

# Assessing Data Science's Application to Economic Theory

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## Abstract

*Data science is becoming increasingly important in economic theory. This paper examines how data science can be applied to economic theory and how it is used to make predictions about economic outcomes. It looks at how data science can be used to identify patterns in economic data, and how it can be used to develop new economic theories and to forecast economic trends. It also discusses the potential challenges and ethical issues associated with the use of data science in economics, and how data science can be used to improve economic decision-making. Finally, the paper concludes with a discussion of the potential benefits of data science to economic theory and practice.*

## Keywords

*Application, Analysis, Data Science, Economic Theory, Impact.*

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## INTRODUCTION

Data Science is a field of study that seeks to extract meaning and value from large amounts of data. It has become increasingly popular in recent years, as the amount of data available to researchers and businesses has grown exponentially. With the rise of big data, data science has become an essential tool for businesses, researchers, and economists. In this article, we will explore how data science can be used to improve economic theory and practice. We will discuss how data science can be used to better understand economic trends, how it can be used to develop better economic models, and how it can be used to improve forecasting accuracy. We will also explore how data science can be used to improve policy-making and the decision-making process. Finally, we will discuss the potential implications of data science for the future of economics.

Data science has become a powerful tool to help economists understand and predict economic phenomena. With the rise of data-driven decision-making and the increasing availability of data, economists are increasingly turning to data science to better understand the economic environment and to create more accurate predictions of economic trends. Data science can help economists to create models that can explain complex economic processes, identify key drivers of economic growth, and enable more precise forecasting of economic outcomes. In this paper, we will explore the ways in which data science can be applied to economic theory and the potential implications for economic policy. We will discuss the potential benefits of data science in economics, the challenges associated with its application, and the ethical considerations that arise when using data science for economic analysis. Finally, we will explore the future of data science in economics.

Data Science is an area of science that focuses on analysing large datasets and extracting useful information

from them. It has become an increasingly popular field in recent years, due to the ubiquity of data that is now available. This data can be used to better understand and make predictions about economic trends and behaviour. As a result, many economists have begun to explore the possibilities of applying data science to their field. In this essay, I will discuss the potential implications of this application of data science to economic theory.

## OVERVIEW OF THE DATA SCIENCE PROCESS

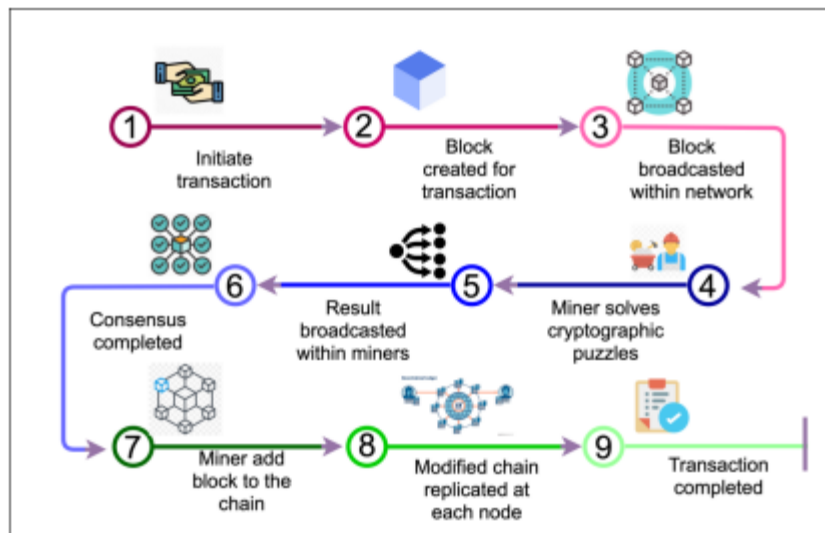
Data science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data. It is a relatively new field, but has already had a significant impact on the way businesses and other organizations make decisions [10]. Data science has application to economic theory in a number of ways. It can be used to improve economic forecasting by providing more accurate predictions of future economic trends and variables. It can also be used to better understand consumer behaviour and market dynamics, which can be used to inform decisions about pricing and marketing strategies. Finally, data science can be used to optimize production processes and improve operational efficiency, which can increase profits and reduce costs. Overall, data science has the potential to revolutionize economic theory by providing data-driven insights and analysis to supplement traditional economic theories. By leveraging the power of data science, economic theorists can better understand the underlying dynamics of the economy and develop more accurate models and forecasts to guide decision-making.

