

# Research and analysis of Python in economics courses in the background of big data

**Yabin Shi**

*Faculty of Economics, Guangzhou College of Commerce, Guangzhou, 511363, China*

**Abstract:** *With the advent of the era of big data, accelerating the development of modern industrial system, expanding the growth of the new generation of information technology, and promoting the deep integration of the Internet, big data and artificial intelligence is the development trend of The Times. Python, as a powerful programming language, has significant advantages in big data processing and analysis. In addition, the importance of data analysis in the field of economics is becoming increasingly prominent. In this context, it is of certain practical significance to study the integration of Python technology and economics related courses. This paper aims to analyze the current situation of Python teaching in economics courses under the background of big data, analyze the reasons for the integration of python and economics courses, discuss its application in economics teaching and research, and its positive impact on the cultivation of economics professionals.*

**Keywords:** *python, Economics course, research*

## 1. Introduction

In today's big data era, the scale and complexity of data are growing exponentially. As a social science studying resource allocation and human behavior, economics is becoming more and more dependent on data. Traditional economic analysis methods face many challenges when dealing with large-scale data, and the emergence of Python language provides new tools and methods for economic research. Python As a more concerned big data artificial intelligence language, it shows many highlights in the financial data analysis. Many colleges and universities begin to pay attention to the organic integration of Python and economic disciplines, and study the influence of Python technology on university talent training, major construction and discipline development. For example, some students majoring in economics in universities began to contact "python Computer Language Programming" and subsequent "python Finance Big Data Mining and Analysis" in their freshman year. It can be seen that the integration of python and economics courses is in line with the purpose of "cultivating people by virtue and educating people". To some extent, it affirms the positive guidance of python for talent training in colleges and universities. Using Python, a tool of data analysis, it provides valuable suggestions for the professional development of economic colleges and the training of economic talents, which reflects the positive role of python on the professional development of economics. Under this research background, integrating Python technology into economics curriculum construction is one of the ideas of curriculum reform<sup>[1]</sup>.

## 2. The reasons for promoting the integration of Python technology and economics courses

### 2.1. Python Technical characteristics meet the needs of economics curriculum reform

First of all, it is well known that Python compared with other computer languages is easier to learn computer programming languages, with fewer keywords, simple structure, and a more powerful standard library and third-party library. Python Computer programming language can solve the more complex business flow in economic and financial activities, avoiding students trapped in complex data acquisition and collation and losing interest in the course. In addition, Python has a relatively complete ecological environment in the analysis and processing of financial big data, and there are mature modules for the distributed computing, data visualization and database operation of financial big data. The integration of economy and finance with Python technology can strengthen students' skills to acquire, clean and analyze financial data, and efficiently display complex economic and financial data through Python visualization function, which is in line with the skill goal of economics curriculum

reform.

## ***2.2. The combination of Python technology and economics courses meets the needs of big data talent training and applications***

Under the background of realizing the Chinese modernization, in the critical moment of the construction of a financial power. China is in urgent need of economic and financial application of big data talents with both data analysis skills and business knowledge. Excellent economic and financial application of big data talents should not only be able to understand data, but also apply data to actual production management, and use big data analysis technology to achieve enterprise data decision. Python Technology can realize the perfect combination of technology and theory, which can not only cultivate the computer technology of economics students, but also further deepen the business thinking of economics major students. The integration of computer thinking and economic background can enable students to use big data methods to solve the practical problems of economy and finance in the course of economics and finance. For example, by analyzing the stock price on the day of extracting the stock and analyzing the public opinion of the company on the day of establishment, economics students can study the commercial value of python big data mining technology in the process of learning the production and management of enterprises, and transform the knowledge learned into social productivity<sup>[2]</sup>.

