Yuan-SDR exchange rate after the entry of Yuan into SDR basket

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ABSTRACT. The international monetary system has appeared in a new form since the inclusion of the Yuan in the Special Drawing Rights (SDR) currency basket with a weight surpassed only by the US Dollar and the Euro. In the SDR basket, the Yuan exchange rate with other currency baskets has been calculated daily under a freely floating exchange rate, for which China now has to reform its exchange rate mechanism and capital market structure. In this new scenario, this paper examines the interrelationships between the exchange rates of Yuan-SDR, Yuan-US Dollar, nominal effective exchange rate (NEER), and real effective exchange rate (REER) of the Yuan in order to find any influence on the Yuan-SDR due to changes in the Yuan-US Dollar, NEER, and REER, respectively. The Hamilton decomposition regression filter of the Yuan-SDR, applied from 2017m1 to 2021m7, showed that the cyclical trend of the Yuan-SDR is shaped as an inverse U, and its cyclical pattern constitutes seasonal variations. In addition, Johansen's cointegration test and vector error correction model (VECM) showed that the Yuan-SDR have long-run causalities from the Yuan-US Dollar and NEER of Yuan. Moreover, the Yuan-US Dollar, REER, and NEER of the Yuan have short-run causalities from the Yuan-SDR.

Keywords: Yuan, US Dollar, nominal effective exchange rate, real effective exchange Rate, international monetary system

TIPO DE CAMBIO YUAN-DEG DESPUÉS DE LA ENTRADA DEL YUAN EN LA CANASTA DE DEG

RESUMEN. El sistema monetario Internacional aparece en una nueva forma desde que el yuan se incluyó en la canasta de monedas de los derechos especiales de giro (DEG) con una ponderación solo superada por el dólar estadounidense y el euro. En la canasta de DEG, el tipo de cambio del yuan con canastas de divisas se ha calculado diariamente con un tipo de cambio de libre flotación, por lo que China ha tenido que reformar su mecanismo de tasa de cambio y su estructura de mercado de capitales. En este nuevo escenario, se examinan las interrelaciones entre los tipos de cambio de Yuan-DEG, Yuan-Dólar estadounidense, el tipo de cambio efectivo nominal (TCEN) y el tipo de cambio efectivo real (TCER) del yuan para encontrar cualquier influencia sobre Yuan-DEG debido a cambios en Yuan-Dólar estadounidense, TCEN y TCER, respectivamente. Se aplica el filtro de regresión de descomposición de Hamilton de Yuan-DEG desde 2017m1 a 2021m7 y se encuentra que la tendencia cíclica de Yuan-DEG tiene forma de U inversa y su patrón cíclico constituye variaciones estacionales. Asimismo, se usa la prueba de cointegración de Johansen y el modelo de vector de corrección de errores (VECM) y se halla que el Yuan-DEG tiene causalidades a largo plazo desde el Yuan-Dólar estadounidense y el TCEN del yuan. Además, el Yuan-Dólar estadounidense, el TCER y el TCEN del yuan tienen causalidades a corto plazo desde el Yuan-DEG.

Palabras clave: Yuan, dólar estadounidense, tipo de cambio efectivo nominal, tipo de cambio efectivo real, sistema monetario internacional

Códigos JEL: C32, F31, G15

1. INTRODUCTION

The Chinese exchange rate mechanism has been engulfed into a new horizon after the entry of the Yuan into the SDR basket in the IMF since October 2016. The whole exchange rate regime has been structurally reformed in context of international currency competition under the new umbrella of flexible exchange rate where Chinese renminbi (RMB) per SDR has been calculated daily in the window of IMF, which has had great influence on other exchange rates of currencies where China usually used fixed or pegging exchange mechanism.

This system had great impact on the Chinese international trade in which Sino-US trade patterns had generated Chinese domination with an increasing favorable balance of trade since the Yuan had depreciated continuously with respect to the US Dollar. Moreover, internationalization of the Yuan produces huge pressures on the demands for Chinese bonds, shares, equity funds, interbank lending volumes as well as on the turnover of trading, market capitalization and foreign direct investment inflows in which China is lacking far behind the USA and the Euro Area regarding the international capital market. In consequence, China has to deal with the capital account convertibility under freely floating exchange rate mechanism to maintain the weight of the Yuan in SDR and even China will have to improve the indicators of its capital market structures as an international competitor where China's role is pivotal in stabilizing the international monetary system followed by USA and Euro Area. In this context, the People's Bank of China clearly stated that if China constitutes 30-40 % of international reserves and can enhance 20 % of bonds and shares, then it would be possible to enact the full convertibility and freely floating exchange rate mechanism (Bhowmik, 2020b).