Data Science is a field that uses a variety of tools and techniques to analyse large datasets and draw insights from them. It is an interdisciplinary field that combines elements of mathematics, computer science, statistics, and business to analyse data. Data Science has been applied to a variety of economic theories to help better understand the underlying

economic forces at work in different markets, industries, and economies. Data Science can be used to understand the relationships between economic variables and to make predictions about the future state of the economy [1]. By using data analysis techniques, economists can better identify potential risks and opportunities in the economy, and develop strategies for managing them. Data Science can also be used to uncover trends in the data that may not be obvious to the naked eye. This can help economists better understand the forces driving economic change and how those forces interact with each other.

Data Science can be used to identify patterns in economic

data that may not be visible to the naked eye. By analysing these patterns, economists can better understand the cause-and-effect relationships in the economy [2]. This can help them make more informed decisions about economic policy and help them to anticipate potential changes in the economy. Data Science can also be used to develop models of economic behaviour. By applying data analysis techniques, economists can develop models that can be used to predict future economic conditions and identify areas for potential intervention. This can help policymakers identify areas where intervention may be necessary to promote economic growth and stability.



**Figure 1: Data Processing**

(Source: Bouveyron, Charles, et al. 2019, [1])

Finally, Data Science can be used to improve economic forecasting. By analysing large datasets, economists can develop models that can be used to more accurately predict economic conditions in the future. This can help them better understand how changes in the economy will affect businesses, consumers, and other stakeholders. Overall, Data Science has proven to be a powerful tool in the field of economics. It can be used to better understand the underlying economic forces at work in different markets, industries, and economies, as well as to model economic behaviour and improve economic forecasting. By applying data science techniques to economic theory, economists can gain a better understanding of the economy and make more informed decisions about economic policy.

**DATA COLLECTION**

Data science has been applied to economic theory in various ways. One of the key applications of data science in economics is data collection. Data science techniques such as machine learning and artificial intelligence have been used to collect vast amounts of data from various sources, such as financial markets, government agencies, and online sources. This data can then be used to understand the economic state of the world and to make predictions about the future. Additionally, data science can be used to analyse large

datasets to uncover correlations and relationships between different economic variables, and to create models that can be used to forecast economic trends.

Data science can be used to assess the application of economic theory in many different ways. One way is through the collection of data [9]. Data scientists could use various methods to collect data from various sources such as surveys, interviews, and other forms of data collection. This data can be used to analyse how economic theories are being applied in the real world [3]. For instance, data could be collected on the impact of tax policies on consumer spending, or the effectiveness of monetary policies in promoting economic growth. By collecting and analyzing this data, data scientists can gain an understanding of how economic theories are being applied in the real world.

**Data Analysis**

Once data has been collected, data scientists can use various methods of analysis to assess the application of economic theories. This could include using descriptive statistics to identify patterns in the data, or using predictive analytics to forecast future trends. Data scientists can also use machine learning algorithms to identify correlations between different economic variables and help inform decision makers.

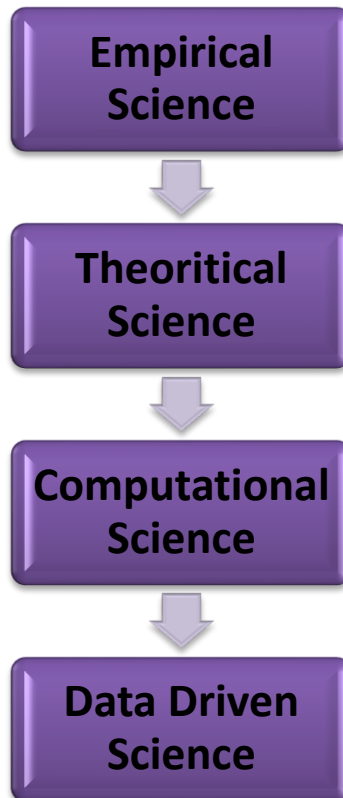
**Data Visualization**

Data visualization can also be used to assess the application of economic theories. Data scientists can create visual representations of the data, allowing for an easier understanding of the relationships between different economic variables. This can be used to identify trends or to uncover relationships between different economic indicators.

