EXPLORATION OF THE OPPORTUNITIES OF DIGITAL RMB IN PROMOTING CHINA'S CROSS-BORDER TRADE AND RMB INTERNATIONALIZATION

TAO SHEN*

Abstract

China has made significant efforts in the internationalization of the Renminbi (RMB). However, compared with mainstream currencies like the US dollar and the euro, a structural gap remains. This paper identifies the fundamental constraints on RMB internationalization and examines how the Digital RMB (e-CNY) can enhance the currency's international usage. Utilizing an Autoregressive Distributed Lag (ARDL) model on monthly data from 2012 to 2025, we provide quantitative evidence on the e-CNY's impact. The results indicate a stable long-run cointegrating relationship. Specifically, policy milestones such as the official announcement of the e-CNY and the launch of mobile applications have a significant positive long-run effect on the RMB Internationalization Index, whereas the mere expansion of pilot cities shows a marginal effect. These findings provide early empirical evidence for assessing the international role of Central Bank Digital Currencies (CBDCs).

KEYWORDS: Digital RMB, RMB Internationalization, ARDL Model, CBDC, Cross-Border Trade.

1. INTRODUCTION

LOOKING BACK at the evolution of the international monetary system since the mid-20th century, a significant change is taking place. While the US dollar maintains systemic dominance, providing the United States with extraordinary financial power, this order is facing structural challenges. The weaponization of financial sanctions and the resulting

*Faculty of Economics, Shenzhen MSU-BIT University. This paper is based on the author's undergraduate thesis completed in June 2025. I am grateful to my supervisor, Professor Cai Yichuan, for his guidance. All errors are my own.

welfare losses have sparked concerns among global policymakers. For China, promoting the diversification of the international monetary landscape is of strategic significance.

Currently, the global economy is undergoing a transformation driven by digital technology. Central banks worldwide are exploring Central Bank Digital Currencies (CBDCs). As the first major economy to enter the large-scale pilot phase of a legal digital currency, China's Digital RMB (e-CNY) has secured a first-mover advantage. This paper explores how this innovative currency form, backed by national credit and technological efficiency, can reshape international payments.

Existing literature often focuses on qualitative descriptions of the e-CNY or general policy discussions (Zhang, 2024). There is a lack of rigorous empirical analysis quantifying the specific impact of the e-CNY rollout on RMB internationalization. This study fills this gap by employing an Autoregressive Distributed Lag (ARDL) model to analyze the transmission channels and mechanisms through which the digital RMB influences the international status of the RMB.

2. THE DIGITAL RMB AND GLOBAL NETWORK EXPANSION

2.1. Differentiated Advantage System

Unlike third-party payment tools, the e-CNY is legal tender backed by national credit, fundamentally avoiding commercial credit risks. It features a "fully controllable anonymous" architecture that balances privacy protection with risk prevention. Furthermore, the "payment as settlement" model supported by blockchain technology significantly enhances liquidity efficiency, reducing the traditional $T + 1$ settlement cycle to real-time clearing.

2.2. Empowerment through Programmability

By loading executable code, the e-CNY achieves condition-triggered automated payments via smart contracts. This feature has profound implications for cross-border trade, potentially reducing fulfillment risks in supply chain finance and enabling precise liquidity control. Relying on the mBridge project, the e-CNY has the potential to achieve cross-chain interoperability, reducing settlement times from days to seconds.

3. EMPIRICAL FRAMEWORK

3.1. Model Selection: ARDL Approach

To assess the causal impact of the e-CNY on RMB internationalization, this study faces econometric challenges, primarily the non-stationary nature of macroeconomic time series. We adopt the Autoregressive Distributed Lag (ARDL) bounds testing approach (Pesaran et al., 2001). This method is advantageous because it allows for a mixture of $I(0)$ and $I(1)$ regressors and enables the simultaneous estimation of short-run dynamics and long-run equilibrium relationships through an Error Correction Model (ECM). While we acknowledge that policy timing might be endogenous to global market conditions, the ARDL framework helps mitigate dynamic endogeneity bias through its lag structure.

