

Status and prospects of HKG offshore market based on RMB internationalization: a non-linear regression model using Granger-causality test

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Abstract-Over the past eighteen years, Hong Kong has developed the simple deposit business of the local RMB market into the world's largest offshore RMB hub by virtue of its advantages as an international financial center.

Firstly, this paper introduces the specific situation of cross-border use of RMB, collects historical data on the offshore RMB market in Hong Kong through a desktop research approach, and reviews the development of the offshore RMB market in Hong Kong using the process of RMB internationalization as a clue. Secondly, the current opportunities and challenges facing the Hong Kong offshore RMB market are elucidated from three dimensions: demand, supply and exchange rate movements of RMB in the Hong Kong offshore market, respectively. To further illustrate the potential development of Hong Kong's offshore market, this paper takes the development of offshore financial markets and RMB internationalization as a specific entry point, constructs a quantitative model, and obtains the conclusion that offshore financial markets have a positive impact on the internationalization process of RMB. On this basis, the paper illustrates the development potential of Hong Kong's offshore market in the context of its specific situation. Finally, synthesizing the reflections in the whole paper, this paper makes certain analysis on the development direction of Hong Kong's offshore market in the light of the blueprint of the national 14th Five-Year Plan.

1. Overall Situation of Cross-border Use of RMB

1.1 Time Dimension

According to data from the People's Bank of China, the cross-border use of RMB continued to grow steadily from 2010 to 2022, In the first half of 2022, RMB cross-border transactions amounted to RMB 20.32 trillion, up 15.7% year-on-year, rising to 49.1% of total domestic and foreign currency cross-border transactions in the same period.^[4]

The steady year-on-year rise in cross-border RMB receipts and payments reflects, to a certain extent, the development of cross-border trade RMB settlement business and the increasing willingness as well as demand for RMB usage. As domestic enterprises continue to integrate in the global industrial chain, supply chain and value chain, the cross-border use of RMB will expand in a favorable policy environment, promoting trade and investment facilitation while driving the degree of RMB internationalization.

1.2 Regional Dimension

Hong Kong, which serves as a bridge between the Mainland and international markets, accounts for 48.6% of total cross-border payments and receipts with Mainland China in 2021, much higher than second-ranked Singapore (11.3%) and third-ranked UK (5.4%). The status of Hong Kong's offshore RMB market speaks for itself.^[4]

In recent years, the bilateral local currency swap agreements signed between China and countries along the "One Belt and One Road" have increased the channels for cross-border RMB transactions, which to a certain extent has contributed to the steady rise of the RMB's international status. With the ongoing internationalization of RMB, the flow of RMB cross-border settlement funds has become more diversified.

2. Historical Development of Hong Kong Off-shore Market

In order to have a more comprehensive understanding of the development of Hong Kong's offshore RMB market

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and to accurately delineate its historical stages, this paper adopts a desktop research approach by collecting and analyzing data from different periods, regions and types of data, and by conducting a comprehensive analysis in conjunction with the development process of RMB internationalization, the historical development of Hong Kong's offshore market since its inception in 2004 is divided as follows.

2.1 Beginning and Accumulation Period

2004-2009 was the initial accumulation period of Hong Kong offshore market, which not only achieved the leap from personal RMB business to cross-border trade in terms of business type, but also made the RMB internationalization process from nothing to something.

1. In 2004, banks in Hong Kong started to provide RMB services to individual customers, and the Hong Kong RMB offshore market was officially opened.

2. In 2007, China Development Bank issued the first offshore RMB bond in Hong Kong, and the offshore RMB business in Hong Kong was extended from personal to institutional.

3. In 2009, the People's Bank of China launched the pilot cross-border trade RMB settlement, and Hong Kong was identified as the offshore RMB center, since then, the RMB internationalization process was officially opened.