**DATA CLEANING**

Data cleaning is an important step in the application of data

science to economic theory. The process involves identifying and removing any invalid or unnecessary data from the dataset. It can involve anything from identifying outliers, incorrect data entries, and missing values to filling in missing values, renaming variables, and converting data formats. Data cleaning is a critical step in the data science process as it helps to ensure the data is accurate and reliable for further analysis. Additionally, it allows researchers to better understand the data and reveals potential relationships and trends that can be used to inform economic theory.



**Figure 2:** Analysis method of various data  
(Source: Made by the author)

Data science can be applied to economic theory in a variety of ways. One of the most important steps in applying data science to economic theory is data cleaning. Data cleaning is the process of preparing raw data for analysis [8]. This includes organizing data into a consistent format, removing missing or incorrect values, and formatting data for analysis. Data cleaning is essential for ensuring accurate results from data analysis and for deriving meaningful insights from large datasets. By properly cleaning and organizing data, data scientists can better identify patterns and trends in the data that can be used to inform economic theory.

Data cleaning plays a vital role in the application of data science to economic theory. It is the process of preparing data for analysis by removing or modifying incomplete, inaccurate, irrelevant, or duplicate data [4]. This process helps to ensure that the results of the analysis are reliable and accurate. Data cleaning is important because inaccurate data can lead to incorrect conclusions and can cause faulty

predictions. Data cleaning involves a variety of techniques, including data standardization, data validation, data reduction, and data transformation. Data standardization involves changing the format of the data so that it can be compared and analysed. Data validation checks the accuracy of the data and ensures that it meets certain criteria. Data reduction eliminates redundant or unnecessary data. Data transformation involves changing the format of the data to make it more useful for analysis. The application of data science to economic theory requires data cleaning to ensure that the data is accurate, complete, and valid. Cleaning the data helps to ensure that the results of the analysis are reliable and can be used to make informed decisions.

**DATA EXPLORATION**

Data science can be applied to economic theory in a variety of ways. For example, data science can be used to explore and analyse economic data in order to gain insights into economic

trends and phenomena. By using data science techniques such as data mining, machine learning and statistical modelling, economists can uncover patterns in the data that can provide valuable insights into the current state of an economy or into how certain economic policies may be impacting it. Additionally, data science can be used to build predictive models that can help economists make better and more informed decisions. For instance, using data science, economists can develop models to predict the future of a particular market or sector and make decisions based on those predictions. Finally, data science can be used to develop algorithms that can optimize economic systems and help inform economic policy decisions.

Data science has a multitude of applications to economic theory [7]. Data science can be used to identify patterns in the data that can be used to inform economic theory. For example, data science can be used to identify consumer trends, identify correlations between economic variables, and to better understand the drivers of economic growth. Data science can also be used to develop predictive models that can help to forecast economic activity, such as predicting stock prices or consumer spending. Additionally, data science can be used to develop new economic models that can help to better understand the dynamics of the economy and can be used to design better economic policies [5]. Ultimately, data science can be used to inform economic theory and practice by providing insights into economic behaviour and by providing a better understanding of the underlying drivers of economic performance.

	<b>Economics</b>	<b>Data Science</b>
<b>Research Focus</b>	Focus on understanding casual mechanism of a system.	Focus on making predictions within a system.
<b>Toolkit</b>	Status Matlab, Excel	Python and Database system.

**Table 1:** different types of economics and data Science  
(Source: Made by the author)

### DATA ANALYSIS

Data science can be a powerful tool for economic theory. Data science can help economists identify trends in economic data and draw conclusions about economic behaviour. It can also be used to build models that can predict economic outcomes and analyse the results of economic experiments. By combining data science with economic theory, economists can better understand and explain economic phenomena. Data science can also help economists identify potential solutions to economic problems, such as policy solutions or market interventions. Ultimately, data science can help economists better understand the complexities of the global economy and how it impacts our lives.