This paper seeks to explore the relationships of the Yuan per SDR exchange rate with the Yuan per US Dollar exchange rate, NEER and REER of the Yuan during the period from 2017m1 to 2021m7, emphasizing the Yuan entry into the SDR basket. This is relevant due to the central role of exchange rates in the international monetary system in determining stability, confidence, trade patterns and monetary policies of the global economy. Indeed, due to the inclusion of the Yuan in SDR, the overall exchange rate system of the Chinese basket has been fully reformed and internationalized.

2. LITERATURE REVIEW

There are different opinions among economists, policy makers and public officials about the decision of IMF to include the Chinese Yuan into the basket of currencies in SDR. Hung (2015) argued that the Yuan inclusion in SDR will not bring much impact in Chinese economy as the RMB will be freely usable currency which will diminish due to the rapid revival and strength of US dollar as reserve currency. In this context, it is expected that People's Bank of China will lose its incentive to use foreign exchange reserve to stabilize the RMB value, which will be allowed to fall more freely. Consequently, the devaluation of RMB will be eminent.

Narasimhan (2015) stated that, after the inclusion of the Yuan in SDR basket, China should make RMB fully convertible to current and capital account and should strengthen its bond market and reform financial sector to increase international demand for RMB in global economy because world financial order is highly skewed in favor of the US Dollar.

Wolf Jr. (2016) criticized the idea that, assuming the US Dollar's role as the dominant reserve currency, the devaluation of the Yuan would harm the USA US interest in the world. If the two giant economies, China and USA, do not implement aggressive monetary policies and begin to use their currencies as complementary in the world payment system, there would be more stability.

There are many new researches about the Yuan inclusion in the SDR. With regard to RMB inclusion in SDR basket, Suzuki (2016) suggested that: (i) emerging economies need to develop stronger fundamentals, (ii) Chinese financial system in handling RMB exchange rate needs to be improved, and (iii) cooperation and coordination between USA and China through multilateralism, even regarding the issue of the RMB/US$ exchange rate, are needed for stability of international monetary system.

Considering that exchange rate policy, monetary policy and underlying trade relation determined the co-movements of currencies, Ito and McCauley (2016) used the Haldane and Hall (1991) and Frankel and Wei (1994) models of the key currency weights, applying the estimations for 172 economies during the period 1970-2021 over rolling windows of 36 months and found that the Yen zone did not improve outside of Japan, whereas the Euro zone improved in western Europe and east Europe till 2000 and then moved towards Dollar zone which had retained still share of around 50-60 % in global activity. With respect to the Chinese financing to Dollar zone current account, the stabilization of RMB against SDR basket could shrink the Dollar zone and revise the balances of current account of Dollar zone and other zones.

Srinivas (2018) maintains that the Yuan inclusion in the SDR would help to increase the representativeness, stability and attractiveness of the SDR in the international monetary system. In this respect, China signed four initiatives: (i) bilateral currency swap arrangements, (ii) RMB as foreign institutional investor status, (iii) RMB payment settlement system and (iv) Asian Infrastructure Investment Bank. China agreed in hiking its quota and, although it is not willing to retaliate trade policies with USA, it is willing to cooperate with this country in currency exchange rate policies. Rising trade and financial linkages are the present outcome of increasing financial spill over from China.

Das (2019) discussed the policy perspectives of the Chinese exchange rate, which has cross effects on other currencies. He reports that, since July 2005, the RMB/US$

daily exchange rate became less volatile than other floating exchange rate. In turn, the RMB appreciated from July 2005 to July 2015 and then depreciated till December 2016. From 2016 to 2017, RMB is broadly stable and then depreciates by 10 % in CFETS basket. China reduced pressure on capital flows and exchange rate till August 2018 and RMB/US$ depreciated by 2,5-7,5 %. In turn, the new exchange rate regime stablishes a ±2 % daily band around the central parity rate and sets limits to the use of Forex market to prevent from excessive volatility.