2.2 Consolidation and Rapid Development Period

The period 2009-2017 was a period of rapid development of Hong Kong's RMB offshore market, which not only took into account the reciprocal interoperability with the onshore market, but also gave full play to Hong Kong's advantages as an international financial center, providing international investors with access to the mainland financial channels and making RMB recognized and accepted by the international community.

1. From 2011 to 2013, the pilot and implementation of the "RMB Qualified Foreign Institutional Investor" scheme enriched the capital flow channels between Hong Kong and the Mainland, realized two-way RMB capital flow, and clarified the model of Hong Kong's hybrid internal and external offshore financial market.

2. From 2014 to 2016, the launch of Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect broke the restrictions on institutional investors, further opened the capital linkage channels between the Mainland and Hong Kong, and consolidated Hong Kong's position as an offshore RMB center.

3. In 2016, RMB was included in the International Monetary Fund's "Special Drawing Rights" basket of currencies, and the strengthening of foreign exchange reserves of RMB abroad has brought RMB to the attention of the international community.

2.3 New Opportunities and Challenges Period

In 2017, Hong Kong processed more than 75% of global RMB payment transactions, making it the world's top

offshore RMB settlement center as of today. With China's growing economic volume and increasing share in global trade and investment, Hong Kong's offshore RMB market has also ushered in new opportunities in the face of greater challenges.

1. In 2019, "the Outline of the Development Plan for the Greater Bay Area of Guangdong, Hong Kong and Macao" clarifies the strategic direction of Hong Kong as a global offshore RMB business center, pointing out the new opportunities for cross-border RMB flows and business innovation brought by the innovative cooperation among Guangdong, Hong Kong and Macao.

2. In 2020, the five-year renewal of the central bank's currency swap agreement with the HKMA regarding the currency swap has provided more RMB liquidity to the Hong Kong offshore RMB market and has contributed to the robust development of the Hong Kong offshore RMB market.

3. In 2021, the official opening of the Bond Connect "Southbound Link" has facilitated offshore RMB bond financing and trading in Hong Kong. The issuance of 5 billion RMB local government bonds by the Shenzhen Municipal People's Government in Hong Kong has once again broadened the issuing entities in the Hong Kong offshore RMB bond market.

3. Opportunities and Risks in the Hong Kong Off-shore Market

3.1 Exchange Rate

3.1.1 Current Status

In 2021, the offshore RMB exchange rate and the onshore RMB exchange rate have basically moved in the same direction, and the onshore-offshore exchange rate differential was relatively stable. The average daily offshore onshore exchange rate differential for 2021 is 64 basis points, a 50 basis point narrower than in 2020.

3.1.2 Business Opportunities

The relative stability of the cross-strait exchange rate difference indicates, to a certain extent, the expanding scale of the RMB offshore market in Hong Kong and the guaranteed liquidity, as well as the basic stability of the RMB's value, which also plays a positive role in enhancing the international community's confidence in the RMB. The expected appreciation of the RMB will also attract foreign capital inflows and promote active trading.

3.1.3 Risks

The expected appreciation of the RMB has put forward new requirements for Hong Kong to further explore its potential and enrich other financial products. At the same time, it also means that international trade-oriented enterprises will be more inclined to accept RMB payments, which will, to a certain extent, aggravate the situation that imports far outweigh exports in RMB cross-

border trade settlement, resulting in a serious imbalance in RMB cross-border trade settlement.

As the size of the offshore RMB market in Hong Kong continues to expand, the RMB exchange difference between offshore and onshore is also significantly reduced. Expectations of RMB appreciation will also lead to a certain degree of evolution of the offshore market towards an arbitrage market.^[6]

3.2 Supplying Side

3.2.1 Current Status

The size of the Hong Kong RMB pool has started to pick up since 2017 when the Hong Kong RMB market entered a new phase of opportunity. 2021 saw the size of the Hong Kong RMB pool maintain its growth trend, hitting a six-year high.

