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摘　要

目前，中国是世界上第二大石油消费市场，不断上涨的石油价格给中国经济发展带来了巨大的压力。国际上，石油金融衍生品市场特别是石油期货市场在国际石油定价机制中的影响越来越大，世界石油价格均以交货前后一段时间的期货市场价格为基准定价，这个参照的基准价都是各地有影响的期货交易所场内交易的石油期货品种价格，而亚洲至今没有成功的石油期货市场，这对中国，以及亚洲其他的新兴石油消费国都是极为不利的。

从1998年开始，改革之后的中国石油价格体系脱离了计划经济的约束，以美国标准的普氏报价系统公布的新加坡市场价格为基础来确定。但是，作为一个垄断性的行业，中国石油价格仍然与政府有着千丝万缕的联系，导致目前的石油定价机制存在诸多弊端。为应对国际石油价格的波动，保障中国石油市场安全和国民经济长期稳定发展，中国迫切需要发展并利用自己的石油衍生品市场，将衍生品市场价格作为本国石油交易甚至是亚洲石油交易的定价基准。

基于以上的考虑，本书以价格波动为研究核心，试图通过石油金融衍生品价格波动的研究，探索衍生工具发现价格、稳定价格、回避价格风险的作用，因此，本书分别进行了石油衍生品市场价格波动与石油现货市场价格关系的研究，衍生品市场价格波动的规律和风险管理研究，并在本书的最后提出了管理中国石油价格波动风险的思路和方案，那就是建立中国石油金融衍生品市场，让这个市场发挥石油交易定价中心的作用，将现货价格波动的风险转移到衍

生品市场上。

本书开宗明义，首先介绍了石油现货市场价格波动的情况。影响石油价格波动的重要原因之一就是石油期货市场的投机行为，而以期货为核心的世界石油价格形成机制是导致石油期货投机对石油现货价格波动产生重要影响的始作俑者。因此，在第3章本书采用了演绎的方法，将预期价值理论应用到石油期货市场和现货市场上，研究了期货和其他衍生品市场上的预期行为，并构造了期货市场石油价格的预期传导机制。通过这一传导机制，预期不仅影响了石油期货和其他金融衍生品的价格，还影响了石油现货的价格，由此，我们可以得出一系列的关于稳定预期从而稳定价格，培育石油市场的理性预期者从而稳定经济等相关政策建议。

在本书的第4章“基于神经网络的石油期货价格波动研究”里，应用了实证研究的方法。经过了反复几十次的调试，发现了石油期货价格波动的规律，并利用这个规律对石油期货价格进行合理的预测。通过BP网络的训练，可以发现相当长时间内的石油价格变化的规律，利用这个规律进行预测，对于周的数据精确度是最高的；对于日的数据而言，由于日数据的波动性比较小，所以预测的精确度没有周的预测效果好；对于月的数据，由于数据相对较少，只有196组数据，所以精确度也没有周的预测效果好。如果能够有足够多的月数据，月的预测结果和周的结果会是一样好，因为其总体走势图都呈现了相似的波动。研究还发现，汇率对石油价格的每日波动没有显著影响。

石油价格波动的规律性研究不仅与投资者的利益密切相关，对于提高市场理性预期来说也具有重要作用，如前面所述，如果利用神经网络对于石油期货价格波动的研究能够促进衍生品市场形成更合理的理性预期，那么基于神经网络的石油期货价格波动研究对提高市场效率，稳定石油价格将起到重要作用。

在石油金融衍生品市场价格波动风险的管理上，本书从两个方面进行研究，一是石油交易所对于衍生品价格波动风险的管理；二

是石油企业对衍生品价格波动风险的管理。

石油交易所对价格波动的风险管理，主要反映在期货合约设计上面，本书采用实证研究与案例研究相结合的方法，以一个创新的合约设计为例，来看交易所合约设计的具体内容对价格波动风险的控制作用。鉴于纽约商品交易所和上海期货交易所的燃料油品种的联动性越来越强，如果投机者采用传统的套利方法进行套利投机，则投机者操作涉及两个市场，两笔交易，资金量大，加之投资者对国外市场又不熟悉，因而风险比较大。由此，本书设计了燃料油期货跨市套利合约。本研究利用历史数据，从两个市场的价差中寻找规律，确定合理的合约乘数、保证金、涨跌停板等合约设计中的重要数据，通过历史收益模拟可以看出，合约设计是较为合理的。此合约设计不仅提供了一种避险方法，而且合约的价值低，操作方便，如果得到市场的推广，必将受到套保者和投机者的欢迎。从合约的具体交易上来看，本合约设计还有待在实际运用中进一步测试、完善。

