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Measurement of Qualitative and Quantitative Variables in Economics

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Abstract

A comprehensive grasp of economics requires both qualitative and quantitative factors. Qualitative factors give depth and context, whereas quantitative variables enable exact, numerical analysis. Economists may create realistic models, arrive at precise findings, and make well-informed judgments by accurately measuring and integrating both kinds of data. Economists can now measure and evaluate a wide range of economic indicators more easily than ever before because to developments in econometrics and data analytics. The paper's goal is to create a measuring tool that will accurately assess the qualitative random variables. Respondents are provided with 180 possible responses using the Sama Radial Indicator (SRI), and the results are treated as a continuous random variable. As a result, it may be inferred that either the sampling distribution or the probability distribution of it will be roughly regularly distributed.

Keywords: Delphi method, item scale, latent variable, Likert scale**,** qualitative variable, sama radial indicator (SRI),

Introduction

Qualitative variables are used in research studies across a range of disciplines. As a result, they are inferred from other observable variables. These inferred variables are known as hidden variables, or Latent Variables (LV) (Borsboom & Molenaar, 2015); (Ge. et al., 2019). In economic research and analysis, both qualitative and quantitative variables play critical role in understanding behavior, trends, and relationships. Measurement of these variables is fundamental to constructing economic models, making policy decisions, and interpreting economic phenomena. This article provides an overview of the nature, classification, and methods for measuring qualitative and quantitative variables in economics.

For instance, measuring people's attitudes, beliefs, and characteristics is necessary for researchers in the domains of psychology, education, business, marketing, medical, and healthcare, among others. These qualitative variables are assessed using multi-item scales, where a question is referred to as a "item" and the estimated value of the LV is referred to as a "scale" (Furr, 2011).

The Sama Radial Indicator (SRI) is a method used in qualitative research to measure and visualize variables. It typically involves representing various qualitative variables on a radial diagram, where each axis corresponds to a different variable. This approach can help in understanding the relationships and relative strengths of these variables in a visually intuitive manner (Konarasinghe, 2023).

Statement of Problem

In many different study domains, polytomous rating measures such as the Likert scales are extensively used. To determine the item response for a latent variable, the Likert scale often employs three, five, or seven similar groups (Likert, 1932). The ordinal measuring scale is used to assess category variables. The outcomes of the mathematical operations have little significance when the measurements of these variables are comparable.

In light of this, it is inaccurate to assume that Likert-type classes represent interval-level assessment (Knapp, 1990, Kuzon et al., 1996; Susan, 2004; Allen & Seaman, 2007). If the requirements for normalcy are not satisfied, then categorical data should not be subjected to parametric analysis. As an illustration, categorical variables cannot be measured using mean or variance; categorical response variables cannot be used in multiple regression analysis; Z-test or ANOVA cannot be used to compare (Attwood et al., 2009, Allen & Seaman, 2007, Carifio & Perla, 2008).

Although it is highly unusual for variables assessed by polytomous item scales, such as Likert scales (Susan, 2004; Allen & Seaman, 2007). Since Likert-type scales are interval scales, it is currently common practice to assume that the measurement becomes regularly distributed. Rese archers analyze categorical data using parametric approaches and get nonsensical findings as a result of these faulty assumptions. Given that parametric approaches have more statistical power than non-parametric ones (Carifio & Perla, 2008; Bishop & Herron, 2015). It's possible that this has become the norm. To address this issue, an appropriate item scale that lessens the drawbacks of polytomous rating scales should be created.

Objective

To provide an appropriate measuring tool for the qualitative and quantitative variables.