3.2.2 Business Opportunities

The expansion of Hong Kong's offshore RMB pool indicates that Hong Kong is strengthening its position in the international financial market while also developing and growing its financial services industry in an effort to provide more investment opportunities and more financial services to international investors. The inflow of Hong Kong RMB in cross-border trade has facilitated the inflow of RMB into the Hong Kong RMB market in the form of trade transactions, and the size of the Hong Kong offshore RMB pool is expected to continue to rise in the future.

Unlike the onshore market, which is regulated by the People's Bank of China, the offshore market is relatively free and has closer ties with the international financial markets. The exchange rate fluctuations in the offshore market have attracted many companies to exchange foreign currency in Hong Kong, and the arbitrage of companies has injected more RMB market.^[12]

3.2.3 Risks

There is a mismatch between assets and liabilities in Hong Kong's RMB pool, which places a higher demand on the scale of development of Hong Kong's offshore RMB business. When it comes to RMB deposits in Hong Kong, they are overwhelmingly repatriated to the mainland in the form of cash due to the conservative policies of the mainland, which creates a counterproductive disincentive for further exploration of RMB repatriation mechanisms.

3.3 Demanding Side

3.3.1 Current Status

The Hong Kong Monetary Authority's annual report shows that Hong Kong has been the world's largest offshore RMB bond market for the past five years, with the size of outstanding RMB bonds in Hong Kong have reached 179.8 billion yuan in 2020.

3.3.2 Business Opportunities

As China's share in global trade continues to increase, the investment attributes of RMB as an international currency are growing. The demand for RMB in the offshore market is showing signs of potential expansion due to the expected appreciation of RMB and the issuance of RMB treasury bonds in Hong Kong and the implementation of RMB IPOs in Hong Kong, which has also put a demand on Hong Kong to tap diversified financial investment products.^[3]

3.3.3 Risks

The relatively large size of outstanding RMB bonds in Hong Kong illustrates the large size of the offshore RMB bond market, but also shows the relatively weak repayment ability of RMB bonds in Hong Kong as well as the stability and liquidity deficiencies of the market.

Despite the trend of expanding demand in the offshore RMB market, as mentioned above, the imbalance in cross-border RMB settlement remains, suggesting that the scale of RMB capital repatriation is limited and the demand for RMB repatriation is relatively low. As for the factors constraining RMB repatriation,^[1] they are as follows.

The first is the mainland's central bank's control over the capital account and the restrictive opening of the market lead to overseas enterprises inhibiting RMB repatriation due to the reduction of investment opportunities.

The second is the imperfect functionality of the offshore RMB market and the relatively small size of the offshore investment financial market. The relative gaps in currency derivatives and commodity derivatives trading to a certain extent illustrate the relative lack of risk management tools in the Hong Kong offshore RMB market, which limits the diversification of portfolios in the Hong Kong offshore RMB demand market and reduces the willingness to hold overseas RMB assets.

4 Modeling Analysis

Based on the above analysis, this paper will build a regression model with the degree of RMB internationalization as the dependent variable and the degree of offshore market development and the indicator factors affecting RMB internationalization as the independent variables to analyze the relationship between the development of offshore financial markets and the impact of RMB internationalization, so as to argue the development potential of Hong Kong's offshore market.

4.1 Variables Selection

The theoretical analysis of the internationalization of a currency is based on the three functions of a currency, but due to the limited internationalization of RMB and the lack of disclosure of some data, it is impossible to argue a positive relationship between the development of offshore financial markets and the internationalization of RMB at the micro level.^{[1] [5] [12]} Therefore, this paper selects

relevant data at the macro level in China to analyze the impact and relationship between offshore financial markets and the degree of RMB internationalization for empirical study and testing. In this paper, the following variables are selected: *CRI*, *ORI*, *GDP*, *r*, *e*, and *inf* to analyze the impact on the degree of RMB internationalization.^{[2] [8]}

4.2 Data Analytics

(a) Selection of *CRI*: On September 20, 2013, the Bank of China officially launched the BOC Cross-border RMB Index (*CRI*) to the global market. The index reveals the dynamics of cross-border RMB flows and usage, and reflects the active degree of cross-border and overseas usage of RMB in a comprehensive manner. The data are decimal.