3.2. Model Specification

Based on unit root tests, the dependent variable (RMB Internationalization Index) and the Bond Scale variable were found to be $I(2)$ in levels. To ensure stationarity, we specify the model in first differences of the growth rates. The general ARDL-ECM specification is formulated as follows:

$$\begin{aligned}\Delta(\Delta\ln(Index_t)) = \alpha_0 &+ \sum_{i=1}^{p-1}\phi_i\Delta(\Delta\ln(Index_{t-i})) \\ &+ \sum_{j=0}^{q_1-1}\delta_{1,j}\Delta D_{1,t-j} + \sum_{j=0}^{q_s-1}\delta_{s,j}\Delta PilotScope_{t-j} \\ &+ \sum_{j=0}^{q_3-1}\delta_{3,j}\Delta D_{3,t-j} + \sum_{j=0}^{q_c-1}\delta_{c,j}\Delta C_{t-j} \\ &+ \sum_{k=1}^{K'}\theta_k X_{k,t-1} + \mu CNY_t + ECT_{t-1} + \epsilon_t \end{aligned} \tag{1}$$

Where $Index_t$ is the RMB Internationalization Index; $D_{1,t}$ and $D_{3,t}$ are dummies for the official announcement and app rollout; $PilotScope_t$ measures the number of pilot cities; and C_t is the SWIFT RMB share.

4. EMPIRICAL RESULTS

4.1. Cointegration Test

The existence of a long-run relationship is validated by the coefficient of the Error Correction Term (ECT). Our estimation yields an ECT coefficient ($\hat{\theta}_0$) of -0.4353. The t-statistic is highly significant ($p < 0.01$), confirming a stable long-run cointegrating relationship. This implies that approximately 43.5% of any deviation from equilibrium is corrected within one month.

4.2. Long-Run Effects

TABLE I presents the estimated long-run coefficients.

Table I. Long-Run Estimation Results (ARDL-ECM)

Variable	**Coefficient**
e-CNY Variables	
Announcement Dummy ($D_{1,t}$)	0.0072
Pilot Scope ($PilotScope_t$)	0.0011
App Rollout Dummy ($D_{3,t}$)	0.0053
Control Variables	
SWIFT RMB Share (C_t)	-0.0127
Real Effective Exchange Rate ($\ln REER_t$)	-0.2328^{*}
Exchange Rate Volatility	-1.2025
Interest Rate Differential	0.0054
Stock Market Turnover	0.0804
Bond Market Scale ($\Delta \ln BondScale$)	-0.5806
Error Correction Term ($\hat{\theta}_0$)	-0.4353^{***}

Note: The dependent variable is the change in the growth rate of the RMB Internationalization Index. *** denotes significance at the 1% level, * at the 10% level. Standard errors are computed using the Delta method.

The initial announcement of e-CNY research ($D_{1,t}$) and the launch of the mobile application ($D_{3,t}$) exert positive structural effects on the growth of RMB internationalization. This suggests that key strategic milestones that shape market expectations are pivotal drivers. Interestingly, the quantitative expansion of pilot cities ($PilotScope_t$) shows a smaller positive impact, indicating that the quality and strategic depth of the rollout may matter more than mere geographical coverage.

This divergence may be attributed to two mechanisms. First, the "announcement effect" serves as a strong signal of sovereign commitment, boosting global market confidence. Second, the current pilot programs focus primarily on domestic *retail* scenarios, whereas RMB internationalization is driven more by *wholesale* cross-border trade and financial settlement. Thus, infrastructural readiness (e.g., the app launch) and policy signaling outweigh the marginal gains from expanding retail pilot zones.

4.3. Robustness Checks

To ensure the robustness of our findings, we re-estimated the model using the Cross-Border RMB Index (CRI) from the Bank of China as an alternative dependent variable. The core findings regarding the impact of the e-CNY initiative's key milestones ($D_{1,t}$ and $D_{3,t}$) remained robust, reinforcing the conclusion that the e-CNY project serves as a structural enabler for RMB internationalization.

5. CONCLUSION

This paper provides rigorous empirical evidence that the phased rollout of China's digital yuan acts as a significant structural driver for RMB internationalization. By utilizing an ARDL framework on monthly data from 2012 to 2025, we find that major policy milestones have positively shifted the long-run equilibrium of RMB international usage.

The findings imply that policymakers should prioritize the "quality" of the e-CNY rollout over mere "quantity." Future efforts should focus on fostering innovative cross-border use cases, such as the mBridge project, to translate domestic technological advantages into global financial utility. Future research could further address potential endogeneity in policy timing using instrumental variables, though our ARDL specification provides a robust baseline.

REFERENCES

VON BESCHWITZ, B. (2024): "Internationalization of the Chinese Renminbi: Progress and Outlook," Federal Reserve Working Paper.

LEE, Y. W., AND K. LIM (2024): "Status Quo Crisis Again? RMB Challenges and Dollar Hegemony," *New Political Economy*, 29(5), 709–732.

PESARAN, M. H., Y. SHIN, AND R. J. SMITH (2001): "Bounds Testing Approaches to the Analysis of Level Relationships," *Journal of Applied Econometrics*, 16(3), 289–326.

ZHANG, L. (2024): "Steady and Prudent Promotion of RMB Internationalization: Development Process and Path Analysis," *Academic Frontiers*, 1, 24–32.