Importance of the Research

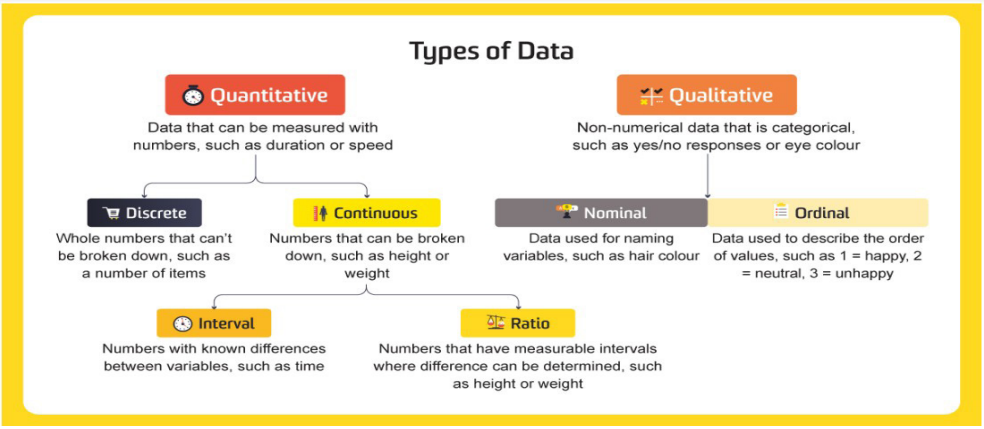
In research, misuse of statistics has emerged as a major issue. Of them, the global abuse of Likert-type polytomous scales is prevalent. This results from several shortcomings of the currently used polytomous rating scales as well as the carelessness of the researchers. This work aims to address a long-standing issue in several research domains by introducing an efficient item scale for measuring qualitative characteristics.

Literature Review

The study of economics relies heavily on accurate measurement of both qualitative and quantitative variables. Quantitative variables—such as income, GDP, inflation, and unemployment rates—are measured numerically and analyzed using statistical methods. In contrast, qualitative variables—such as consumer preferences, political stability, and institutional quality—require different methodological approaches, often involving subjective assessments, scales, or categorical indicators. Wooldridge explored that quantitative variables are typically measured using econometric techniques such as regression analysis, time series, and panel data models (Wooldridge, 2013). Diewert described that indices like the Consumer Price Index (CPI) and GDP deflators provide standardized measurements for economic performance over time (Diewert, 2013). Kuznets pioneered the concept of GDP as a quantitative tool for national economic performance measurement, which remains a fundamental metric in macroeconomic analysis (Kuznets, 1941).

Likert explained that variables like education level, employment type, or political stability are measured using nominal or ordinal scales. Techniques such as Likert scales. They are commonly employed in surveys to quantify subjective opinions (Likert,1932). Ragin introduced QCA as a method that enables the systematic comparison of qualitative cases using Boolean algebra, which has found applications in institutional and development economics (Ragin ,1987). Kahneman and Deaton emphasized that the importance of measuring life satisfaction, happiness, and emotional well-being using self-reported survey data (Kahneman & Deaton, 2010). Tools like machine learning are now used to analyze large volumes of both structured (quantitative) and unstructured (qualitative) .

Figure 1. Different Types of Data



Source:online.unsw.edu.au/blog/types-of-data

data, improving prediction and policy analysis (Varian, 2014).

Developed by UNDP, HDI combines life expectancy (quantitative), education (mixed), and income (quantitative) to provide a holistic measure of development (Sen, 1999). Kaufmann et al. (2009) developed the Worldwide Governance Indicators (WGI), which combine survey data (qualitative) and expert assessments (quantitative proxies) to evaluate governance dimensions. Studies in this field often combine experimental data (quantitative) with survey-based preferences or psychological traits (qualitative) to explain deviations from rational behavior (Thaler & Sunstein, 2008). There are three sections to the literature review:

2.1 Different kinds of probability distributions, measurement scales, and random variables

2.2 Likert scale

2.3 Characteristics of a productive measuring scale

Different Kinds of Probability Distributions, Measurement Scales, and Random Variables

A probability experiment gives a chance to determine how much it is worth. Figure 1 displays the several types of random variables together with the matching measurement scales (UNSW Sydney Online, 2022).

At random, there are two basic categories of variables: qualitative and quantitative. Quantitative variables are those that are related to measurements, whereas qualitative variables are those that are not related to measurements.

