Application of Statistics to Financial Modelling

Taking Alipay as an Example

Bohao Yan
871889403@qq.com

Xi'an Middle School of Shaanxi Province Xi'an, China

Abstract—In the past two decades, with the development of computers and various statistical software, statistics, as a primary subject, has been widely used in finance, insurance, biology, medicine, economy, sports, operations management and engineering technology. Many fields have been extended by the use of statistical tools and ideas. Although there are still some problems or errors in applying statistical knowledge, statistics are of great help in many ways. Without it, many issues would not be solved. In the complex financial modelling environment, the use of statistics can often produce a more compelling force, so in the process of continuous development and improvement of statistics itself, it is used more and more frequently in the field of financial modelling.

Keywords- financial modelling, statistics, financial products, Alipay

1 INTRODUCTION

By analyzing the specific application of the relevant principle of statistics in financial quantitative research, this paper takes Alipay's basic functions as an example, and combines time series models to study the current role of big data in the financial field.

Statistics is based on statistical methods, which are used to study the fundamental laws of the quantity changes of many random phenomena in society and nature. Statistics and finance have a quite close connection because the application of statistics in the field of finance has been paid much more attention with the prosperity and development of the financial industry, as well as the continuous innovation and development of financial instruments, the complexity of financial markets is increasing, the application of statistics in the field of finance has been paid much more attention. Finance is a discipline based on economic phenomena, and statistics are inextricably linked. More and more statistical methods are used in financial data analysis and financial market research in order to make more reasonable decisions with the convincing proof of statistic data.

2 ONE CLASSIFICATION OF FINANCIAL PRODUCTS IN CHINA

First of all, financial products refer to various non-physical assets with economic value that can be traded or cashed publicly, also called securities, such as cash, bills of exchange, stocks, futures, bonds, insurance policies, etc [1]. Financial products are a combination of specific

ICEMME 2022, November 18-20, Nanjing, People's Republic of China

DOI 10.4108/eai.18-11-2022.2327192

provisions and agreed elements. A financial product often has the duration which could be divided into limited and unlimited. Many bonds and money market products are time-limited. As for stocks, they are theoretically open-ended because they exist for as long as the stocks exist. Financial products also have risks and benefits which will affect each other to some extent but the risks and benefits for financial products will also be affected by many other factors. Price is the core element of financial products since the funder sells financial products in order to obtain income equivalent to the price of the product. In this case, the investor's investment amount is usually exactly equal to the price of the buyer's financial products. In addition, its liquidity and negotiability are also both quite important factors because whether financial products can be quickly converted into cash and whether they can be sold in time at the market will greatly affect the price of financial products. Along with the development of the era of financial products are not only limited to the issue of the bank, more and more private enterprises are also involved in the case of financial products, such as pay-and-escrow, Jingdong payment, etc., which is divided into the loans and financing two aspects such as Jingdong ious, Jingdong financial, balance, etc. Financing is a monetary transaction to pay more than cash for purchases, or to raise funds to acquire assets. Additionally, a loan is a form of credit activity in which a bank or other financial institution lends money at a certain interest rate and must be repaid. By both definitions, financing takes the form of both loans and other ways. Loans can be processed for purchase financing or could be used for consumption, debt repayment and so on. Therefore, the two financial transactions have an intersection but are not included in each other.

In addition to financial products, the financial market can also be divided into money market and capital market according to the use time of financial instruments in Table 1 . Money market refers to the market where financial instruments are limited to one year and less [2], and capital market refers to the market where financial instruments are limited to more than one year.

The debt financing market is mainly composed of medium and long-term loan market, and the medium and long-term loan market is composed of term loans, medium-term notes, long-term bonds, project financing and off balance sheet financing. The specific forms of financial market instruments are as follows.

TABLE 1. CLASSIFICATION OF FINANCIAL MARKETS

Money market (one year or within one year)
Commercial paper Asset backed notes Bank debt Government bills Floating rate note Repurchase agreement Money market fund Short term bond mutual fund Bank acceptance bill Short term financing bonds / ultra short term financing bonds Interbank certificate of deposit Certificate of deposit

Capital market (more than one year)
Debt market *+Debt financing market*
Term loan Medium term note Mortgage bond Credit bond Convertible bond Sovereign bonds Municipal Bond Eurobonds Zero coupon bond Floating rate debt High yield debt income bond Mortgage trust bond Equipment Trust Certificates Index bond Economic development bond TIF bond Tender option bond Multi currency bond Green bond
Equity market *+Equity financing market*
Common Stock Preferred Stock Convertible securities Warrant Depositary Receipts (DRS)

Similarly, the influencing factors of debt financing also include credit enhancement, guarantee enhancement, bond rating factors, maturity matching, etc. Therefore, the practical application of financial models often needs to consider many factors.