Qiqi (2020) commented that the internationalization of the RMB using freely floating exchange rate is caused by the US pressure since the US Dollar still dominates the international currency basket. Yet the RMB evolution has improved its geo-economic power as is seen from US-China trade war. People's Bank of China has aimed to balance RMB stability and exchange rate stability which will eventually put RMB as second option for international currency reserve, because RMB still lacks an automatically self-regulating function to become the main type of international currency reserve.

Bhowmik (2020a) examined the determinants of the Chinese exchange rates through cointegration and vector error correction model during the period 1990-2019 and found that Shanghai composite index, trade openness and terms of trade have long run causalities with NEER, balance of trade, foreign direct investment and liquidity. In addition, REER, balance of trade, foreign direct investment and liquidity have long run causal relation with the Shanghai composite index, trade openness and terms of trade respectively. Thus, China requires a policy of improvement in the demand for bond, shares, mutual funds and institutional foreign investment which will internationalize RMB. In this way, RMB could be treated as reserve currency.

3. METHODOLOGY

Semi-log nonlinear regression model is fitted for obtaining the nonlinear trend of the Yuan per SDR. Then, the residual test for stability is obtained from the CUSUM of squares. Hamilton (2018) regression filter model is used to decompose the Yuan-SDR exchange rate into trend, cycles and seasonal variation. Its seasonality is tested by using autocorrelation and partial autocorrelation functions. The Hamilton regression filter residual is fitted into the ARIMA (p, d, q) model for showing AR and MA properties and convergences which is also fitted to the forecasting model for 2023m5 following the Box and Jenkins (1976) procedure.

Hamilton regression filter is chosen instead that of Hodrick and Prescott because the latter introduces spurious dynamic relations that have no basis in the generation process of the underlying data (Hamilton, 2018). Also, other well-known filters such as those of Baxter and King or Cristiano have shown to produce similar problems as well as the propensity to overestimate the trend (Estrella, 2007).

Besides, unit root is examined through the application of the augmented version of the test proposed by Dickey and Fuller (1979). Johansen (1988) model for cointegration and vector error correction are applied for getting short run and long run causalities and cointegrating relations with the variables of exchange rates, i.e., NEER and REER of Yuan, Yuan per US$ and Yuan per SDR, respectively. Impulse-response functions are used to analyze the response to one standard deviation innovation of the variables after applying Cholesky decomposition. The short run causalities were verified by applying the Wald (1943) test.

The monthly data during the period 2017m1-2021m7 on Yuan per SDR and Yuan per US$ is collected from the People's Bank of China and the monthly data on NEER and REER of Yuan (2010=100) during the same period is collected from the Federal Reserve database.

4. RESULTS

4.1. Regression model

The trend of Chinese Yuan per SDR from 2017m1 to 2021m7 has a cubic form where there is a decline in first phase, an increase in the second phase and finally a decrease in the third phase. The coefficients are significant at 5 % level. The estimated trend is the following:

$$\text{Log}(y) = 2{,}2504 - 0{,}004285t + 0{,}000255t^2 - 3{,}44e^{-06}t^3 + u_i$$