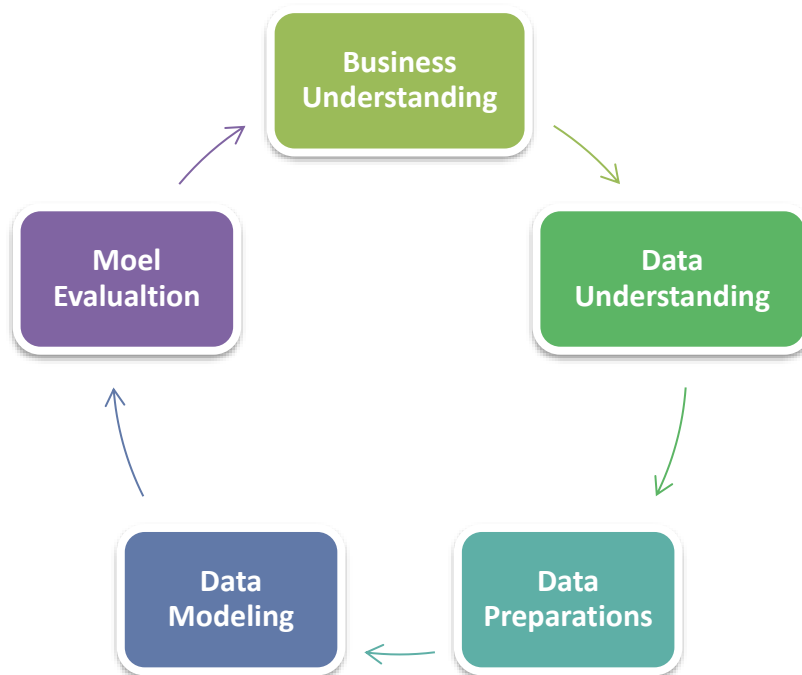
Data science has many applications to economics and economic theory. Data science can be used to analyse and

model data related to economic trends and behaviour, helping economists better understand the dynamics of the economy and identify potential relationships between different economic variables. Data science can also be used to develop custom predictive models that can help economists forecast future economic variables and scenarios. Additionally, data science can be used to identify and analyse economic trends and drivers, as well as to identify economic opportunities and risks. Finally, data science can be used to develop economic simulations and models to help economists better understand the impact of policy changes and other economic forces.

Data science has the potential to revolutionize the field of economic theory. By leveraging large datasets and sophisticated algorithms, data science can bring a wealth of new insights to the field [6]. Data scientists can use data to gain insight into the behaviour of the economy, identify trends, and develop predictive models. Furthermore, data science can be used to conduct experiments and simulations to explore the effects of different policy decisions. Data science can also be used to increase the accuracy of economic forecasting. By analysing large datasets, data scientists can identify patterns and trends in economic behaviour, allowing them to make more accurate predictions about the future. Additionally, data science can be used to develop new economic theories and models. By using machine learning techniques, data scientists can develop models that are better suited to the current environment, allowing for more accurate predictions about the future. Overall, data science has the potential to revolutionize the field of economic theory [11]. By leveraging large datasets and sophisticated algorithms, data scientists can gain new insights into economic behaviour, develop more accurate economic models, and make more accurate forecasts. Furthermore, data science can be used to conduct experiments and simulations to explore the effects of different policy decisions.

### DATA VISUALIZATION

Data science can be applied to economic theory in various ways. Data visualization is one of the most important tools in data science, and it can be applied to economic theory in order to gain a better understanding of how different economic concepts interact with each other. By visualizing data, economists can identify patterns and relationships that would otherwise be difficult to recognize in the raw data [26]. Visualizations can also be used to compare different economic theories and to identify areas of improvement or disagreement. Visualizations can also help economists to identify key drivers of economic trends, and to make predictions about future economic trends. Data science can also be used to build predictive models to forecast economic performance, and to test the validity of different economic theories. Finally, data science can help economists to identify new areas of research, and to more accurately measure the impact of certain economic policies.



**Figure 3:** Data modelling circle  
(Source: Made by the author)

Data science can be used to assess economic theory by providing a better understanding of the data associated with economic principles. By using data science tools such as data visualization, machine learning algorithms, and predictive modelling, economists can analyse large amounts of data to gain insight into economic trends and identify correlations between variables. This can allow economists to better understand the behaviour of the economy and make better predictions about the future [13]. Additionally, data science can help economists to identify potential areas for policy intervention and to understand the impact of policy decisions. Finally, data science can enable economists to develop better economic theories by uncovering patterns in the data that are not immediately apparent.

