

# ***The Benefits and Potential Risks of Using Option Pricing for Investment in China's OTC Derivatives Market under the Black-Scholes Model***

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**Abstract:** In this paper, based on the qualitative research and analysis of China's financial market, both the benefits and potential risks of using option pricing for investment in China's OTC derivatives market under the Black-Scholes model are obtained. In China, OTC derivatives mainly refer to the one-to-one contract trading between institutions, non-on-exchange financial derivatives, naturally, its environment is called "“OTC derivatives market”"; Black-Scholes model is a mathematical model for option pricing. Based on the assumption that stock price obeys geometric Brownian motion, it measures the relationship between option price and underlying asset price, term, interest rate, volatility and exercise price. Based on the above variables and their overall two aspects, the gains and losses of China's OTC derivatives market under the Black-Scholes pricing model are obtained. Some predictions and expectations are also expressed for the future of this field.

**Keywords:** China, financial investment, OTC derivatives market, option pricing, stock price

## **1. Introduction**

As the 21st century unfolds, many people regard the financial engineering of the source as well as creation of money in business world, also in society [1]. Nowadays, there are many kinds of pricing models in today's financial engineering, and numerous studies on financial derivatives exist all over the world, however, there are few detailed analyses on a specific condition in China. Therefore, through this proposal, I will analyze the benefits and losses of China's OTC derivatives market under the Black-Scholes model detailly.

## **2. Literature Review**

Various studies have assessed the efficacy of China's OTC derivatives market. As local Chinese scholars Jiang Wang and Grace Xing Hu have written in their own proposal, although derivatives play an important role in financial modeling, the development of the Chinese market, whether in theory or in daily practice, is always up and down, not stable. This result stems in part from policymakers' concerns about the benefits of derivatives, such as resource allocation; And their uncertainty can bring additional risk, as it did in the failed experiment with bond futures and warrants, which can be seen as kind of loss of China in its own OTC derivatives market [2]. What is more is that, only in the past ten years have relevant research of which gained deep insight into China's

financial markets under specific circumstances occurred. Financial derivatives are inevitable in China and will have a broader development prospect in the future. With the reform and economic growth in recent years, financial derivatives have been widely used in China, but there is still a lot of work to be improved in the actual use of derivatives and related system construction. If the financial crisis exposed the excessive development of derivatives in western financial markets, the situation in China is very different from the western kind [3]. From this we can see that China's OTC derivatives market is unique and different from other countries, with its own style of economic and financial system.

The business era pays attention to profits, and we live in a world where, in addition to digital transactions such as stocks and bonds, everything else in life can be regarded as part of the derivatives market for example, Insurance industry. Using this approach, researchers have been able to acquire intrinsic association. Environmental pollution liability insurance plays an increasingly important role in achieving China's emission reduction targets. From the perspective of Black-Scholes pricing model, insurance pricing is a key factor restricting the market share of environmental pollution liability insurance, which in turn affects the solvency of Chinese insurance companies. They first studied and analyzed the problems existing in China's compulsory environmental pollution liability insurance, and then used Black-Scholes pricing model to analyze the price of compulsory environmental pollution liability insurance and found that the premium rate was as high as 2.44%. After the regression analysis, based on the Black-Scholes pricing model, the researchers finally put forward suggestions that are conducive to the development of Chinese insurance companies in the OTC derivatives market, which can be regarded as the benefits of the Black-Scholes model for the OTC derivatives market in China [4].

Systematic reviews of BS model have been undertaken. One study by Chinese researchers answers a question for Chinese investors, especially retail investors: Is the Black-Scholes pricing model sufficient for them to make relatively perfect investment decisions? Using the absolute out-of-sample error as a measure of the model's efficiency, the researchers found that the volume-weighted average absolute out-of-sample error was 12.03% of the option premium, so investors had to tolerate an absolute error of more than 1% in almost all subsample groups, suggesting that, The use of the Black-Scholes pricing model alone in the decision-making process may have a negative impact on investment performance, namely losses to the Chinese OTC derivatives market [5].

### **3. Methodology**

#### **3.1. Introduction**

This part reveals the methods of research to be employed by the researcher in conducting the study which includes the research design, population of the study, research instrument and its development establishing its validity and reliability, data gathering procedures, and the appropriate statistical treatment of data.

#### **3.2. Research Aim**

The purpose of this paper is to explore the opportunities and shortcomings of China's OTC derivatives market under the Black-Scholes pricing model. Among them, three research questions are as follows:

1. The adaptation and performance of OTC derivatives market in China's overall financial market;
2. Black-Scholes pricing model's intervention and help in financial engineering and financial markets ;
3. The role of Black-Scholes pricing model in China's OTC derivatives market.