石油企业对价格波动风险的管理主要是国际大型石油企业如何运用金融衍生工具规避价格波动的风险，由于金融衍生工具的双刃性，国际石油企业通常结合公司的实际情况有选择性地加以使用，同时针对衍生工具业务活动制定了严格的风险管理及监督机制。本书在此采用了案例研究的方法，介绍了两家相关石油企业如何利用场外期权、互换的衍生工具，管理价格波动风险。在操作风险管理方面，本书以“中航油”事件为例，介绍了中国石油企业价格波动风险管理的特殊之处。

最后，本书回到中国的实际情况，也就是回到了写作本书的出发点——如何管理中国目前面临的石油价格剧烈波动风险。中国石油行业由于其特殊的发展历史和其本身的垄断性，目前仍没有完成彻底的市场化改革，石油定价机制仍存在很多弊端，国外资本甚至利用中国目前的定价机制，在石油衍生品市场上联手操纵油价，使中国石油安全面临极大威胁。

解铃还需系铃人，为了化解中国目前面临的石油价格波动风险，最有效的办法就是以更加市场化的手段来管理中国石油价格，即建立自己的石油金融衍生品市场体系。本书所要建立的石油金融衍生品市场体系，是这样一种价格形成机制，该机制使得石油金融衍生品的价格波动，及时传导到石油现货市场上，成为现货价格的基准价格或参考价格；同时，通过衍生品市场的预期传导机制，现货交易价格也将通过石油金融衍生品的交易者的理性预期传导到衍生品市场上，并综合社会各界因素，形成衍生品市场价格的波动，真实地反映未来现货市场供需情况的变化，发挥石油衍生品市场发现价格、稳定价格、回避价格波动风险的作用。

本书还设计了以成为亚洲能源衍生品交易中心为目标的石油金融衍生品市场价格体系的战略规划，以长期保障作为石油消费大国的中国的利益，保障国家的石油安全。正如计算机内的缓存可以保障计算机运行安全、稳定、高效一样，建立自己的石油金融衍生品市场将对管理中国石油价格波动风险，提高中国市场经济运行效率意义重大。

本书所作出的创造性工作及意义，在相应章节的总结部分以及第7章结论部分已做了论述，在此处作一简要概括。

第一，从研究主题来看，本书以石油金融衍生品市场下的价格波动为本书的研究主题，从金融衍生品市场的角度来研究石油价格。虽然研究石油价格的论文众多，但是从这个角度来研究的相关的论文并不多见。

第二，关于石油价格波动预测，就笔者目前的研究而言，通过BP网络的训练，可以发现相当长时间内的石油价格变化的规律，利用这个规律预测石油价格波动，不仅可以让保值者和投机者最大化自身利润，从社会效率来说，神经网络预测模型能够使期货市场形成更加理性的价格预期，对促进社会效率具有现实意义。

第三，关于预期对石油衍生品价格以及对现货市场价格的影响。本书将预期价值理论应用到石油衍生品市场和现货市场上，并

构造了石油价格的预期传导机制。

第四，在交易所合约设计对价格波动风险的管理方面，本书设计了燃料油期货跨市套利合约。合约不仅可以帮助套保者和投机者实现利润最大化，也是期货交易所控制市场价格波动风险的有效途径。

第五，本书构建了中国未来石油期货及金融衍生品市场发展目标，以及达到这一目标的具体的可行步骤，为中国石油市场提出了以成为亚洲能源金融衍生品交易中心为目标的战略设计。

关键词：金融衍生品市场　价格波动　石油期货　石油市场

Abstract

At present, China has become the second petroleum consumption market. The continuous upgrading petroleum price gives the Chinese economic development huge press. Internationally, the petroleum derivative market, especially the petroleum future market has greater influence to the forming of international petroleum price. The future prices before or after the transaction day are always used as benchmark prices. These reference benchmark prices are always come from variety petroleum future prices which are traded in influential petroleum future market around the world, but Asia still has no successful petroleum future market, this is a very disadvantage to China and to other countries in Asia which have big consumption of petroleum in recent years.