Data science can be applied to economic theory in a variety of ways, including through data visualization. Data visualization is the process of creating visual representations of data in order to gain insight into patterns and trends. This can be done through the use of graphs and charts, as well as interactive visualizations such as dashboards and infographics. These visualizations can help economists to understand complex economic concepts such as supply and demand, as well as to identify correlations and patterns in economic data. By using data visualization, economists can also gain a better understanding of how economic policies and decisions impact the economy [15]. Additionally, data visualization can be used to present economic data in an easier to understand format, which can help to communicate economic concepts to a wider audience.

#### MODEL DEVELOPMENT

Data science can be used to develop economic models that are more accurate and reliable than traditional models. By utilizing the data available from sources such as market data, company financials, and other economic indicators, data science can create models that are more predictive and reliable [27]. Data science can also be used to identify areas of potential improvement within existing economic models, allowing for more efficient and effective policy and decision-making. Additionally, data science can also be used to create new economic models that are more predictive and better able to capture the complexity of the modern economy. Finally, data science can be used to develop forecasting models that can help economists identify potential economic trends and events, allowing them to make more informed decisions.

Data science can be used to develop economic models. This can involve using data to identify patterns and trends in economic behaviour, as well as forecasting the future of economic activity. Data science can also be used to test hypotheses about economic behavior, such as the impact of certain policies or economic shocks [17]. For example, data science can help economists predict how certain economic policies might impact inflation or unemployment. Data science can also be used to create predictive models to forecast the future of economic activity based on past performance. Additionally, data science can be used to analyse large datasets to identify correlations between various economic variables. All of these applications can help improve the accuracy of economic forecasts and enhance economic policy decision-making.

<b>Data Scientist</b>	<b>Data analyst</b>
<b>More pay, More experience</b>	Less pay, Less experience
<b>Predictive modeling</b>	Static modeling
<b>Advanced programming</b>	Basic programming
<b>Future predictions</b>	Historical analysis of data

**Table 2:** Difference of Data scientist and Data Analyst  
(Source: Made by the author)

Data science can be applied to economic theory in a variety of ways. First, data science can be used to develop models that can help explain and predict economic phenomena. These models can be used to identify correlations between different economic variables and to forecast future economic trends. Additionally, data science can be used to analyse large datasets and uncover insights that can inform economic theory [19]. For example, data mining techniques can be used to understand consumer behaviour and the impact of different policies on the economy. Finally, data science can be used to develop decision-making tools that can assist in the implementation of economic policies.

### MODEL EVALUATION

The application of data science to economic theory can provide useful insights into economic systems and help to inform economic decision-making. To evaluate the effectiveness of data science in economic theory, it is important to consider the quality of the data and the accuracy of the models used. In addition, the ability to interpret the results and the ability to draw meaningful conclusions from the data must also be assessed [29]. Finally, it is important to consider the scalability of the data and the models, as well as the cost and time required to obtain meaningful results.

When assessing the application of data science to economic theory, it is important to evaluate the accuracy and effectiveness of the model being used. This can be done by testing the model on a variety of data sets and measuring its performance in terms of accuracy, precision, recall, and other metrics. Additionally, it is important to assess the quality of the data and the assumptions that were used in building the model. For example, if the assumptions used to build the model were not valid, then the model's performance may be unreliable. It is also important to consider the implications of the model and its potential impact on economic theory and policy decisions.

Data science has the potential to revolutionize economic theory. By enabling the use of big data, data science can provide insight into how economies evolve and develop over time. Data science models can be used to test economic theories by providing evidence of their validity or by providing insight into how different economic theories compare [12]. Data science can also be used to develop new economic theories, as data science models can uncover patterns and relationships that were not previously known. Finally, data science can be used to inform economic policy

decisions by providing empirical evidence of the likely outcomes of different policy choices.