(b) Selection of *ORI*: In March 2014, the Bank of China released the BOC Off-shore RMB Index (*ORI*) to the world for the first time. This index is a comprehensive and accurate tracking of the RMB internationalization process, and is a comprehensive evaluation of the development level of RMB in the offshore financial market in terms of the scale of capital stock, capital utilization status, and use of financial instruments. It interacts with the *CRI* and is an indicator of the degree of RMB internationalization. The data are decimal.

(c) Selection of *GDP*: The data are obtained from the National Bureau of Statistics and the OECD, and are expressed as the share of *GDP* in the world. The data are decimal.

(d) Selection of *r*: RMB deposit rate is used as the effective interest rate, and the data are obtained from IFS. Since only the annual average deposit rate is shown in the database, the data are the same for each quarter of each year. The data are percentage.

(e) Selection of *e*: Data are obtained from IFS. Since the quarterly data from 2015 to 2017 are missing, the annual data are distributed equally to each quarter. The data are percentages.

(f) Selection of *inf*: Data are obtained from the inflation tool. The data is calculated from China's official public CPI data, using the Month-over-Month calculation method. The units are percentages.

The data cover the period from 2015 to 2021, and the time is selected as a time series with quarterly numbers.

4.3 Empirical Testing

Based on the above analysis, the following empirical equation is established in this paper:

$$CRI = C(\alpha_1 ORI + \alpha_2 GDP + \alpha_3 r + \alpha_4 e + \alpha_5 inf) + \mu$$

$$s.t. \alpha_1^2 + \alpha_2^2 + \alpha_3^2 + \alpha_4^2 + \alpha_5^2 = 1$$

The equation represents the linear relationship of each influencing factor of *CRI*, $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ represents the coefficient of each factor respectively, *C* represents a constant, and μ represents the random disturbance factor added. This paper will use R language software to conduct Granger causality test and co-integration test on the relevant factors, and then investigate the impact of

offshore financial market on RMB internationalization.

4.3.1 Validating the Relationship Between *CRI* and *ORI*

First of all, in order to obtain whether there is a causal relationship between the index of RMB internationalization and the offshore financial market of RMB, this paper will conduct Granger causality tests on the two variables, *CRI* and *ORI*. Before conducting the test, unit root and cointegration tests are conducted before the causality test to ensure the smoothness of the time series.

4.3.1.1 ADF Test

The data for both *CRI* and *ORI* variables were first be found to be in need of seasonal adjustment. Then the year data distribution after adjustment is approximately average, which is a valid amount.

Then a unit root test is performed and the results are shown in *Table 1*. The original hypothesis of "non-stationary time series" was tested at 1% significance level. The first ADF value of both variables is larger than the critical value of 1% confidence level, and the remaining two are smaller than the corresponding critical value, so the original hypothesis is accepted, which means the time series is non-stationary and there is a unit root.

Table 1 The Results of ADF Tests

	Critical Values	Value of test-statistic	
		<i>CRI</i>	<i>ORI</i>
1pct	-4.15	-2.9125	-0.2529
5pct	-3.50	3.1054	2.0897
10pct	-3.18	4.2639	1.3417

Therefore, the variables were first-order differenced to make them smooth. The single integer series *CRI*, *ORI* is obtained.

4.3.1.2 Cointegration Test

Since the variables *CRI* and *ORI* are both single-integer series, they meet the correlation requirements of the cointegration test.^[9] The long-run equilibrium model using R language software for cointegration test, the correlation coefficients of the two factors were obtained, the result of cointegration test is 0.263 and the corrected result is 0.2347, which indicates that the variable *ORI* explains only 26.3% of the development of RMB internationalization and there is a basis for explanation, but the univariate variable has a lower effect on *CRI*.