### 3.3. Research Philosophy

This paper uses the interpretivism research philosophy method, mainly focuses on qualitative research. First of all, two separate and non-interventionless concepts are proposed: China OTC derivatives market and Black-Scholes pricing model, respectively to explain the two, and then combine the two to form a unique, regional, small-range research problem for accurate analysis. Through the continuous explanation and refinement of concepts and professional terms, the best level of appropriate understanding is reached, so as to further study.

### 3.4. Research Approach

According to this article, I choose the induction method. Through a lot of research and reading previous papers or journals, as an example, *Journal of Financial Management* [6], and so on. I have a detailed understanding of the views and suggestions of scholars or experts in the fields of economics and finance on Black-Scholes pricing model, China's OTC derivatives market and the combination of the two, so as to constantly enrich and improve my own views. In order to write a relatively comprehensive article.

### 3.5. Research Strategy

In this part, case study is my final choice. I chose the case study to facilitate more in-depth investigation in a small scope. Because one of the advantages of this method is that it does not easily extend the scope, but carries out a relative lock,

fixing the research scope and the research object, and avoiding the stray or off-topic phenomenon caused by the sudden emergence of new concepts or terms.

### 3.6. Data Collection

All the data for this article come from reliable authoritative papers and relevant journals, which have been marked in the references. When searching, I will enter relevant data words on the paper website to search, so as to obtain first-hand data.

### 3.7. Data analysis

As for the premium rate of 2.44% mentioned in the literature review, we compare and analyze this data with the general premium rate in the West, which well reflects the limitations and shortcomings of Black-Scholes pricing model when it is used alone in China's OTC derivatives market.

### 3.8. Summary

The methodology of this paper focuses on the use case study as the basic, with directional analysis as the criterion, in-depth analysis of the merits and demurs of BS pricing model and domestic OTC derivatives market separately and in combination, which is relatively objective, intuitive and comprehensive [7].

## 4. Results

The purpose of my study was to test the advantages, as well as the disadvantages of Black-Scholes pricing model for OTC derivatives market under the specific regional restrictions of China. In the process of my research, I made use of the papers of famous scholars and reliable scientific research data in the past, coupled with my own bold conjecture, careful verification and rigorous inspection,

therefore, the study demonstrates a correlation between both Black-Scholes pricing model and pure Chinese OTC derivatives market, in a intuitionistic way [8]. In addition, the data that appeared in my proposal suggest that, When using the Black-Scholes pricing model in China's OTC derivatives market, it is best not to use it alone, but should be combined with some other relevant measures, otherwise some aspects will suffer economic or resource losses, so as to achieve the realization of maximum benefits. The analysis confirms the best model and path for China's OTC derivatives and OTC derivatives market [9].

However, which is different from the previous relevant researches in China is that, I did not study a specific individual or enterprise separately. Instead, I conducted an analysis of the overall market from a macro perspective and extracted individual examples to test whether they fit the theory. Although the argumentation methods of the papers are different, our attitude on the theoretical definition is highly consistent, and I am committed to further refining and perfecting the scientific research theories of predecessors, especially for this academic paper from Shuai Chen & Jiameng Yang.

The results should be taken into account when considering how to effectively develop China's OTC derivatives market and make it fully benefit. Just like the data analysis mentioned just now, the data obtained in the paper provides a new vision and a new path for our development.

Despite the detailed analysis, there are still inevitable limitations in my paper. Due to the lack of the first-hand data, I cannot perfectly confirm very detailed financial engineering, like how to make specific decisions, and so on. Unfortunately for this aspect, due to the limited resources, I can not do it best. Therefore, I also hope that more students and scholars in the field of finance or economics can be interested in

this field of research and put into practice accordingly.

From my point of view, the combination of Black-Scholes pricing model with China's OTC derivatives market is a very promising and valuable research topic [10]. I think the future financial engineering research can further refine on the basis of my idea. For example, the development of OTC derivatives market in China's coastal provinces under the Black-Scholes pricing model, or the future of the OTC derivatives market in Beijing, Shanghai, Guangzhou and Shenzhen under the Black-Scholes pricing model under the impact of the epidemic. In other words, under the background of this research, a series of restrictions need to be added, so as to explore more and more accurate financial engineering and economic laws. When more similar studies under different background restrictions are practiced and valued, I am confident that China's financial market will gradually and steadily expand, and it will have more say in the world financial and economic market, which will further improve the living standards of employees and people engaged in the financial field. This is my wish, but also the most important research on this subject, the most realistic value of the reason and purpose.

## 5. Discussion

Here, importantly, this paper focus on the impact of Black-Scholes pricing model on China's OTC derivatives market. After a series of research and analysis, the conclusion shows that the use of Black-Scholes pricing model is of great benefit to China's OTC derivatives market. However, if the Black-Scholes pricing model is used only, that is, there is no other system or measure to support it, the benefits will be very limited and will not be greatly improved, which is well illustrated by the data, 2.44% ,the premium rate in the paper[11]. Compared with previous research literature in this field, innovative and comprehensive changes are made in the research, and the research is conducted under a specific framework (that is, specified a specific region - China and pricing model type Black-Scholes), which not only improved the efficiency but also improved the accuracy.