The application of data science to economic theory can be assessed by evaluating the models used to analyse economic data. The evaluation criteria for data science models can be divided into two categories: accuracy and usability. Accuracy refers to how well the model can predict economic outcomes based on the data it is given. Usability is about how easy it is for economists to use the model for their own research and apply it to economic theory [14]. To evaluate the accuracy of a model, economists can use metrics such as the R-squared and the root mean squared error (RMSE). The R-squared measures the proportion of the total variation in the data that is explained by the model. The RMSE measures the average difference between the predicted values and the actual values.

To evaluate the usability of a model, economists can evaluate how user-friendly the model is, how well it is documented, and how well it is integrated into existing economic theory. User-friendliness is important because it affects how easily economists can use the model for their research. Documentation is important because it helps economists understand the workings of the model and how to use it for their own research [26]. Integration into existing economic theory is important because it helps economists understand how the model fits into the larger economic framework. Overall, assessing the application of data science to economic theory involves evaluating the accuracy and usability of the models used to analyse economic data. This evaluation can be done by assessing metrics such as the R-squared and RMSE, as well as user-friendliness, documentation, and integration into existing economic theory.

### ASSESSING DATA SCIENCE'S APPLICATION TO ECONOMIC THEORY

Data science is rapidly becoming an integral part of economic theory. By combining the power of data science with traditional economic theory, economists are able to gain valuable insights into the behaviour of markets, the impact of policy, and the overall health of the economy [16]. Data science can be used to improve economic models and identify patterns in economic data that could not be easily seen before. It can also help to provide more accurate economic forecasts, allowing policymakers to make better-informed decisions. Additionally, data science can be used to identify trends in the economy and help to inform policy decisions. Overall, data science is a valuable tool for economists to use in their work. By combining data science and economic theory, economists can gain a more accurate picture of economic trends and the impact of policy on the economy. This can help to inform more effective policy decisions and improve economic forecasting. In the future, data science will continue to be an important part of economic theory and will help to provide a more complete picture of the economy.

Data science has become an increasingly important tool for economic theory. Data science can be used to analyse data

from a variety of sources, including economic indicators, surveys, and financial transactions. By understanding the underlying patterns and trends in the data, economists can better understand the behaviour of markets and individuals [18]. Data science can also be used to develop predictive models that can help economists forecast economic conditions and predict future trends. Data science can also be used to help better understand the effectiveness of economic policies. By analysing data from past and present economic policies, economists can gain insights into the effectiveness of different policies and how they can be improved. Additionally, data science can be used to identify and measure the impact of economic policies on different economic sectors, allowing economists to better understand the effects of policy on different segments of the economy. Overall, data science has become an indispensable tool for economists [30]. It allows them to analyse large amounts of data quickly, identify patterns and trends, and develop predictive models. This helps economists understand the behaviour of markets, people, and economies, and develop better economic policies.

### **THE ROLE OF DATA SCIENCE IN ECONOMIC THEORY**

Data science is playing an increasingly important role in the development of economic theory. Data science can be used to analyse large amounts of data and identify patterns that may not be visible to the naked eye. This allows economists to make more informed decisions and develop better economic theories. Data science can also help economists understand the complexities of the economy by providing deeper insights into the relationships between different economic variables.

For example, data science can be used to better understand the behaviour of consumers and their preferences in different markets. Data science can also be used to identify trends in the economy, such as changes in the labour market or fluctuations in the stock market. Data science can also be used to develop predictive models which can help economists better understand how the economy will evolve in the future [20]. Data science can also help economists to evaluate the success of specific economic policies. By analysing data related to the implementation of policies, economists can determine which policies are effective and which are not. This can help them better understand how to adjust economic policies to achieve desired outcomes. Overall, data science has the potential to revolutionize economic theory by providing more accurate insights into the behaviour of the economy. Data science can help economists to make better decisions and develop more effective economic policies, leading to a stronger and more stable economy.

### **ADVANTAGES OF UTILIZING DATA SCIENCE FOR ECONOMIC THEORY**

- **Increased Accuracy:** Data science can provide more accurate economic models than traditional

economic theory [25]. Data science methods such as machine learning and artificial intelligence can help to uncover hidden patterns and correlations in economic data that would be difficult to detect using traditional economic theory. This can help to create more accurate economic models and predictions.

