How to Optimize China's International Assets Allocation Based on the Data of BRICS

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Abstract: With the gradual emergence of China's RMB in the international market, China's capital assets management in the global market has become a worthy topic to study. Considering the hysteresis effect of China's abundant financial assets, we establish an auto-regressive model and analyze the optimization of China's financial assets' external structure by combining the data of BRICS.

1. Introduction

Since the reform and open up, borrowing foreign debts has become a main form of utilizing foreign capital and promoted the rapid growth of China's national economy. It can be seen from the data of China's foreign debts in recent years that China's external debt is increasing year by year. In the latest data of 2018, short-term foreign debt is $12.7161 billion. That's up 11% from $11.4524 billion in 2017. We can learn from Table 1, although China's overall external debt does not reflect serious debt risks, with the scale of external debt expanding, China's external debt balance and debt ratio and other indicators are rising. If the trend continues, China's debt indicators will inevitably hit a warning line and challenge China's solvency and foreign exchange reserves. Moreover, the mentioned debt crisis all occurred when a country's foreign reserves declined rapidly. Because of the plenty of foreign debts, the ratio of foreign income generated by other foreign debts to the foreign debt decreased, which was the common problems of several countries with debt crises. Therefore, to prevent our country's debt problem, we need to study deeply.

Table 1 Balance sheet of our external debt (unit: millions dollar)

Year	Foreign debt balance	Short-term debt balance	Foreign debt service ratio	External liabilities ratio	External debt ratio
2010	5489.4	3757.0	1.6	9.0	29.2
2011	6950.0	5009.0	1.7	9.2	33.3
2012	7369.9	5409.3	1.6	8.6	32.8
2013	8631.7	6766.3	1.6	9.0	35.6
2014	17799.0	12982.0	2.6	17.0	69.9
2015	13829.8	8874.1	5.0	12.6	58.6
2016	14158.0	8660.4	6.1	12.7	64.4
2017	17579.6	11452.4	5.5	14.5	72.6
2018	19652.1	12716.1	5.5	14.4	74.1

Source: National Bureau of Statistics

Cole and Kehoe believed that the large proportion of long-term external debt helped reduce the risk of foreign debt, mainly because the government did not need to borrow new debt from

international borrowers every period [1]. Lin and Sosin empirically tested the relationship between external government debt and per capita GDP growth rate based on the total samples of 77 countries and sub-samples of each region [2]. The cross-sectional estimate of the total sample of foreign debt coefficients is negative but not always statistically significant. Available data from African countries show a highly negative correlation between external debt and growth in GDP per capita.

Mingchao used extended complete Chebyshev system to give upper bounds for the number of isolated periodic solutions of some perturbed Abel equations [3].Claudio Raddatz analyzed international asset allocations and capital flow by using benchmark effect [4]. Recently, Yong-Jun Liu used studied international asset allocation optimization by usingthe fuzzy theory [5].

On that basis, considering the hysteresis effect of China's huge financial assets, this paper establishes an auto-regressive model with fourth-order hysteresis variables and analyzes the optimization of China's financial assets' external asset structure based on the data of BRICS.

2. Model and Analysis
2.1. Variable Selection
This part uses panel data of four BRICS countries from 2001 to 2018 for a total of 18 years to study the management of short-term national debt in China. Since 2001, Goldman Sachs, chief economist of Goldman Sachs, proposed the concept of "BRICS." Since then, the BRICS countries have become even more involved. In 2010, after South Africa joined, the five countries were collectively called "BRICS" because of the initial alphabet. Therefore, it is relatively direct and clear to analyze the management of China's international assets with the data of China's financial assets held by these four countries. The data taken in this section are the rate of change in the exchange ratio between nominal currency and foreign currency, the number of domestic bonds held by non-residents. Among them, the ratio of RMB to foreign currency is indirect quotations, that is, the amount of one unit of RMB to foreign currency. The foreign exchange data and the data of BRICS holding Chinese bonds are all taken from the CPIS database of IMF.

(1)   International Assets

All the data in the paper are from the IMF's CPIS database. From the IMF's website, the data to confirm the data accuracy and reliability of this database from the BRICS countries (South Africa, Russia, India, and Brazil) from 2001 to 2018 are sufficient. In the 18 years of data, according to the Table 2, we can conclude the demand for non-resident investors investment management in our country, and the attraction of foreign financial assets in China and requirements.