At the same time, the residuals need to be plotted to determine whether there is long-term cointegration, and if there is long-term cointegration, then it needs to be linearly filtered by the VECM method, and the filtered "residual components" are used for further analysis. The residuals are plotted as shown in the figure 1. This indicates that there is no long-term cointegration between *CRI* and *ORI* data, so we can proceed to the next step without filtering.^[9]

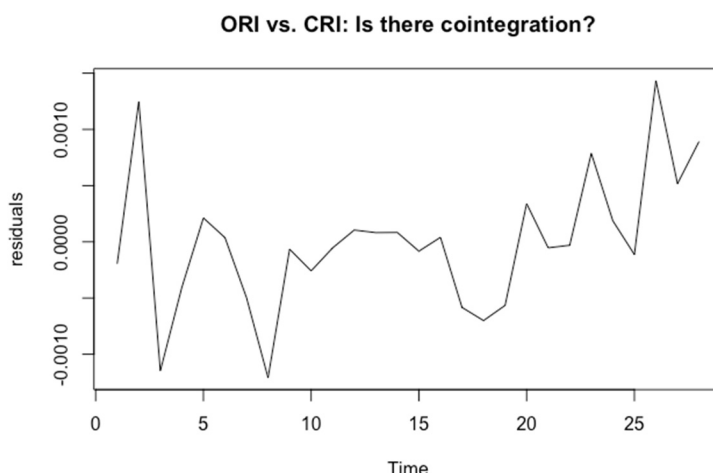


Figure 1 ORI vs. CRI: Is there cointegration?

4.3.1.3 Granger Causality Test

Since there is an explanatory basis between the two variables, *CRI* and *ORI*, the Granger causality test was conducted on the two variables. The original hypothesis is "*ORI* is not the Granger cause of *CRI*" at 5% confidence interval level. p-value is 0.2996, which is less than 5% confidence level, so the original hypothesis is rejected, i.e. *ORI* is the Granger cause of *CRI*.

Therefore, it can be concluded that the development of offshore financial market has some influence on the internationalization of RMB.^{[8] [9]}

4.3.2 Validating the Relationship Between the Remaining Factors and *CRI*

4.3.2.1 ADF Test

Similarly, the variable data was first analyzed and found to require the same seasonal adjustment. The year data distribution after adjustment is approximately average, which is a valid amount.

The unit root test for each factor was then performed and the results are shown in *Table 2*. The original hypothesis of "non-stationary time series" was tested at 1% significance level. The first ADF value of variables *r* and *e* is larger than the critical value with a confidence level of 1%, and the remaining two are smaller than the corresponding critical values. The first ADF values of variables *GDP* and *inf* are smaller than the critical value with a confidence level of 1%, and the remaining two are larger than the corresponding critical values, so the original hypothesis is accepted, that is, the time series is non-stationary and there is a unit root.

Table 2 The Results of ADF Tests

	Critical Values	Value of test-statistic			
		<i>GDP</i>	<i>r</i>	<i>e</i>	<i>inf</i>
1pct	-4.15	-	-	-	-8.8249
5pct	-3.50	4.3326	1.2374	0.7047	25.9985
10pct	-3.18	7.3635	0.9794	1.6248	38.9972

Therefore, the variables are smoothed by performing a first order difference. A single integer series *GDP*, *r*, *e*, *inf* is obtained.

4.3.2.2 Cointegration Test

Since the variables *GDP*, *r*, *e*, and *inf* are single integer series, they meet the correlation requirements of the cointegration test. The cointegration test was performed using R language software and the correlation coefficients of each factor with *CRI* were obtained.

The result of the cointegration test of *GDP* with *CRI* was 1.068e-06 and the corrected result was -0.03846, which indicates the low fit of the variable *GDP* to *CRI* and the failure of the fit.

The result of the cointegration test of *r* with *CRI* is 0.0006577 and the corrected result is -0.03778, which indicates that the variable *r* has a low fit to *CRI* and the fit fails.