- **Increased Efficiency:** Data science can be used to automate certain processes associated with economic theory. This can help to save time and money, as well as reduce human error.
- **Improved Insight:** Data science is able to provide more insight into economic behavior and trends than traditional economic theory [22]. By examining large amounts of data, data science can uncover trends and correlations that may not be visible using traditional methods. This can provide a better understanding of economic phenomena and help to inform economic decision making.
- **Increased Accessibility:** Data science can provide access to economic data that would otherwise be difficult or impossible to access. This can help to make economic data more accessible to researchers and other stakeholders. Overall, data science has the potential to improve economic theory by providing more accurate models, increased efficiency, improved insight, and increased accessibility.

Data science has the potential to revolutionize the field of economic theory. By leveraging the power of data, economic theorists can gain a better understanding of economic trends and market dynamics. Data science can help uncover previously unknown relationships between variables and provide insights into previously unknown economic relationships [24]. Additionally, data science can help to uncover patterns in economic data that can help to inform economic decisions.

By leveraging powerful algorithms and statistical techniques, economic theorists can gain access to powerful and accurate insights that can improve the accuracy of economic predictions. Furthermore, data science can help to inform economic models and enable them to become more accurate and reliable. Finally, data science can help to identify and quantify the effects of various economic policies, allowing for better decision-making by governments, businesses, and individuals.

Data science offers a powerful tool for analysing economic theory. By leveraging data-driven models, economists can gain insights into complex economic relationships and dynamics. Data science provides the ability to uncover hidden patterns and correlations in large datasets, helping economists to make more informed decisions [21]. It also enables the development of predictive models, which can be used to identify potential future outcomes and trends. Additionally, data science can provide valuable insights into the impact of certain policies on the economy. By utilizing data-driven methods, economists can more accurately assess the impact of proposed policies and make better decisions

that can improve economic performance. Finally, data science can provide a wealth of information that can be used to inform economic decision making. In summary, data science can be a powerful tool for assessing and improving economic theory.

### **CHALLENGES OF APPLYING DATA SCIENCE TO ECONOMIC THEORY**

The application of data science to economic theory poses several challenges. Firstly, economics relies heavily on theoretical models that are based on assumptions about the behaviour of individuals and markets. Data science, on the other hand, is based on the analysis of actual empirical data. This means that data science can be used to test the accuracy of theoretical models, but it is difficult to make generalizations from the data that can be applied to economic theory. Secondly, economic data can be highly complex, and there are often many variables that need to be taken into account. This can make it difficult to accurately analyse the data in order to draw meaningful conclusions [24]. Finally, there may be ethical considerations when using data science in economics, as it may be used to make decisions that have significant social and economic implications.

Applying data science to economic theory can be a challenging task. It requires a deep understanding of the economic principles and their underlying dynamics, as well as a technical knowledge of data science techniques. Additionally, data science requires a large volume of data to be collected and analysed, which may be difficult to obtain or may be subject to biases or errors [23]. Furthermore, economic theory can be highly complex and difficult to interpret, often requiring the use of sophisticated models and techniques to support its conclusions. Data science can be an invaluable tool in helping to analyse and interpret economic theory, but it is not a substitute for a deep understanding of the underlying principles.

### **CONCLUSION**

In conclusion, data science can have a powerful impact on economic theory. By allowing for the collection and analysis of large amounts of data, researchers and economists can gain insights that can help inform policy decisions and contribute to a better understanding of the economy. Data science also brings in new techniques that can be used to analyse economic data in different ways and uncover new trends. With the help of these new techniques, economic theory can be advanced and better decisions can be made to help promote economic growth and stability.

Overall, data science has made a significant impact on economic theory. By incorporating data-driven approaches, researchers and economists alike can gain a better understanding of economic phenomena and make more informed decisions. Data science can also help us to identify economic trends and correlations between different economic variables, which can be used to forecast the future and explore new economic possibilities. As data science

continues to evolve, its application to economic theory is likely to become even more valuable and important.

Overall, data science has the potential to drastically improve economic theory. By providing more accurate data, more sophisticated algorithms, and more efficient analytics, data science can help economists better identify economic trends and make more informed decisions. Additionally, data science can also help economists better understand the causes and effects of certain economic phenomena, as well as better predict the likelihood of certain events occurring in the future. In the end, data science is a powerful tool that can significantly enhance economic theory and help economists make better decisions.

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