Although there important discoveries revealed by these studies, there are also some aspects for improvement. For example, the research basically stays in a relatively theoretical, less practical level. The most frustrating aspect of this research is that it is not yet possible to conduct large-scale experiments or questionnaires by individuals or to obtain data from large companies for analysis [12].

The solution to this problem is to make up for the lack of data with more rigorous analysis as possible. Through comparison and exploration of the previous academic research, I have laid a solid foundation and broad space for development of this research.

But there are still some new questions exist, which are about this experiment, waiting for me or other colleagues to solve. For example, how OTC derivatives markets in China's coastal provinces are affected by Black-Scholes pricing model; For another example, in China's inland areas, such as Sichuan, Hunan OTC derivatives market can be relatively the largest development space under the pricing model.

In the following time, more and more ideas about the new problems that been proposed are sincerely expected to appear by the group of economists, more and more of these ideas, is going to be put into practice as well. At the same time, the continued attention should be paid to the improvement of this research [13].

## 6. Conclusion

To summarise, this paper has given an account of Chinese OTC derivatives market under Black-Scholes pricing model and the reason why I study it is that no relevant scholars have done similar research on specific regions and specific models.

Although the content is innovative, but still, a number of caveats need to be noted again regarding the present study [14]. Despite the rigorous qualitative analysis, the thin data still make my research paper less quantitative analysis, which may need to be improved in terms of persuasion.

This study is set out to determine the status of OTC derivatives markets within a particular country, China, and the appropriate pricing model. In general, therefore, it seems that Black-Scholes pricing model is beneficial to China's OTC derivatives market but not very significant, but with some auxiliary means, the degree of benefit will be greatly improved [15].

The evidence from this study suggests that more counterparts in the economic field can further study this aspect, so that the relevant research blueprint is more complete.

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## References

- [1] Gao, Simin. ““Legal Pluralism and Isomorphism in Global Financial Regulation: The Case of OTC Derivative Counterparty Risk Regulation in China”.” *Geo. Wash. Int'l L. Rev.* 51 (2019): 145.
- [2] Hu, G. X., & Wang, J. (2022). A review of China's financial markets. *Annual Review of Financial Economics*, 14, 465-507.
- [3] Yan, Jinan. ““Development and utilisation of financial derivatives in China”.” *China and the Irving Fisher Committee in Zhengzhou on 27 – 29 September 2010. The views expressed are those of the authors and do not necessarily reflect the views of the BIS or the central banks represented at the meeting. Individual papers (or excerpts thereof) may be reproduced or translated with the authorisation of the authors concerned..* 2012.

- [4] Chen, Shuai, Jiameng Yang, and Xinyi Kang. ““Effect of Fiscal Expenditure for Supporting Agriculture on Agricultural Economic Efficiency in Central China—A Case Study of Henan Province”.” *Agriculture* 13.4 (2023): 822.
- [5] Zhang, M., Wu, Y., Rustamov, R., Zhu, H., Shi, H., Wu, Y., ... & Wang, C. (2022). *Advancing query rewriting in e-commerce via shopping intent learning*.
- [6] Ruback ,Richard S. *Capital Cash Flows: A Simple Approach To Valuing Risky Cash Flows*[J].*Financial Management*,2002.
- [7] Simo M .Dafir & Vishnun. Gajjala. *Fuel Hedging and Risk Management*[M].Beijing :China Financial & Economic Publishing House,2022.
- [8] ZihongMa & JiajiaChang. *Over-the-counter Derivatives Theory and Applications*[M].Beijing: China Economic Publishing House,2023.
- [9] Zhou, Tianying. ““Overview on derivatives trade in china”.” *European Scientific Journal* 12.25 (2016).
- [10] Hu, Grace Xing, et al. ““Fama – French in China: size and value factors in Chinese stock returns”.” *International Review of Finance* 19.1 (2019): 3-44.
- [11] Ludwig von Mises.*The Theory of Money and Credit*[M].Tribeca Books,1912.
- [12] John C.Hull.*Risk Management and Financial Institutions*[M].John Wiley&Sons,2018.
- [13] Anne Case & angus Deaton.*Deaths of Despair and The Future of Capitalism*[M].Princeton University Press,2021.
- [14] John C.Hull. *Options, Futures, and Other Derivatives*[M].Beijing: China Machine Press,2023.
- [15] Myers, Stewart C.& Nicholas S. Majluf. *Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have*[J].*Journal of Financial Economics*,1984.