The result of the cointegration test between *e* and *CRI* is 0.04335 and the corrected result is 0.006557, which indicates that the explanatory degree of the variable *e* on the development of RMB internationalization only reaches 0.6557%, and there is a basis for explanation, but the univariate effect on *CRI* is very low.

The result of the co-integration test of *inf* with *CRI* is 0.01261 and the corrected result is -0.02536, which indicates that the variable *inf* has a low fit to *CRI* and the fit fails.^[11]

4.3.3 Improvement of the Empirical Equation

Based on the results of the previous cointegration tests, it is clear that *GDP*, *r*, *e*, and *inf* as univariate variables cannot be used as an explanatory basis for *CRI*, so the empirical equations are improved.

4.3.3.1 Non-linear Test – RESET Test

The former empirical equation has a linear relationship

between *CRI* and each factor, so a nonlinear test is performed first.

The non-linearity test was conducted using R language software to test the relationship between each factor and *CRI*. A p-value of 0.05 was chosen as the threshold of the test, and the original hypothesis was "the coefficient of the higher order term of the model is zero".^[10] The results are shown in *Table 3*. The p-value obtained for each factor was greater than 0.05, so the original hypothesis was rejected, i.e., the coefficient of the higher-order term of the model exists.^[11]

Table 3 The Results of Reset Test

	p-value
<i>ORI</i>	0.11310
<i>GDP</i>	0.82770
<i>r</i>	0.97860
<i>e</i>	0.08024
<i>inf</i>	0.75460

4.3.3.2 Adjusted Model

Based on the previous analysis, the improved empirical equation is as follows.

$$CRI = C(\alpha_1 ORI^2 + \alpha_2 GDP + \alpha_3 r^3 + \alpha_4 e^4 + \alpha_5 inf) + \mu$$

The equation represents the nonlinear relationship of each influencing factor of *CRI*, where $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ represents the coefficient of each factor respectively, *C* represents a constant, and μ represents the random disturbance factor added. Then the non-linear regression of each factor was performed using SPSS software, and the test results are shown in *Table 4*. The R-squared obtained from this regression model is 0.691, indicating that *ORI, GDP, r, e, and inf* can explain 69.1% of the development of RMB internationalization, which is a high degree of explanation.

Therefore, the development of offshore financial market does have a positive impact on the internationalization process of RMB, i.e., it promotes the internationalization of RMB.

Table 4 The Results of Non-Linear Regression

SOURCE	Sum of squares	df	Mean squares
REGRESSION	2282757.98	7	326108.283
RESIDUAL	8864.018	21	422.096
UNCORRECTED TOTAL	2291622.00	28	
CORRECTED TOTAL	28707.714	27	

R Squared = 0.691

5 Development Potential of Hong Kong Off-shore market

The conclusion drawn from the previous quantitative model is that the development of offshore financial markets has a positive counterpart to the internationalization of the RMB and, conversely, that the increased internationalization of the RMB drives the development of offshore markets.^[12]

5.1 Policy Incentives

Currently, Hong Kong, as the world's largest offshore RMB center, has various innate policy and geographical advantages.

Taking RMB internationalization as an opportunity, the People's Bank of China has promoted Hong Kong as the world's largest RMB offshore center by promoting cross-border trade settlement in Hong Kong, supporting the development of Hong Kong's RMB bond market and exploring cross-border RMB lending business.

The government's policy support has greatly boosted the development of Hong Kong's offshore market, and Hong Kong is evolving with the goal of becoming an offshore RMB center.

5.2 Capital Inflow

With the support of policies, some state-owned enterprises and large capital enterprises will give priority to invest in infrastructure and financial industries related to Hong Kong offshore market, promoting the construction of Hong Kong offshore market.

As the offshore market is relatively mature in its continuous development, the considerable returns achieved by investors attract domestic investors, which makes the capital chain of the offshore market relatively stable.