3 TAKE ALIPAY AS AN EXAMPLE TO ILLUSTRATE THE ROLE OF FINANCIAL MODELING

Financial modeling is conducive to the financial analysis of enterprises. In essence, financial modeling is the further refinement of financial modeling. Firstly, from the theoretical basis of modeling, financial modeling is an applied discipline, which studies the construction of quantitative economic model and financial calculation on computer, involving many fields such as monetary theory, financial practice, spreadsheet operation and computer programming [3]. Financial modeling uses mathematical tools to study economic phenomena and conduct quantitative analysis through economic models to find potential rules in financial activities and guide actual activities [4]. The application of financial modeling also includes many aspects, accounting or finance; In terms of project investment or project management, it mainly adopts

models such as net present value / internal rate of return. Equity and bond investment includes market scale prediction, investment value prediction and income prediction of various equity; Model estimation and execution strategies for transactions and different financial products [5].

In the era of big data, everyone's information can be digitized. Especially in recent years, advanced data has gradually emerged. Taking Alipay as an example, Alipay has nearly half of its users in China, and the figure is still rising. Meanwhile, the data involved in North China business is more complex [6]. After understanding the user's occupation, it is necessary to review the user's reputation and analyze the user's income to obtain the specific loan amount. This is a highly complex process involving many aspects. For the current commercial banks, financial modeling is widely used in management decision-making and risk management. Common problems in financial and economic modeling include investment problems, housing loan problems, installment problems and securities problems. The general method is to transform these problems into common knowledge points in elementary mathematics through mathematical modeling to solve these problems, such as number line problems, power function problems, inequality problems, etc [7].

Therefore, the financial model must be used to analyze it in order to play a reference role [8]. For example, in other aspects, Monte Carlo simulation method in financial modeling can be used to obtain specific digital characteristics of statistics and take them as numerical solutions to problems solved by sampling experiments or random simulation of existing data of random variables using random numbers. This can better solve the randomness and uncertainty of cash flow in project investment. Financial analysts can predict decision makers from cumbersome mathematical calculations, or through computer numerical simulation experiments many times in a short time to improve decision-making efficiency and save a lot of decision-making time [9]

Statistics has a variety of applications. Financial modeling is the combination of modern mathematics and computer technology in the financial field. It is still a huge undertaking, with more than 500 million users, and even financial models to guide and analyze the lending and savings process. Therefore, statistical data must be used to separate target customers during modeling, that is, different financial models must be established for different levels of users [10]. It is usually stratified according to users' income and social status, so that different groups of users have corresponding models as the basis.

Alipay's popularity is that it can collect data in a standardized way and organize data effectively. Constantly put forward new data model structure, abstract practical application problems into mathematical thinking, analyze, verify and review statistics, better integrate mathematical statistics into financial analysis process, improve functional efficiency, expand application scope, and finally achieve high-quality development.

Alipay also adopts the standard time series model. This paper introduces the classical model of time series analysis - autoregressive model, in order to explain the conventional form of time series model and its application significance.

Autoregressive model first introduces the autoregressive model: autoregressive model is the process of taking itself as a regression variable, that is, using the linear combination of random variables at a certain point in the early stage to describe the linear regression model of random

variables at a certain point in the future, which is a common form in time series. The mathematical expression of autoregressive model is as follows:

$$y = c + \emptyset_1 y_{t-1} + \emptyset_2 y_{t-2} + \cdots + \emptyset_p y_{t-p} + \varepsilon_t \quad (1)$$

c is a constant term, is the coefficient of the model, is white noise sequence. The above equation is called a p-order autoregressive model, denoted as AR(p). When p = 1, the autoregressive model is similar to geometric series and damping vibration models, and the parameters can be solved by first-order linear recursion. When p = 2, the autoregressive model is identical to the Fibonacci sequence and other models and can solve parameters by high-order linear recursion. The significance of this model lies in that the past determines the future, and the current value of variables depends on the linear combination of the past matters. Therefore, the rules discovered in the past can be used to fit the future data to achieve the prediction effect. This model has the following characteristics:

- There is a correlation between the front and the back, and a set of data conforming to the above model is autoregressive data.
- The autoregressive model of time series is not closely related to each moment. Time is only the order given to data, providing an Angle for observation and recording.
- The ultimate purpose of the time series model is to understand the essential laws of changes of things through data analysis.
- After mastering its regular changes, and then according to the data corresponding to the required time, we predict the data to be generated in the future, and the final result is to improve its accuracy.
- Each group of data has its independence, and there are similarities between each group of data. The autoregressive model of this study is a relatively basic model based on the summary and induction of multiple sets of data, which conforms to a relatively large amount of data. 6. the model cannot accurately predict the data; there is an inevitable error within the normal range.