Since 1998, Chinese petroleum price system has been broken away from the restriction of planned economy after the reforming, and been fixed on the price of Singapore market, which is promulgated in Platts quote system in America. But, as a monopoly industry, the petroleum price still has countless ties from the government, and made the present petroleum pricing system have many abuses. In order to cope with the international petroleum price fluctuation, safeguard the Chinese petroleum market and steady development of national economy in long-term, China eagerly need to develop and utilize her own petroleum derivative market, and made the derivative price as the pricing benchmark in petroleum trade in China and in Asia.

Based on the considering upwards, taking the price fluctuation as the kernel, the paper tries to grope for the function of discovering price, stabilizing price, obviating price risk of petroleum financial derivative market through the studying of price fluctuation in petroleum financial derivative market. So, this book respectively studies the relationship of price fluctuation in petroleum financial derivative market and the price in petroleum spot market, the rule and risk management of price fluctuation in financial derivative market, and puts forward the idea and blue print of how to manage the risk of petroleum price fluctuation in China in the last part of this paper, that blue print is to build the petroleum financial derivative market in China, exerting its function as the pricing center in petroleum transaction, and transfer the risk of price fluctuation in spot market to the derivative market.

This book makes clear the purpose from the very beginning, and firstly introduces the condition of the price fluctuation in petroleum spot market, one of the important reasons which influence petroleum price fluctuation is the speculation in petroleum future market, and the driving reason of this condition is the world price forming system in which future is the core. So, in the third chapter, adopting deducting method, utilizing the theory of anticipation value into petroleum future market and spot market, this book studies the anticipation behavior in future and other derivative market, and structure an anticipation conducting system of petroleum price in future and other derivative market. Through this conduct system, anticipation has not only very important influence to the price in petroleum future and other derivative market but also to the price in petroleum spot market. So, we can drive a series of policy suggestions such as stabilizing the anticipation to stabilize price, fostering the reasonable anticipation to stabilize the economy, etc.

In the fourth chapter "the study of petroleum future price fluctuation

through the nerve net", the book adopts case studying method. After scores of debugging time after time, the fluctuant rule of petroleum future price has been founded, utilizing the rule, the petroleum future price has been reasonably forecasted. Through the training of BP net, the rule of the movement of petroleum price can be found in the long time. With the rule to forecasting, the week dates are most accurate, as the day dates' fluctuation is comparatively small, so its forecasting is not as accurate as week dates; for the month date, because it is relatively less, which has only 196 group dates, so the forecasting is not as accurate as week dates also. If enough dates can be given, it is believable that the forecasting is as accurate as week dates, since its whole trend is as the same as the week dates. The study also finds that the every-day fluctuation of petroleum price isn't the notable consequence of every-day fluctuation of exchange rate.

The study of the rule of petroleum price fluctuation not only has a very close correlation with the benefit of investors, but also has important function to improve the reasonable anticipation of the market. As stated before, if the study of petroleum future price fluctuation through the nerve net can improve the more reasonable anticipation to come into being in the derivative market, it'll also has an important function to improve the market efficiency, stabilize the petroleum price.

In the aspect of risk management in petroleum price fluctuation in financial derivative market, the book studies from two sides, one is derivative price fluctuation risk management by petroleum exchange; the other is derivative price fluctuation risk management by petroleum corporation.

The price fluctuation risk management by petroleum exchange focuses mainly on the design of future agreement. Adopted the case and demonstration studying methods, the book designs an innovative fuel fu-

ture arbitrage contract as an example to see the price fluctuation risk control function of exchange in agreement design. As the linkage of fuel future between NYMEX and SHFE, many people are trying to adopt the traditional arbitrage method to gamble. But this kind of arbitrage method involves two markets, two transactions, and a big capital investment, together with the unfamiliarity to the market abroad, the risk of arbitrage is huge. Using history dates, the study finds the rule of the price difference between two markets, and confirms some important parameters, such as the reasonable contract multiplication, the bail, the rise and fall board, etc. From the simulation through history income, we can see the contract design is quite reasonable. The design of this contract not only gives a risk hedging method of future contract, but also will be welcomed by the hedger and speculator after market popularizing because of its lower value and convenience operation. But, from the angle of material transaction, this contract design still needs to be tested and polished in actual exercises.