5.3 Inadequacy of the Market System

Hong Kong's offshore market has just entered the middle and late stage of development, and lacks a systematic regulatory system for the risks associated with the RMB financial market described above. However, it is precisely this immature system that gives arbitrageurs more freedom to operate in the Hong Kong offshore market, and if the regulatory system cannot be implemented in the short term, it will bring certain risks and also bring room for the offshore market to develop. In the case of the implementation and maturity of the management system, the market risk is reduced, a stable market will bring stable and high returns, attracting risk averse investors, the offshore market will have more room for development.

5.4 Hong Kong Financial Market Features

The internationalization of RMB is driven more by the application of RMB in financial products and investments, in which the Hong Kong market is uniquely positioned.^[6]

5.4.1 "Financial Center" Status

(a) Hong Kong's financial services industry as one of its pillar industries, financial products are popular among practitioners and the financial market is active.

(b) Hong Kong has professional service capabilities that are in line with international standards, and practitioners have more experience in negotiating with

international individuals and companies.

(c) At present, Hong Kong has become the world's largest and most efficient offshore RMB market, with the world's largest offshore RMB pool and RMB-priced products.

5.4.2 Abundant Funds

By 2022, Hong Kong have already handled 75% of the world's offshore RMB payments, making it deservedly the world's largest offshore RMB pool.

5.4.3 Diverse RMB Financial Products

According to statistics, in 2019, the number of licensed institutions operating RMB business in Hong Kong reached 164, and RMB financial services are quite common, at the same time, Hong Kong has a relatively complete range of RMB financial products.

Therefore, once the internationalization of RMB reaches a certain level, the offshore market, as a freer trading market, will surely bring considerable benefits. Driven by a virtuous cycle and the combined interests of multiple parties, the offshore market will maintain a high rate of development for at least a decade and has great potential for growth.

6 The future of Hong Kong Off-shore Market

Looking at the global development situation and the blueprint of *the 14th Five-Year Plan*, the new development of Hong Kong's offshore RMB hub should proceed towards the following two features.^[6]

6.1 Steady Development from Point to Point

6.1.1 RMB Business in Off-shore Market

In recent years, Hong Kong has extended the scope of RMB business while focusing on the continuous growth of various types of business, with both capital and current accounts moving hand in hand, and both traditional "dim sum bond" transactions and basic RMB lending business have achieved year-on-year growth in transaction value.

However, as mentioned above, Hong Kong's offshore market also suffers from a certain degree of fragmentation of RMB products and inadequate RMB offshore market functions. With the growing size of the Chinese economy and the increasing proportion of global trade participation, the RMB's settlement and investment functions in the international currency arena are also increasing. This development environment has created opportunities for the Hong Kong offshore market to develop multiple forms of RMB financial products. This has created a requirement for the Hong Kong offshore market to further develop its basic financial services, explore the potential of other financial products, improve the asset construction of the offshore financial market and build a more diversified and complete offshore market environment.

6.1.2 Trading Transactions

The high-quality promotion of "One Belt, One Road" has brought a boost to the RMB pool in the offshore market, and Hong Kong, as an important interface between inside and outside, will have more room for breakthrough in the area of RMB regional cross-border investment and trade financing in the future.

6.1.3 Progressive Opening of the Capital Account

The opening of the capital account is closely related to the internationalization of the RMB, but the full liberalization of the capital account would be a great blow to the function of Hong Kong's offshore RMB market.^[7] At present, Hong Kong, as the most controllable two-way interconnected market of the country, the attempt of limited capital account opening has an immeasurable effect on the future macro layout of the country.

The gradual process of pipeline priority opening of capital account in Hong Kong has certain requirements on the adjustment mechanism of Hong Kong offshore RMB market. The expansion of the offshore RMB market volume will inevitably form a challenge to Hong Kong's position as the hub of offshore RMB business. Going forward, it will be both a challenge and an opportunity for Hong Kong's offshore market to optimize the RMB cycle and create a path for RMB to flow back while maintaining the dominant position of Hong Kong's offshore RMB market.

6.2 Innovation-driven and Virtuous Cycle

Hong Kong's offshore market is more liberal than the mainland's onshore market, and there are ample opportunities for innovation in RMB products in Hong Kong.