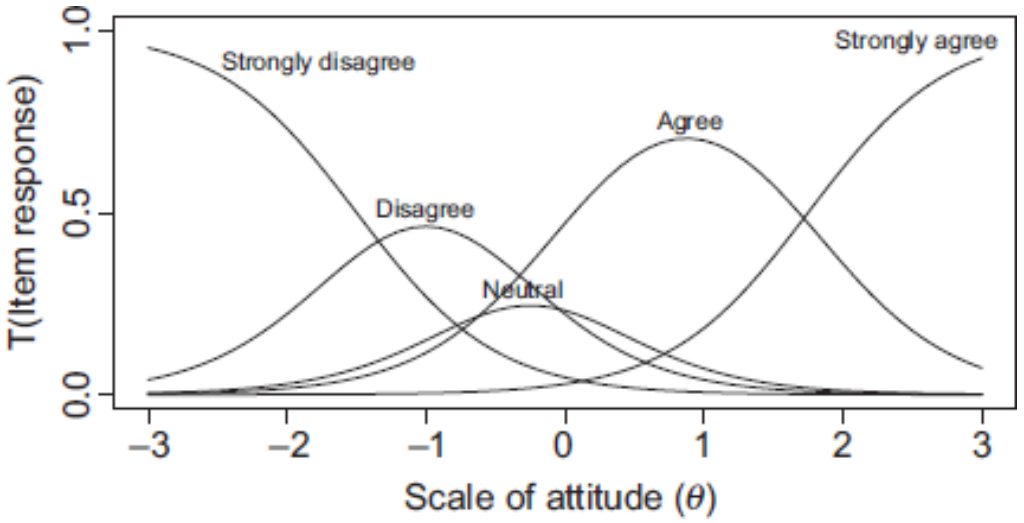
The "interval" is used to measure quantitative variables, whereas the "nominal" or "ordinal" scale is used to measure qualitative variables. The temperature in various cities within a country can be quantified using the interval scale; similarly, the height of students in a school can be quantified using the ratio scale; a person's gender can be measured qualitatively using the nominal scale; and the level of education possessed by individuals within a country (secondary school, high school, diploma, degree, etc.) can be measured qualitatively using the ordinal scale.

The random variable's potential values and associated probabilities are given by a probability distribution. A discrete probability distribution is linked to a discrete random variable, whereas a continuous probability distribution is linked to a continuous random variable.

The Bernoulli, Poisson, Binomial, and geometric distributions are a few examples.

Figure 2. Scale Lines

Likert Scale



Source: Samejima, 1969 and Thissen, 1983.

Categories of a qualitative variable are given numerical values, or "codes or ranks," using the Likert scale (Likert, 1932). A latent variable (LV) was measured using a number of items, and the result of the random variable was determined by adding up all of the item rankings. Using 12, 15, and 24 items for each LV, the "Sigma Method of Scoring" was evaluated on a sample of 100 respondents. It was discovered that the rank summations were roughly normally distributed (Likert, 1932). Therefore, the study assumed that LV rank totals would be roughly normally distributed if they were assessed using several items and rank totals were used as the result. Nonetheless, the study has highlighted the risk associated with it and the necessity of accuracy and inaccuracy (Likert, 1932).

Figure 2 displays the trace lines from the graded model for responses on a 5-point Likert scale to an attitude issue. Certain replies have a symmetrical distribution, whereas others do not. Therefore, according to Samejima and Thissen, this kind of variable follows the Logistic Distribution rather than the Normal Distribution (Samejima, 1969 & Thissen, 1983).

The variable may be roughly normally distributed if 10–25 items are used to assess one LV and rank summation is employed as the result of the variable (Likert, 1932). However, adding a lot of items raises the non-response rate and causes several additional issues (Paulhus, 1991).

It is understandable from the study of Knapp (1990), Kuzon et al. (1996), Susan (2004), and Allen and Seaman (2007) that while Likert scale answer categories with a rank order and their gaps between values cannot be taken for granted. It is inaccurate to assume that interval-level assessment is comprised of Likert-type categories. This misuse is known as "Ab(using) the Likert scale," according to Susan (2004), and it is regarded as a fatal sin in statistical analysis by (Kuzon et. al. 1996).

Characteristics of a productive measuring scale

Higher response alternatives are desirable in an effective measuring scale, but each answer should be distinct from the others (Furr, 2011; Diener et al., 1985; Allen & Seaman, 2007; Thissen, 2015). In contrast to a dichotomous or five-point scale, a response scale with the following selections: strongly agree, moderately agree, slightly agree, neutral, slightly disagree, disagree, strongly disagree types of variables has more response options; however, the respondent might not be aware of the distinction between moderately agree and slightly agree, and vice versa.