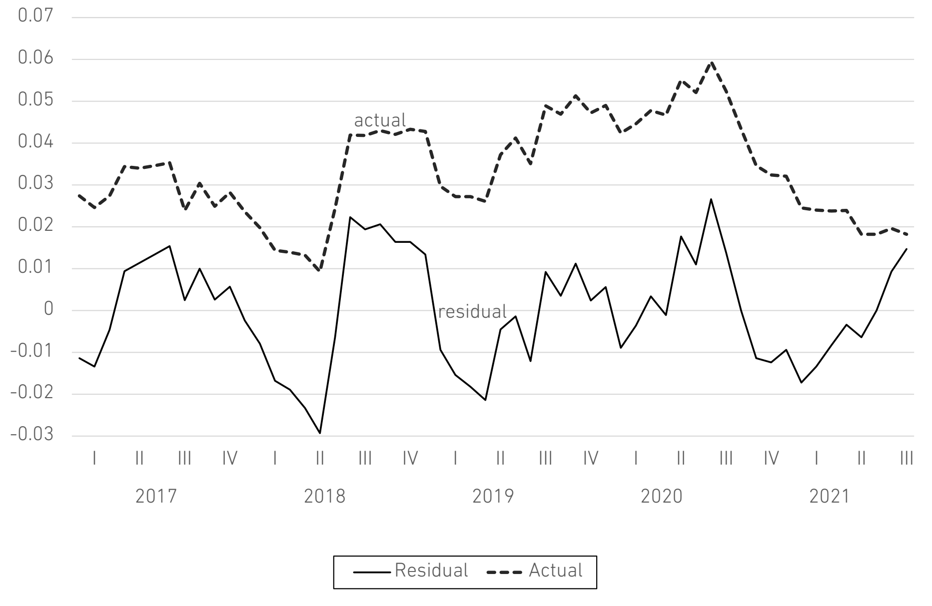
$$(294{,}42)^* \quad (-3{,}722)^* \quad (5{,}452)^* \quad (-6{,}38)^*$$

R^2=0,57, F=23,91*, DW=0,603, AIC=-5,72, SC=-5,58, * = significant at 5 % level, y = Yuan per SDR, t = period of time (month).

In Figure 1, we see the discrepancy between residual and actual values in the calculation of the trend line of Chinese Yuan per SDR.

Figure 1

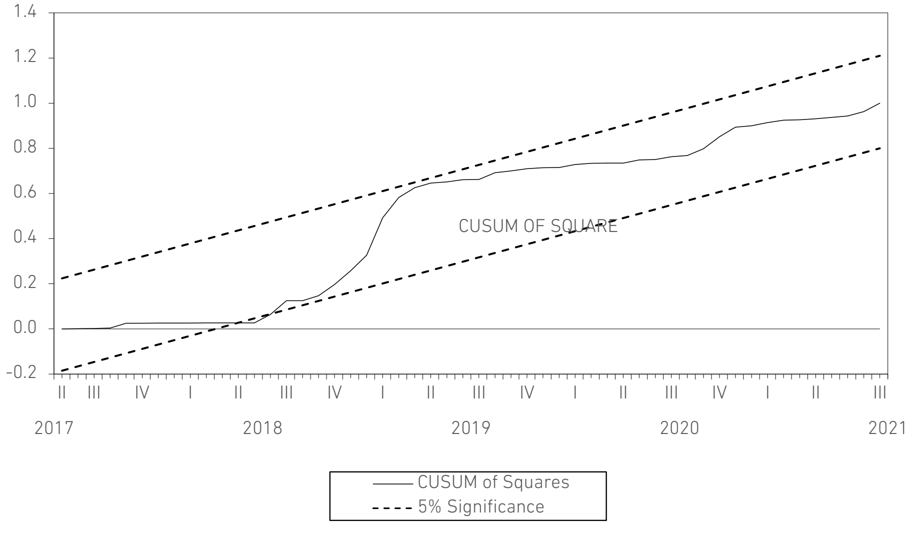
Residual and actual in calculation of Chinese Yuan per SDR



This fitted trend line is found to constitute a stable model where the CUSUM of squares line passes through the confidence bands, as seen in Figure 2.

Figure 2

Stability of the trend line



Since the exchange rate of Yuan per SDR from 2017m1 to 2021m7 has the property of cyclical behaviour, it can be decomposed into trend, cycle and seasonal variation by applying the Hamilton regression filter model. The estimated equation is as follows:

$$Log(y)_t = 4{,}487 - 0{,}459log(y)_{t-24} + 0{,}268log(y)_{t-25} - 0{,}254log(y)_{t-26} - 0{,}552log(y)_{t-27} + v_t$$

(7,97)* (-1,50) (0,60) (-0,53) (-1,56)

R^2=0,417, F=4,30*, AIC=-5,12, SC=-4,89, DW=0,45, n=29, * = significant at 5 % level.