The cross-border testing of digital currencies in Hong Kong has provided new ideas for payment models in the offshore market.^[3] Whether for the future cross-border applicability of digital currencies or for the operational efficiency of cross-border payment systems, Hong Kong, as the region with the highest share of cross-border RMB receipts and payments, is groundbreaking in its exploration. Hong Kong offshore market's attempt on cross-border digital payment will help Hong Kong validate and promote the digital RMB-led digital currency unified cross-border payment standard network, win the first-mover advantage of digital finance several pieces of user stickiness, and become the beneficiary of efficient and convenient offshore RMB business. It will also help promote the advancement of cross-border payment technology in Hong Kong and facilitate the interconnection of digital RMB systems between the Mainland and Hong Kong.

7 Conclusion

7.1 Current Status Summary

As the world's largest offshore RMB center, Hong Kong

not only has the largest offshore RMB pool, the largest offshore RMB foreign exchange transactions and the largest offshore RMB bond market, but also a significant share of cross-border RMB payments and receipts outside of China. However, Hong Kong's offshore market faces many challenges, whether it is the stability and liquidity of the offshore RMB market due to fiscal risks, the impact of RMB exchange rate volatility on the offshore market, or the relative lack of an offshore RMB commodity market.

7.2 Future Prospects

In order to skillfully play the "bridge advantage" of Hong Kong to turn the many challenges faced by the offshore market into opportunities, the integration of the "live" international market and the "strategy" of the domestic market is the Hong Kong offshore market. The offshore market in Hong Kong is eager to solve the problem. In the context of RMB internationalization, how Hong Kong can give full play to the advantages of the offshore market and further promote the process of RMB internationalization is the key point to be considered more in the future.

In terms of policy, a sound regulatory mechanism and open market participation will increase the availability of RMB funds in the offshore market. With the strengthening of RMB internationalization, the further development of dual domestic and international circulation will play a crucial role in widening the supply channels of funds in the offshore market; further exploration of the interconnection of financial infrastructure between onshore and offshore markets will increase the liquidity of offshore RMB through the opening of capital items.

As far as the financial sector is concerned, more RMB denominated products will help mitigate the impact of RMB exchange rate volatility on the offshore market. Under the expectation of RMB appreciation, the abundance of financial derivative products will effectively meet the demand of hedging RMB risk and interest rate risk in the market; the innovation of financial products will help the flexible nesting of foreign exchange risk management tools in trade financing business.

For the public, whether trading in the foreign exchange market or investing in the bond market, public participation in the offshore RMB market will promote market activity, enhance market liquidity and, to a certain extent, broaden investment portfolios and improve investment returns, further contributing to market stability.

7.3 Research Review

Reviewing the whole research process, this paper provides an in-depth discussion on the Hong Kong offshore market and future trends in the context of the development of RMB internationalization. In the previous desktop study, this paper synthesizes the latest data and distills the risks and opportunities of the Hong Kong offshore market by summarizing the different dimensions of the Hong Kong offshore market. In the next quantitative model analysis, this paper constructs the

empirical equations by combining relevant specific data and rich research experience. Through testing and adjusting the model, this paper demonstrates the positive impact of offshore financial market on RMB internationalization. On this basis, the paper further analyzes the development potential of Hong Kong's offshore market and explores the mutual promotion of the degree of RMB internationalization and the degree of offshore market development.

There is, of course, a degree of deficiency in this paper. Even though we have chosen the most recent data, the relative one-sidedness of the data affects our comparative perception of the Hong Kong offshore market. In the subsequent study, we will also synthesize more international data and consider enriching the three-dimensionality of Hong Kong's offshore market through comprehensive comparisons with other offshore markets.

In the process of adjusting the empirical equation, the fitted R^2 of 0.691 is still lower than our expectation, despite the fact that we tried various equation forms, and we will try to study the views of different scholars and try to improve the fit by further improvements in the follow-up study.

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