## ***2.3. Python has obvious advantages in the process of big data processing in economics***

First, simple and easy to learn: Python Language has a simple, easy to read grammar, in line with the language logic of most people, so that beginners can quickly learn. For economics students without computer background, there is no need to learn and use Python for financial big data mining and analysis without a deep programming foundation. Second, the rich third-party libraries and tools. Python There are many powerful big data mining and analysis libraries, such as Requests, NumPy, Pandas, Matplotlib, etc. These third-party libraries provide efficient data processing, analysis, and visualization functions that can meet the various needs of economic research. Third, the efficient data processing ability. Python Can collect and process large-scale data sets with high operational efficiency. In the context of big data, economic research needs to deal with massive data, and the efficiency of Python can greatly improve the efficiency of research. Fourth, open source is free. Python Is an open source language that users can use and distribute for free. This allows economics students and researchers to access powerful data analysis tools without increasing costs<sup>[3]</sup>.

## **3. Application of python in the economics curriculum**

### ***3.1. Data collection and collation***

As we all know, data collection and collation is an important link in economic research. Python Data can be obtained from various data sources through web crawler and other technologies, cleaned and collated, to provide high-quality data for subsequent analysis. For example, when studying market trends in a specific industry, you can use Python to write a web crawler and crawl data from industry-related websites, including product price, sales volume, user reviews and other information. Then, these data were cleaned and collated using the Pandas library, removing duplicates, processing missing values, etc., to obtain a structured data set available for analysis. Processing of files is indispensable when processing data. Although there are too many file processing libraries, such as xlrd library, openxl library, os library, etc., the basic principles of these libraries are the same, but some functions are different. The xlrd library and openxl libraries are particularly suitable for handling excel files. Because there are many table-type functions on top of them for users to call, such as formulas, charts, etc. They are all written in general functions and have good compatibility. With these libraries, students can easily read and change data from excel files; the os library provides users with many functions to interact with the system. Through these libraries, students can learn how to browse, create, and delete files and directories in the file system. Processing of files also requires students to learn deeper into the unique properties of different file types and how to handle them correctly. For example, a text file is the most common and contains a lot of document information; a csv file is a text file usually separated by a comma; and an excel file is a table file that can store large amounts of data<sup>[4]</sup>.

### 3.2. Data analysis and modeling

Python Provide a wealth of data analysis and modeling tools for statistical analysis, regression analysis, time series analysis, etc. Economics students can use Python for empirical research to validate economic theory and models. For example, when studying consumer behavior, Python's Statsmodels library can be used to conduct linear regression analysis to determine the influence of consumers' income, product price and other factors on consumers' purchasing decisions. Through the regression analysis of a large number of survey data, the quantitative results can be obtained to provide a basis for enterprises to develop marketing strategies. For other data analysis tools, pandas is a very powerful data analysis tool, capable of reading, processing and analyzing data, and generating corresponding data tables as needed. Students can process the data by understanding how to read and write data with pandas, how to perform data cleaning and analysis, and how to use the various functions of pandas. Such as `read_csv()` and `to_csv()`, both files can be easily read and written to the csv files. There are also `drop()` and `fillna()`, which are tools for handling missing values of data. The `drop_duplicates()` function removes duplicate values; the `groupby()` function is suitable for the classification and integration of data. Using these functions and techniques, students can interpret and analyze the data more deeply, revealing the pattern and development direction. pandas Also has the unique data architecture of Dataframe. This data structure is not only able to handle the original files, it can also meet the needs of a variety of complex application scenarios, including the transformation of file formats. Dataframe Data can also easily complete data cutting, merging, screening, and sorting tasks. These advantages together create a favorable environment for data analysis. For example, the various functions and strategies of Dataframe can be utilized to select the data columns analyzed and to synthesize and statistically process these selected data columns, greatly simplifying the steps of data analysis and processing. There are also like Numpy libraries: Numpy is a library for scientific computing that provides a large number of mathematical functions and optimized array objects. Since the elements in python's list can be of various types, they do not constitute a true numerical array, but Numpy solves these problems very well, making these calculations more efficient. From the perspective of data analysis, although the list of python can be used for data storage and processing. Numpy actually has a multi-dimensional array with a fixed data type. When using, the user only needs to create the corresponding value according to the variables needed to query, so as to quickly find the desired results. In addition, Numpy provides a range of powerful functions, such as `rand()` to generate random numbers and `mean()` to calculate means. These functions make it much easier to operate on an array. From the perspective of data processing, Numpy provides us with numerous linear algebraic functions as well as Fourier transform functions. Students can give their mathematical expressions and their related properties by analyzing such data. The `half()` function has the ability to solve problems such as linear systems of equations. Such functions can construct many mathematical equations, making the mathematical operation process in the economic field in python more concise and efficient. In the field of statistics, for example, Numpy. `median()` numbers are able to handle the calculation of medians, while `Numpy.std()` functions are able to handle problems such as standard deviation. Such functions play a crucial role, and they constitute the core of many data analysis technologies.