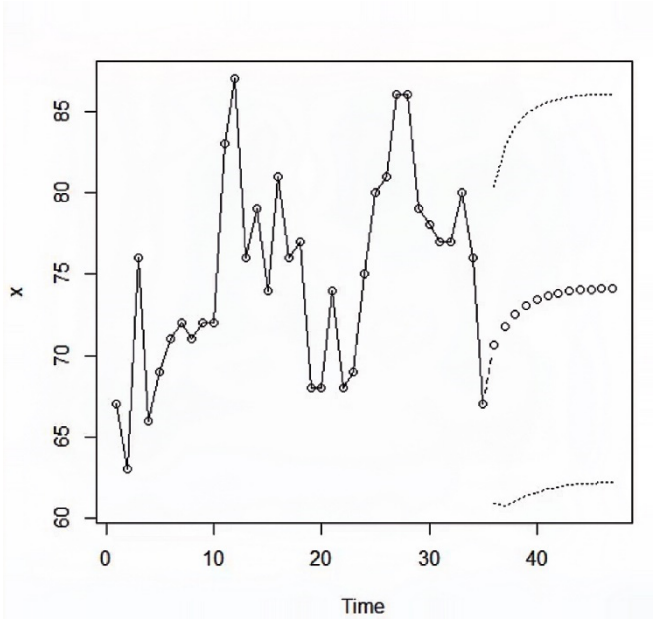

Figure 1. The expression form of time series model

The expression form of time series model is often shown in the Figure 1 above.

Using the time series analysis method, we can find out the composition of the law of financial market development and change to make a scientific prediction. For example, determine whether the asset price has a long-term trend, positive or negative trend, or whether a variable contains seasonal factors. In short, qualitative analysis mainly focuses on the exploration of the essence of things. After the data is brought into the model, the trend of its change is analyzed, and the different characteristics shown by other models are compared to find the overall features. According to the research results, macroeconomic adjustment directions such as economic policy can be formulated.

Another way to use time series is to use models to fit market data and make scientifically accurate predictions. By bringing data into each model, we can observe its characteristics and rules and choose the most intuitive model to show the aspects of the data as the mathematical modelling of the variable and used to predict the variable's future value. The quantitative analysis mainly focuses on the analysis of data. According to the data structure and characteristics, find out its internal mathematical relationship and predict the data at the next moment. Quantification considers the interference of external factors. Quantitative application is more reflected in the prediction of financial asset price data.

4 CONCLUSIONS

This paper first introduces the concepts of statistics and financial modeling, and then elaborates the relevant factors of financial products and many private enterprises involved in financial products are mainly divided into loans and financing. Furthermore, this paper uses Alipay as an

example to analyze the convenience and importance of data statistics and financial modeling in dealing with large amounts of data. In addition, the autoregressive model and the time series analysis method are illustrated to show the actual case of the financial model used by Alipay to show the convenience and effective effect of the two models are given. As a vital link in the decision-making and operation of modern enterprises, financial modelling plays an increasingly important role [11]. It plays a crucial guiding role in applying financial investment, financial research, financial risk avoidance and financial prediction, financial supervision, financial data analysis and many other fields. In the future, it is more necessary to improve the role of statistics in the application of finance and improve the scientificalness and predictability of financial investment.

REFERENCES

[1] Pan Haifeng. Innovation and practice of financial statistics teaching [J]. Journal of jilin university of education (late),2013,29(02):29-30.

[2] Chen Yu-Chen, Huang Wen-Chen. Constructing a stock-price forecast CNN model with gold and crude oil indicators[J]. Applied Soft Computing Journal,2021,112:

[3] Liu Xinghua. Dynamic Mechanism and Agent Modeling analysis of Securities Market [D]. Donghua University,2005

[4] Wei Jianrong. Financial Data Analysis in economic physics: Statistics and Modeling [D]. Fudan University,2013.

[5] Dai Yuwen. Can ESG Investing Beat the Market and Improve Portfolio Diversification? Evidence from China[J]. The Chinese Economy,2021,54(4):

[6] Chen Zelu. Marketing Strategy of E-commerce platform -- A case study of Alibaba [J]. Office Automation, 2012,26(14):26-28+44.

[7] Yang Chunxia. Financial Complexity Research and Financial Market Modeling [D]. University of Science and Technology of China,2006.

[8] Zheng Yangdan, Fang Youheng. Shanghai Insurance,2021(06):45-48. (in Chinese)

[9] Yu Shaohao, Zhuo Yanjun. Analysis of the business model and potential risks of the third Payment -- taking Alipay as an example [J]. Today's Wealth,2021(14):33-34

[10] Zhang Chao. Application analysis of statistics in financial field [J]. China Business Theory,2021(13):79-81

[11] Wang Yuan. Research on the application of applied statistics in the field of finance and securities [J]. Wealth Times,2020(02):53.