated in foreign currencies also carry the risk of losses owing to factors such as foreign exchange rate fluctuations.
When bonds are purchased via public offerings, secondary distributions, or other OTC transactions with Nomura Securities, only the purchase price shall be paid, with no sales commission charged. Bonds carry the risk of losses, as prices fluctuate in line with changes in market interest rates. Bond prices may also fall below the invested principal as a result of such factors as changes in the management and financial circumstances of the issuer, or changes in third-party valuations of the bond in question. In addition, foreign currency-denominated bonds also carry the risk of losses owing to factors such as foreign exchange rate fluctuations.
When Japanese government bonds (JGBs) for individual investors are purchased via public offerings, only the purchase price shall be paid, with no sales commission charged. As a rule, JGBs for individual investors may not be sold in the first 12 months after issuance. When JGBs for individual investors are sold before maturity, an amount calculated via the following formula will be subtracted from the par value of the bond plus accrued interest: (1) for 10-year variable rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used, (2) for 5-year and 3-year fixed rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used.
When inflation-indexed JGBs are purchased via public offerings, secondary distributions (uridashi deals), or other OTC transactions with Nomura Securities, only the purchase price shall be paid, with no sales commission charged. Inflation-indexed JGBs carry the risk of losses, as prices fluctuate in line with changes in market interest rates and fluctuations in the nationwide consumer price index. The notional principal of inflation-indexed JGBs changes in line with the rate of change in nationwide CPI inflation from the time of its issuance. The amount of the coupon payment is calculated by multiplying the coupon rate by the notional principal at the time of payment. The maturity value is the amount of the notional principal when the issue becomes due. For JI17 and subsequent issues, the maturity value shall not undercut the face amount.
Purchases of investment trusts (and sales of some investment trusts) are subject to a purchase or sales fee of up to 5.5% (tax included) of the transaction amount. Also, a direct cost that may be incurred when selling investment trusts is a fee of up to 2.0% of the unit price at the time of redemption. Indirect costs that may be incurred during the course of holding investment trusts include, for domestic investment trusts, an asset management fee (trust fee) of up to 5.5% (tax included/annualized basis) of the net assets in trust, as well as fees based on investment performance. Other indirect costs may also be incurred. For foreign investment trusts, indirect fees may be incurred during the course of holding such as investment company compensation.
Investment trusts invest mainly in securities such as Japanese and foreign equities and bonds, whose prices fluctuate. Investment trust unit prices fluctuate owing to price fluctuations in the underlying assets and to foreign exchange rate fluctuations. As such, investment trusts carry the risk of losses. Fees and risks vary by investment trust. Maximum applicable fees are subject to change; please thoroughly read the written materials provided, such as prospectuses or documents delivered before making a contract.
In interest rate swap transactions and USD/JPY basis swap transactions (“interest rate swap transactions, etc.”), only the agreed transaction payments shall be made on the settlement dates. Some interest rate swap transactions, etc. may require pledging of margin collateral. In some of these cases, transaction payments may exceed the amount of collateral. There shall be no advance notification of required collateral value or collateral ratios as they vary depending on the transaction. Interest rate swap transactions, etc. carry the risk of losses owing to fluctuations in market prices in the interest rate, currency and other markets, as well as reference indices. Losses incurred as such may exceed the value of margin collateral, in which case margin calls may be triggered. In the event that both parties agree to enter a replacement (or termination) transaction, the interest rates received (paid) under the new arrangement may differ from those in the original arrangement, even if terms other than the interest rates are identical to those in the original transaction. Risks vary by transaction. Please thoroughly read the written materials provided, such as documents delivered before making a contract and disclosure statements.
In OTC transactions of credit default swaps (CDS), no sales commission will be charged. When entering into CDS transactions, the protection buyer will be required to pledge or entrust an agreed amount of margin collateral. In some of these cases, the transaction payments may exceed the amount of margin collateral. There shall be no advance notification of required collateral value or collateral ratios as they vary depending on the financial position of the protection buyer. CDS transactions carry the risk of losses owing to changes in the credit position of some or all of the referenced entities, and/or fluctuations of the interest rate market. The amount the protection buyer receives in the event that the CDS is triggered by a credit event may undercut the total amount of premiums that he/she has paid in the course of the transaction. Similarly, the amount the protection seller pays in the event of a credit event may exceed the total amount of premiums that he/she has received in the transaction. All other conditions being equal, the amount of premiums that the protection buyer pays and that received by the protection seller shall differ. In principle, CDS transactions will be limited to financial instruments business operators and qualified institutional investors.
Transfers of equities to another securities company via the Japan Securities Depository Center are subject to a transfer fee of up to ¥11,000 (tax included) per issue transferred depending on volume. No account fee will be charged for marketable securities or monies deposited.

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