In macroeconomics, the consumption function is an important area of research. Suppose that we have a set of data on household income and consumer expenditure. The following are the codes for the simple linear regression analysis using the pandas and statsmodels Library in python:

```
import pandas as pd
import statsmodels.api as sm
# Reading data
data = pd.read_csv('consumption_data.csv')
# The independent and dependent variables were defined
X = data['income']
y = data['consumption']
# Add constant terms
X = sm.add_constant(X)
# Build a regression model
model = sm.OLS(y, X).fit()
```

```
# Output regression results
```

```
print(model.summary())
```

Through this simple case, we can analyze the influence of household income on consumer expenditure, and obtain important statistical information such as regression coefficient and goodness of fit.

### 3.3. Data Visual display

As the final purpose room of economic mining data, presenting data to non-professionals to understand, so the means of data visualization is one of the most important ways in economic research. Python Visual libraries such as Matplotlib and Seaborn can display complex data in the form of intuitive charts, helping researchers to better understand the data and analysis results. For example, when displaying the level of economic development in different regions, Python can be used to map the GDP and per capita income data of each region on the map in different colors, intuitively reflecting the economic differences between regions. Matplotlib Library: Matplotlib is a library for data visualization, which can draw various types of charts. By learning how to use the Matplotlib library to draw pie charts, scatter charts, line charts, bar charts, and how to beautify the charts and add labels and legends, students can visualize the processed and analyzed data, and then analyze the results through the charts. In Matplotlib libraries, there are several important functions that can help students create and beautify charts. For example, `scatter()` is used for drawing scatter plots, which easily creates a series of points and adjusts the color, size, and shape of the points as needed. The `plot()` function can be used to draw line charts, which allows students to create line charts. The `bar()` function is used to draw bar graphs that can create graphs that show the data in bars. The `pie()` function can be used to draw pie charts, which create graphs that fan out the data. The `Subplot()` function is the creation of a subgraph in a drawing, which can place multiple subgraphs in a drawing. The `Legend()` function can be used to add legends to the graph, allowing students to add illustrative labels to the chart to explain what each legend means. Matplotlib: There are such as color mapping, coordinate axis scale configuration, text annotation, and legend setting. Students have the opportunity to master these tools and functions, not only to improve the beauty of the chart, but also to add more information to the chart. In this way, students can not only master and use each knowledge points of python more deeply, but also more effectively meet the needs of visualization.

In financial economics, it is a common study to analyze the fluctuation of stock price. We can use education to obtain the stock data and perform a visual analysis. Here is an example of using the pandas and matplotlib library:

```
import pandas as pd
import matplotlib.pyplot as plt
# Get stock data from the network (assume to obtain data using a stock data interface)
stock_data = pd.read_csv('stock_price.csv')
# Draw a stock price chart
plt.plot(stock_data['date'], stock_data['price'])
plt.xlabel('Date')
plt.ylabel('Stock Price')
plt.title('Stock Price Trend')
plt.show()
```

This case shows how education can be used to quickly visualize stock price movements, helping analysts intuitively understand the trends in stock prices<sup>[2]</sup>.