Table 2 The number of financial assets held by BRICS from 2001 to 2018 in China

Year	Brazil	India	South Africa	Russian
2001	540	0	0	0
2002	0.06	0.00	0.00	0
2003	0.60	0.00	6.17	0
2004	0.13	0.00	2.13	0
2005	1.04	0.00	4.58	0
2006	0.79	0.00	1.29	0
2007	14.51	35.59	1.17	7
2008	0.91	29.29	15.26	5
2009	0.82	29.20	28.59	3
2010	13.35	3.59	175.67	12
2011	3.11	0.02	277.30	12
2012	0.88	2.12	258.32	15
2013	1.10	0.73	195.52	2
2014	17.06	3.08	285.99	3
2015	14.90	222,90	327.95	4
2016	10.95	229.11	866.02	29
2017	7.69	552.28	1060.48	25
2018	7.61	531.48	1103.78	27

Data source: CPIS database on the official website of IMF

(2)   Rate of Exchange

The rate of the exchange is the exchange rate of the current period minus the exchange rate of the previous period and then divide the exchange rate of the previous period. The formula is as follows:

$$EX_i = \left| \frac{EX_{i,t} - EX_{i,t-1}}{EX_{i,t-1}} \right|$$

EX_i is the rate of exchange of a period, i is a country, and t is a certain year. $EX_{i,t}$ is the number of one unit of RMB exchanged for another country's currency in a given year. The fluctuation of the exchange rate has always been an important reason for countries to hold international assets. When China's exchange rate depreciates, one unit of RMB will be converted into fewer assets of other countries, and other countries will naturally sell part of China's financial assets to avoid losses. In the past two years, according to the Table 3, China's RMB gradually emerged in the international market, so China's capital asset management in the international market is a topic worth studying.

Table 3 Exchange rates of BRICS currencies and RMB exchange rates(%)

Year	Brazil	India	South Africa	Russian
2001	3.73	24.10	5.04	28.44
2002	7.48	22.44	3.02	24.29
2003	35.67	22.37	61.04	40.78
2004	5.76	8.43	8.79	6.21
2005	0.48	1.84	0.29	16.77
2006	0.41	1.03	1.09	10.72
2007	2.27	3.52	1.33	10.36
2008	3.80	4.52	3.95	4.77
2009	1.57	4.76	3.43	8.30
2010	0.51	3.65	1.97	11.31
2011	3.77	7.47	6.62	4.49
2012	1.66	0.28	6.66	16.83
2013	0.25	0.95	4.04	10.31
2014	9.23	6.81	1.25	9.43
2015	73.79	10.19	3.56	42.03
2016	1.47	17.43	2.30	1.04
2017	4.44	6.69	3.10	12.51
2018	15.02	6.83	7.12	10.49

Source: the IMF's CPIS database

2.2. Model Establishment

This section, the amount of China's financial assets held by each country in the international market is taken as the explained variable, and the exchange rate volatility between China and BRICS countries is taken as the explanatory variable. Because the exchange rate and international assets affect each other, the data in the model are all endogenous variables. After considering the hysteresis effect of China's huge financial assets, we establish the following model:

$$Y_t = \alpha + \beta_1 X_t + \beta_2 Y_{t-1} + \beta_3 Y_{t-2} + \beta_4 Y_{t-3} + \beta_5 Y_{t-4} + \varepsilon$$

2.3. Testing and Estimation

Table 4 Data analysis results table

Country	α	β_1	β_2	β_3	β_4	β_5	R^2
SouthAfrica	8400.35	-1391.10	1.20	-0.26	-1.01	1.68	92.25%
India	-1519.58	928.72	0.45	1.74	-0.75	-0.67	92.22%
Russian	757.29	-58.23	0.77	-0.07	-0.11	1.41	82.93%
Brail	500.58	15.65	-0.98	-0.45	0.16	0.12	24.20%

According to the analysis results, In South Africa, the figures are 0.60, 3.99, 0.60, 1.17, and 2.1. The t-test values of India were 1.44, 0.98, 3.41, 0.96, and 0.42, respectively. The absolute values of t obtained by Russia are 0.12, 3.12, 0.33, 2.06, and 3.12. The absolute values of the five t's obtained by Brazil are 1.27, 0.27, 0.14, 0.14, 0.52, and 0.36, respectively. The above t values were all greater

than 0.05, indicating that the above analysis results were significant at the 95% confidence level. Also, it can be seen from the analysis results that the p-value of India, South Africa and, Russia is 0.0003, 0.0003, and, 0.0246, respectively, except that the f-test result of Brazil is 0.76, which all show significant performance at the 95% confidence level.