The derivative price fluctuation risk management by petroleum corporation is mainly about how the international big petroleum corporation to use financial derivative methods to evade the risk of price fluctuation. Since the financial derivative methods has two blades, the international big petroleum corporation always make use of them selectively according to their actual condition, and set down a very strict risk-control and supervised mechanism aiming at the operation of derivative methods. With case studying method, the paper introduces two pertinent petroleum corporations on how to make use of derivative methods with OTC option and swap to manage price fluctuation risk. On the operation risk management, the book uses the event of China Aviation Oil Company as an example to introduce the special area of petroleum price fluctuation risk management of Chinese company.

Finally, the book goes back to the actual situation in China, which is the starting point of the paper-how to manage the drastic fluctuation risk of oil price which is faced by China nowadays. A thorough market reform still has not completed yet in China because of its special history development and its own monopoly character in this industry, and the oil pricing mechanism still exists many drawbacks, Foreign capital even make use of the current market pricing mechanism in China to manipulates the price in oil derivative markets jointly, Chinese petroleum security is at high risk.

Solution needs the people to give out who puts forward the question, in order to avert the risk of oil price fluctuations which is faced by China nowadays, the most effective measure is to use more market-oriented means to manage Chinese oil prices, that is, to establish our own financial petroleum derivatives markets system. The price system of petroleum financial derivative market which this paper is going to build is such a price forming system that it made the price of petroleum spot price and petroleum financial derivative price to be linkage. It makes the petroleum financial derivative price fluctuation transmit to the petroleum spot market in time and become the spot price's benchmark price or reference price; At the same time, through anticipated price conducting system in the derivative market, the spot transaction price will be transmitted to the derivative market through the bargainers' reasonable anticipation in petroleum financial derivative transaction market, and together with the other social factors, forms the fluctuation of the price in financial derivative market, This reflects the true condition of supply and demand in future spot market, and will truly exert the function of petroleum financial derivative market of discovering price, stabilizing price and obviating price fluctuation risk.

Finally, the book designs a strategic plan of price system in oil fi-

nancial derivative market which aims to become the energy derivatives trading center in Asia, to safeguard the security of Chinese interests as a big oil consumer in long-term, to safeguard the country's oil security. As computer security, stability, high efficiency can be protected with the cache, establishing our own financial derivatives markets will has a great significance in managing the oil price fluctuation risks, improving the economic performance's stability and efficiency of China.

The creative work and its significance have been exposed in the corresponding section of the summary at the end of chapters and in the conclusions of Chapter VII, Here for a brief summary.

First, from the theme of the research, the thesis makes the oil price fluctuation in financial derivatives markets as the theme of the research, from the perspective of the financial derivative markets to study oil prices problem. Although thesis studying on oil prices are numerous, but relevant papers from this perspective haven't been seen frequently.

Second, about the forecast of petroleum price undulation, speaking of the author's present research, through the BP network training, the change rule of petroleum price may be discovered in quite long time, using this rule to forecast petroleum price undulation, the nerve network forecast not only could maximize the profits of the speculator and the hedger, but also could form a more rational price anticipation in the future market, and have a practical significance to promotes the social efficiency.

Third, about the influence of anticipates to the petroleum spot market price as well as to the derivative market price. This paper applies the value theory of anticipation in the petroleum derivative market and the spot market, and structure the petroleum price conduction mechanism of anticipation.

Fourth, in the aspect of risk control of the price undulation with exchange contract designing, this paper designs the arbitrage contract of

fuel future across two future markets. The contract not only may help the hedger and the speculator to dodges the risk, also is the effective way to control the market price undulation risk through the futures exchange.

Fifth, the book has constructed the developing goal of petroleum future and other derivative markets of our country, as well as the concrete feasible steps to achieved this goal, proposing the strategic design to take into the China oil market as energy finance derivative market transaction center in Asian.

Key Words: Financial Derivative Market Price Fluctuation Petroleum Future Petroleum Market

目　录