Another characteristic of an efficient scale is its neutral midpoint, which would be the appropriate response for some responders. A respondent cannot select neither agree nor disagree on a given four point-point scale, for instance, which only allows for the options ‘strongly agree, agree, disagree, and strongly disagree’ (Furr, 2011).

Measurements

Scaling is the process of measuring, and by measurement, we often mean the assignment of numbers to observations or objects of interest in relation to specific attributes. The process of giving variables or characteristics of interest, such height, weight, or test scores, numerical values is known as measuring in statistics. Measuring these variables in a way that enables insightful analysis and comparison is the aim of measurement.

Data organization: Measures offer a means of structuring and organizing data, which facilitates analysis and conclusion-making. Researchers can swiftly

spot patterns and trends in the data by summarizing it using metrics like averages, ranges, and percentiles.

Comparison of data: Additionally, measures offer a means of comparing various data sets or groupings. Researchers can determine group differences or changes over time by computing and comparing metrics like means or standard deviations.

Statistical inference: Measures are essential for statistical inference, which is the process of drawing conclusions about a population from a sample of data. Measures like as p-values and confidence intervals are used to assess the likelihood that events are the product of chance and to decide whether to reject a null hypothesis.

Communication of results: Measures offer a simple and succinct means of conveying statistical findings to others. In order to successfully communicate their findings to a wide audience, researchers employ metrics to characterize and summarize data. When performing statistical analysis, selecting the right degree of measurement is crucial since it can influence the kinds of statistical tests and methods that can be applied. Following are the four scales of measurement are briefly discussed below:

1. Nominal scale
2. Ordinal scale
3. Interval scale
4. Ratio scale

Nominal scale

A nominal scale is stated to be formed by grouping the observations into qualitative categories or groups that are mutually exclusive. There is no specific sequence for the grouping, and the numbers have no numerical value when they are just used to designate the categories of the provided scale. Variables without any measurable value are branded using nominal scales. Nominal scales are similar to "names" or labels, and "nominal" sounds a lot like "name." This helps you remember all of this. For instance, pupils are categorized as male or female based on their health status (i.e., healthy or unwell). Similar to how rain may be categorized as heavy, moderate, or light, the numerals 1 and 2 can also be used to designate the categories.

Ordinal Scale

It has the ability to rank or order measures in addition to having the traits of a nominal scale. What matters and is relevant in this scale is the sequence of the values, although it is not really clear how each one differs from the others. When a set of equivalency classes is given an ordinal scale, the relation larger than holds for every pair of classes, allowing for a full rank ordering of the classes. Ordinal scales are commonly used to measure non-numerical concepts such as intellect, pain, pleasure, and contentment. The reason "ordinal" is easier to remember is because it sounds like "order," and the key to learning "ordinal scales" is because order is important.

Interval Scale

Interval scales are numerical scales where we may determine the precise differences between the numbers in addition to their order. Although the size of this scale is continuous, it lacks a real zero point. Since the difference between each number is the same, the temperature in Celsius is the quintessential illustration of an interval scale. For instance, there is a detectable 10-degree difference between 60 and 50 degrees, just as there is between 80 and 70 degrees. Another excellent illustration of an interval scale with known, constant, and quantifiable increments is time.

Because they allow for further statistical examination of certain data sets, interval scales are useful. For instance, the mean, median, or mode can be used to quantify the central tendency; the standard deviation can also be computed. The main ideas of a "interval scale" are easy to recall, much like . We are unable to multiply or divide interval data, but we are able to add and subtract. Ten degrees plus ten degrees equals twenty degrees. No issue there. However, as there is no such thing as "no temperature" in the context of the Celsius scale, 20 degrees is not twice as hot as 10 degrees. Calculating ratios is impossible without a genuine zero.

Ratio Scale

A ratio scale is an interval scale with a real zero point at its origin. The ratio of any two scale points, such as tree height, on a ratio scale is independent of the unit of measurement. When it comes to measuring scales, ratio scales are the pinnacle since they provide information about order, precise value across units, and an absolute zero that enables the application of a broad variety of descriptive and inferential statistics. To reiterate, all of the information above regarding interval data also applies to ratio scales, and ratio scales have a precise meaning of zero. Two excellent instances of ratio variables are weight and height.