### 3.4. Course teaching assistance

In economics course teaching, Python can be used as a teaching aid to help students better understand economics concepts and methods. By using Python for data analysis and modeling practice teaching, hands skills and problem solving can be improved. For example, Python's financial data regression model and CAPM model of capital asset price both have an impact on actual financial data.

Combined with case analysis, it is easy to transform financial problems into linear regression problems in statistics, which is helpful for teachers to guide students to obtain data involving financial theories and statistical methods through Python. On the other hand, from the perspective of fixed analysis and quantitative analysis, we can use linear regression analysis technology to guide students to correctly understand the return between a single asset and market returns correctly. Relationships; further instruct students to understand that the statistical model is not a panacea. Only in some special circumstances can it be useful. Students should learn to view statistical models and use statistical methods.

#### **4. The value of python to cultivating professionals in economics**

##### ***4.1. Improve the data analysis ability***

In the era of big data, data is an indispensable resource. If economics majors want to stand out, the ability to mine and analyze big data is one of the necessary skills for economics professionals. By learning Python-related courses, students majoring in economics can master advanced data mining and analysis methods and tools, improve their data analysis ability, and lay a solid foundation for their future career development. In addition, through the implementation of economic models through Python, students can have a deeper understanding of the connection between economic theory and practical models, and improve the ability to build and improve the model.

##### ***4.2. Enhancing competitiveness in employment***

Python is a programming language widely used in many fields. Learning Python helps economics professionals to cultivate interdisciplinary thinking and ability, and better integrate with computer science, statistics and other fields. With the wide application of big data in various fields of society, economics professionals who master data analysis tools such as Python will be more popular in the market. The application of Python in economics major meets the requirements of applied talents construction. Learning Python can enhance students' employment competitiveness and broaden their employment channels.

##### ***4.3. Cultivate innovative thinking***

In the future of society, only the innovator wins, but the innovator is strong. The flexibility and openness of python provide a broad space for innovation for students in economics. Students can use python to conduct data analysis and modeling, explore new economic phenomena and problems, and develop innovative thinking and the ability to solve practical problems.

#### **5. Conclusion**

As a subject closely related to the society, economics should follow the trend of the era of big data, actively participate in the curriculum reform, and achieve the goal of cultivating commercial big data talents for the society. It can be seen that in the background of big data, python has an important value in the economics curriculum. It not only provides a powerful tool and method for economics research, but also provides a new way to train economics professionals. In economics teaching, data analysis tools such as python should be actively introduced, so that students can understand big data technology and be in the role of economy and finance to participate in the course teaching, which can improve students' learning interest and learning effect, and deepen students' understanding of economic and financial knowledge points. For courses with strong professional and operational economics, the deep integration of information technology and professional knowledge can achieve the transformation and promotion of traditional teaching, and finally greatly improve the teaching quality, improve students' data analysis ability and innovative thinking, so as to meet the demand of economics professionals in the era of big data.

#### **References**

- [1] Dou Zhibin. *Financial management digital application ability training path and teaching realization [J]. Business Accounting, 2022(06).*
- [2] Tang Yinfen. *Python Financial Big Data Analysis course teaching research [J]. Time Finance, 2021*

(02).

[3] Luan Y ,Zhu X .*Research on the Application of Intelligent Tourism Data Analysis Based on Python*[J].*Advances in Computer and Communication*,2024,4(6):

[4] Sun L .*Research on the Application of Python in Chinese High School Education: Challenges and Solutions*[C]//*Sam Houston State University, Faculty of Business, Law and Social Sciences, Birmingham City University, Northumbria University. Proceedings of the 4th International Conference on Educational Innovation and Philosophical Inquiries(part8). The Middle School Attached to Sichuan Normal University, 2023: 6. DOI:10.26914/c.cnkihy.2023.106435.*