3. Conclusions

As seen from Table 4 in the previous section, the number of South Africa is 92,25% proving the fitness is good. South Africa's holding of China's financial products is increasing year by year, and the increase is the largest among the four countries. Moreover, the ratio of South African currency to Chinese currency fluctuates is in a decreasing trend. That means the rand is becoming less volatile against RMB. It can be concluded from $\Delta=b^2-4ac$ that South Africa's Δ is 2.48 and positive. It can be seen that the selected data has a small oscillation phenomenon around the line. South Africa is the smallest of the five countries in terms of economic size, to be the last to join the BRICs. Therefore, with its lack of momentum, South Africa needs to turn to the outside world and rely on debt to drive domestic demand.

The fitting value analyzed by India is 92.22%, which is also very significant. The number of China's financial assets held by this country also increases year by year, but the increase is not as fast as that of South Africa. Among the three countries that increase China's financial assets held year by year, the increase is the smallest. In India, the $\Delta=b^2-4ac$ is -6.758. Therefore, according to the Fibonacci sequence and the solution method of the characteristic equation, it can be concluded that when the Δ is less than zero and the real root of the complex conjugate root is greater than zero, the image is an oscillation curve, and the absolute value of the upper and lower limits is getting larger and larger. The Indian Rupee has become increasingly volatile with the RMB since 2001. India has been developing rapidly in recent years, with a considerable increase in the economic aggregate. It is now in seventh place, and outside scholars predict that India will jump to third place in the world by 2032. When the economic status rises, the country will face the crisis of severe exchange rate fluctuations, which requires the country to diversify the risk of exchange rate fluctuations by investing in the financial assets of other countries.

Although the goodness of fit of Russia is not as high as 92% as that of South Africa and India, the analysis results are also significant, with the fitting value reaching 82.93%. The number of financial assets held in China is also on the rise. But Russia, like South Africa, has a positive value Δ, so the image of its holding our financial assets is also free of shocks. When the fluctuation of the ratio of Russian Rouble to RMB decreases, Russia will increase its holdings of Chinese financial assets. Due to the increasingly close exchanges between Russia and China, and with the progress of RMB internationalization, RMB internationalization has become the local reserve currency in most countries. After RMB joined into SDR in 2016, the function of RMB as an investment currency has been further opened. Therefore, after 2016, Russia's holding of financial assets in China also increased substantially.Brazil is special among the four BRICS countries.

It can be seen from the data released by IMF that although the number of financial assets held by Brazil in China was on the rise in general, it fluctuated greatly during this period. Although the model lagged by four phases, the fitting degree at 24% in Brazil was not significant. During the 18 years from 2001 to 2018, due to the continuous improvement of China's international status, the status of RMB in other countries also increased. From the overall situation of Brazil's holding of China's financial assets, as an investor, Brazil is not willing to hold too much of China's financial assets for a long time and will constantly adjust the number of financial assets it holds according to the international situation. In 2007, us subprime mortgage crisis dragged down economic growth and triggered global financial market turbulence. To add a buffer to us subprime mortgage crisis, the Brazilian government bought a large number of financial assets in China. In 2010, China-Asean free trade area was formally established, which provided room for appreciation of the RMB. Therefore, the Brazilian government held only 790,000 us dollars of financial assets in 2006 but increased to

14.51 million US dollars in 2007.

China's foreign assets are mainly held in the form of us dollars, while its external liabilities are mainly held in the form of RMB. Under the expectation of RMB appreciation, China's foreign assets will further shrink, which is also a severe test faced by China's foreign exchange management at present. Since both Japan and Germany have experienced the development stage of accumulating large foreign exchange reserves due to continuous trade surplus, we should pay great attention to the optimization of external asset structure.

Acknowledgments

References

[1] Cole H L, Kehoe T J., "*Self-fulfilling debt crises*", The Review of Economic Studies. 2000: 91-116.

[2] Lin S, Sosin K., "*Foreign debt and economic growth*", Economics of Transition. 2001:635-655.

[3] Mingchao Cai, Zhihong Chen, "*Does country background risk matter to the strategic assetallocation ofsovereignwealthfunds*?",Pacific-Basin FinanceJournal, 2019,57: Article101086.

[4] Claudio Raddatz, Sergio L. Schmukler, Tomás Williams, "*International asset allocations and capital flows: The benchmark effect*", Journal of International Economics. 2017: 413-430.

[5] Yong-Jun Liu, Wei-Guo Zhang, Pankaj Gupta, "*International asset allocation optimization with fuzzy return*", Knowledge-Based Systems. 2018: 189-199.