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中国外汇储备风险测度与管理研究

China's Foreign Exchange Reserves Risk Measure and  
Management Research

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## 中文摘要

改革开放以来，中国的外汇储备走过了外汇短缺的时代，经历了国际金融体系的变革，经受住了数次国际金融危机的冲击，到现在已经跃居世界规模第一位。充足的外汇储备不仅增强了中国调节国际收支、维持人民币汇率稳定的能力，也使国际社会对人民币的币值与购买力充满信心，提高了人民币的国际信誉。2007年“次贷危机”后，美国持续推出数轮量化宽松政策，造成美元流动性过剩，其直接后果是美元持续贬值。希腊爆发的主权风险，以及由其引发的欧洲主权债务危机更是进一步阻碍了世界经济复苏的进程。世界主要发达经济体轮番推出宽松的货币政策，导致主要国际货币汇率剧烈波动，这无形之中加大了中国的外汇储备面临的风险。因此，测度中国外汇储备风险，并研究如何管理风险，对于提高中国外汇储备利用效率以及人民币国际化来说意义深远。

本文紧紧围绕外汇储备风险测度这一核心，在相关风险管理理论指导下，借鉴了国内外学者关于管理外汇储备风险的成果和世界上主要发达国家管理外汇储备的经验，对中国外汇储备风险进行测度和管理。首先，在对外汇储备风险重新定义下测度外汇储备风险。将外汇储备所面临的汇率风险重新定义，创新性的提出 MFA—VaR (Modified Factor Analysis Value at Risk) 模型，并用该模型对中国外汇储备汇率风险进行测度。借助有向无环图 (DAG) 对国际上主要外汇市场之间人民币汇率的传递性进行研究。

其次，在外汇储备风险管理方面研究了风险的投资运用。在预期中国经济持续增长、下滑和恶化三种情形下，创新性构建了斯塔克尔伯格 (Stackelberg) 模型。在金砖国家应急储备背景下构造可变比例准备金指数衡量成员国应对危机的能力，并测算了成员国的潜在福利改进空间。

最后，对外汇储备风险进行评估和预警。并在美国债务危机背景下，构建了 KLR 外汇储备风险预警与评估体系。并提出包括依托“一带一路”建设，提高人民币国际影响力、借鉴国外风险管理经验，探索中国的风险测度方法等在内的相关政策建议。

本文可能的创新之处在于：（1）本文将外汇储备所面临的汇率风险重新定

义为：储备中各个币种各自的汇率波动性、币种之间汇率波动的相关性及这两者共同作用给储备资产损益带来的不确定性；（2）在国内外最新测度外汇风险的 GARCH-M-EWMA 模型和 O-GARCH 模型的基础上，根据本文的定义对因子分析进行修正，创新性的提出 MFA—VaR (Modified Factor Analysis Value at Risk) 模型；（3）在预期中国经济持续增长、下滑和恶化三种情形下，从中美两国金融市场发育程度不同出发，在美元回流机制的视角下，创新性的构建了包括央行、金融市场和实体经济为主体的斯塔克尔伯格 (Stackelberg) 模型；（4）根据 KLR 信号分析法的相关理论，在美国债务危机背景下，结合中国的实际情况构建了一整套系统的基于 KLR 的中国外汇储备风险评估与预警系统。

关键词：外汇储备；外汇储备风险；风险测度；风险管理。

## **Abstract**

Since the reform and opening up, China's foreign exchange reserves have gone through the era of shortages experienced changes in the international financial system has withstood several international financial crisis, and now has reached the world scale first. These rely on foreign trade accumulated huge foreign has played a huge role in promoting domestic economic development and resisting the impact of external crisis. Adequate reserves not only enhance our ability to adjust the balance of payments, maintain the RMB exchange rate stability, but also improve the international reputation of the RMB. Adequate reserves not only enhances our financing capabilities in the international financial markets, but also that improving the country's financial strength and international status. But it should be noted that the huge foreign exchange reserves behind implies risk. As after the "subprime crisis", the United States launched a number of rounds of quantitative easing, the dollar internationally excess liquidity continued depreciation of the dollar. Sovereign risk in some euro zone countries, led by the outbreak of the Greek, and triggered by the European sovereign debt crisis is further hindered the process of world economic recovery. The world's major developed economies in order to stimulate the weak economy to implement monetary policy, leading to volatility in major international currencies, which is invisible to increase the risk faced by our country's foreign exchange reserves.

In this paper, absorbing domestic and foreign scholars on the basis of the risk of foreign exchange reserves, drawing on the experience of the world's major developed countries, management of foreign exchange reserves; this paper redefines the exchange rate risk faced by foreign exchange reserves. On the basis of the latest domestic and foreign currency risk measure GARCH-M-EWMA model and the O-GARCH model, We innovatively proposed MFA—VaR (Modified Factor Analysis Value at Risk) model. And use the model to exchange rate risk measure of foreign

exchange reserves; Under China's sustained economic growth, decline and deterioration of the three cases, the extent of the financial markets from the two countries at different developmental view, Innovative constructed including the central bank, the financial markets and the real economy as the main Stackelberg model, deduced Chinese reserve diversification proportion of US Treasuries, equity and FDI investment; This paper examines the degree of risk diversification within the BRICS countries, In the context of the BRICS countries contingency reserve, proposed variable ratio index of the foreign reserve. And measured the full potential of benefits for improvement within member States under the risk diversification.

The paper's innovations may involve :(1) The paper redefined the exchange rate risk of foreign exchange reserves as: Volatility of respective exchange rates of various currencies in the reserves, and the correlation of currency exchange rate fluctuations, the uncertainty of gains and losses of reserve asset brought by the combination of both.(2) On the basis of the latest domestic and foreign currency risk measure GARCH-M-EWMA model and the O-GARCH model, We innovatively proposed MFA—VaR(Modified Factor Analysis Value at Risk)model.(3) In this paper, China is expected to be sustained economic growth, decline and deterioration, From the different degree of financial market development of Sino-US, In the perspective of the dollar reflux mechanism, Innovative building, including the central bank, the financial markets and the real economy as the main Stackelberg model, China's foreign exchange reserves diversified investment optimal proportion United States Treasury bonds, equity and FDI.(4) This paper examines the degree of risk diversification within the BRICS countries, In the context of the BRICS countries contingency reserve, proposed variable ratio index of the foreign reserve. And measured the full potential of benefits for improvement within member States under the risk diversification.(5) According to the theory of KLR signal analysis method, Combined with China's actual situation of China's foreign exchange reserves to build a set of risk assessment and early warning systems.

**Key Words:** Foreign exchange reserves;The risk of foreign exchange reserves ;Risk measure; Risk management.

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