When it comes to statistical analysis, ratio scales provide a multitude of options. These variables can be multiplied, divided (ratios), subtracted, or added in meaningful ways. The mode, median, or mean can be used to quantify central tendency; ratio scales can also be used to compute measures of dispersion like the standard deviation and coefficient of variation.

Table 1: Measurement scale

Nominal scale	Ordinal scale	Interval scale	Ratio scale
Gender	Position (1st, 2nd, 3rd, and 4th)		Age
Eye color	Ranking of volley ball player	IQ Score	Weight
Religion	Rating (poor, good, excellent)		Height
Specialization/Nationality			Time/ salaries spent

Methodology

The methodology concerning qualitative variables and Sama Radial Indicator (SRI) (Konarasinghe, 2023), complete in following steps:

Selection of Qualitative Variables:

Identify the key qualitative variables relevant to your study. These could include subjective measures such as satisfaction, perceived quality, emotional response, etc. Ensure that each variable is distinct and provides meaningful insights into the phenomenon being studied.

Radial Diagram Construction:

Each variable is assigned to an axis radiating from a central point. The number of axes depends on number of variables that needs to be defined, often ranging from a minimum value 0 to a maximum value (10).

Data Collection:

Gather data for each qualitative variable through methods such as interviews, surveys, observations, or expert evaluations. Translate qualitative data into quantitative scores for plotting on the radial diagram. This often involves using rating scales, coding schemes, or other methods to convert qualitative judgments into numerical values.

Plotting and Analysis:

Plot the scores for each variable on their respective axes. Connect the points to form a polygon, which represents the profile of the subject or phenomenon being studied. Analyze the shape and area of the polygon to interpret the relative strengths and weaknesses of the different variables.

Example Application

Imagine a study evaluating the user experience of a new software application. The qualitative variables might include: Usability, Aesthetics, Functionality, User Satisfaction, Learning Curve.

Steps

Identify Variables

Select the five variables mentioned above.

Construct Radial Diagram

Create a radial chart with five axes, each representing one of the variables.

Collect Data

Conduct user interviews and surveys to gather qualitative feedback.

Convert feedback into numerical scores (e.g., usability might be rated on a scale from 1 to 10 based on user responses).

Plot Data

Plot the scores on the radial chart.

Connect the points to form a polygon.

Analyze Results

Analyze the shape of the polygon. For instance, if the area representing "Learning Curve" is significantly smaller than other areas, it indicates that users find the software difficult to learn.

Use this visual representation to identify areas needing improvement.

Advantages of SRI (Konarasinghe, 2023).

Visual Clarity

Provides a clear visual representation of complex qualitative data.

Comparative Analysis

Makes it easy to compare multiple subjects or phenomena by plotting multiple polygons on the same chart.

Holistic View

Offers a comprehensive view of multiple qualitative variables simultaneously.

Limitations

Subjectivity in Scoring

Converting qualitative data to numerical scores can introduce subjectivity. Complexity with Many Variables: Too many variables can make the radial diagram cluttered and hard to interpret.

Qualitative Variables in Economics

Qualitative variables in economics are those that describe attributes or categories rather than numerical values. These include variables like consumer preferences, business confidence, market sentiment, and institutional quality. Measuring such variables requires different tools and methods, often involving surveys, indices, and ranking systems. Here are some commonly used tools:

Surveys and Questionnaires

Used to gather subjective opinions from individuals, businesses, or policymakers.

Examples:

Consumer Confidence Index (CCI) – Measures consumer sentiment about the economy.

Business Confidence Index (BCI) – Captures business sentiment.

Likert Scales

A common survey tool indicates their level of agreement with statements.

Example: 'On a scale of 1 to 5, how confident are you in the economy?'

Delphi Method

Uses expert opinions to reach a consensus on qualitative economic issues.

Often applied in forecasting and policy analysis.

Case Studies and Content Analysis

Used to analyze economic phenomena based on historical and qualitative data.

Example: Studying government policy impacts through document reviews.

Economic Indices and Rankings

Composite indicators that translate qualitative data into numerical scores.

Examples:

Ease of Doing Business Index – Assesses business-friendliness of countries.

Corruption Perceptions Index (CPI) – Measures perceived corruption levels.

Sentiment Analysis (Text Mining & AI)

Uses natural language processing (NLP) to assess qualitative data from news, reports, or social media.

Example: Measuring economic optimism based on financial news sentiment

Conclusion

Variables and measurements are critical concepts in research and data analysis. Variables are characteristics or attributes that can take on different values, while measurements are the process of assigning numerical values to variables. The two main types of variables are

independent and dependent variables, with independent variables being manipulated and dependent variables being measured to determine the effect of the independent variable. Measurement scales are used to determine the level of measurement, and they include nominal, ordinal, interval, and ratio scales. Each scale has its unique characteristics, and researchers must select the appropriate scale for their data. The Sama Radial Indicator (SRI), Delphi method, and sentiment analysis are a powerful tool for visualizing and analyzing qualitative variables, making it easier to identify patterns and areas for improvement. Its effectiveness depends on careful selection of variables, accurate data collection, and thoughtful interpretation of the resulting diagrams.

References

Allen, I., E., & Seaman, C., A. (2007). *Likert scales and data analyses*. Quality Progress.

Attwood, G., Dyer, G., & Dyer, J. (2009). Statistics, Pearson Education Limited, UK. ISBN 978-0-435519-15- 5.

Babbie, E. (2020). The Practice of Social Research. Cengage Learning.

Bishop, P.A., & Herron, R.L (2015). Use and Misuse of the Likert Item Responses and Other Ordinal Measures. International Journal of Exercise Science.8 (3)297-302.

Borsboom, D., & Molenaar, D. (2015). Psychometrics. International Encyclopedia of the Social & Behavioral Sciences. 19, 2nd edition. https://doi.org/10.1016/B978-0-08-097086-8.43079-5.

Carifio, J., & Perla, R. (2008). Resolving the 50-year Debate Around using and Misusing Likert Scales. Med Educ. 42(12), 1150-1152.

Diener, E., Emmons, R., A., Larsen, R., J., & Griffin, S. (1985). The Satisfaction with Life Scale, Journal of Personality Assessment. 49(71-75).

Diewert, W. E. (1998). Index Number Theory.

Furr, R. M. (2011). Scale Construction and Psychometrics for Social and Personality Psychology. The Sage library of methods in Social and personality Psychology.

Ge, Y., Ranjbari, A., Elyse E., O'C., Barber, E., & MacKenzie, D. (2019). Defining Psychometric Variables Related to Use of Autonomous Vehicles, Transportation Research Record, 2673(12) 655–669. /10.1177/0361198119876257.

Grimmer, J., & Stewart, B. M. (2013). Text as data: The promise and pitfalls.

Gujarati, D.N. (2011). Econometrics by Example. Palgrave Macmillan.

Kahneman, D., & Deaton, A. (2010). High income improves evaluation of life but not emotional well-being.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance Matters VIII.

Knapp, T. R. (1990). Treating ordinal scales as interval scales: an attempt to resolve the controversy. Nurs Res. 39,121–123.

Konarasinghe, W.G.S. (2023). Sama Radial Indicator (SRI) for measuring qualitative variables, Journal of New Fronties in Mathematics and Statistics, 3 (1),1-10.

Kuznets, S. (1941). National Income and Its Composition.

Kuzon, W.M. Jr., Urbanchek, M.G., & McCabe, S. (1996). The seven deadly sins of statistical analysis. Ann Plastic Surg. 37, 265–272.

Likert, R. (1932). A Technique for the Measurement of Attitudes. Archives of Phycology, 22(140) 5-55.

Likert, R. (1932). A Technique for the Measurement of Attitudes.

Ragin, C. C. (1987). The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies.

Sen, A. (1973). On Economic Inequality. Clarendon Press.

Sen, A. (1999). Development as Freedom.

Thaler, R. H., & Sunstein, C. R. (2008). Nudge.

Varian, H. R. (2014). Big data: New tricks for econometrics.

Wooldridge, J. M. (2013). Introductory Econometrics: A Modern Approach.

Wooldridge, J.M. (2016). Introductory Econometrics: A Modern Approach. Cengage Learning.