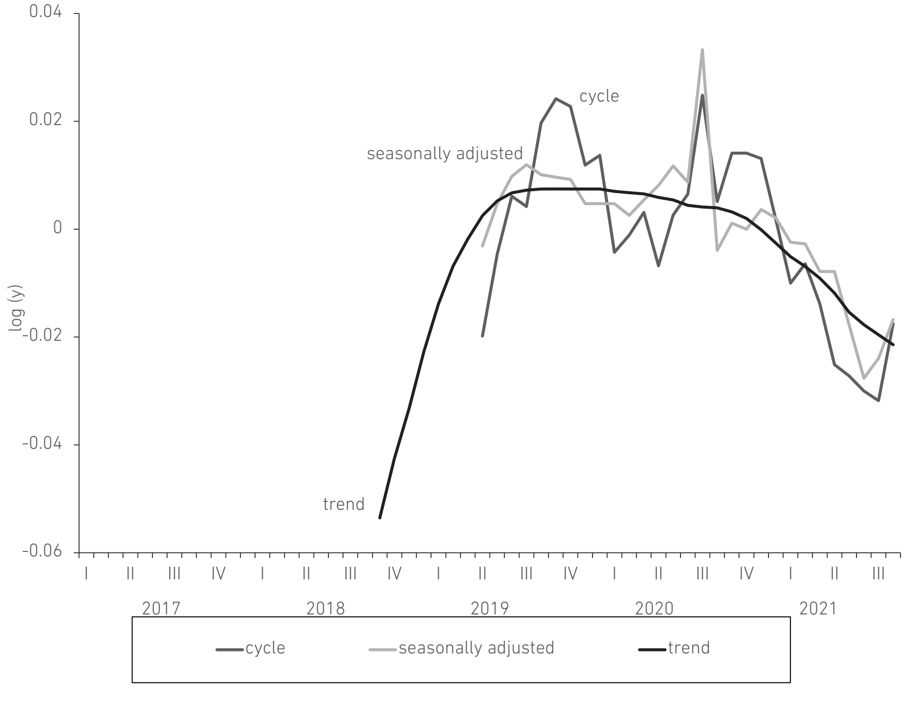
The residual v_t represents the equation which Hamilton calls "regression filter residual" which can also be decomposed into cycle, trend and seasonal variation through the Seasonal and Trend decomposition using Loess (STL) method as follows:

$$v_t = Log(y)_t - [4{,}487 - 0{,}459log(y)_{t-24} + 0{,}268log(y)_{t-25} - 0{,}254log(y)_{t-26} - 0{,}552log(y)_{t-27}]$$

From the STL method, the seasonal variation, the cyclical trend and the cycle of Yuan per SDR have been synchronized into a same diagram which is shown in Figure 3 where the trend line is inverse U shaped and the seasonally adjusted cycles are moving around the cycles with huge upward and downward movements of the rates during the adjusted period from 2019m4 to 2021m7.

Figure 3

Composite figure of cycle, trend and seasonally adjusted rate



The seasonality is verified in Figure 4 by the autocorrelation and partial autocorrelation patterns of the Hamilton regression filter residuals where autocorrelation functions have been declining, tend to be negative since lag 5 and finally reached positive values at lag 11. The partial autocorrelation functions have one spike and then fluctuates between positive and negative values.

Figure 4

AC and PAC of the residuals

Autocorrelation	Partial Correlation		AC	PAC
		1	0.740	0.740
		2	0.562	0.032
		3	0.339	-0.193
		4	0.080	-0.271
		5	-0.091	-0.047
		6	-0.229	-0.053
		7	-0.237	0.135
		8	-0.238	-0.049
		9	-0.097	0.221
		10	-0.063	-0.207
		11	0.013	0.035
		12	0.066	-0.049

Performing several ARIMA estimations based on the Hamilton regression filter residuals, it is found that ARIMA (2,0,2) is the best model since the Akaike Information Criterion (AIC) has the minimum value, i.e., -5,7648. Then, using the ARMA maximum likelihood methodology, the ARIMA (2,0,2) is estimated and convergence is achieved after 20 iterations, so that it is obtained:

$$V_t = -0{,}0023 + 0{,}4907v_{t-2} + \varepsilon_t + 0{,}346\varepsilon_{t-2} + 0{,}000133\sigma^2_t$$

(-0,41) (1,75) (1,05) (2,81)*

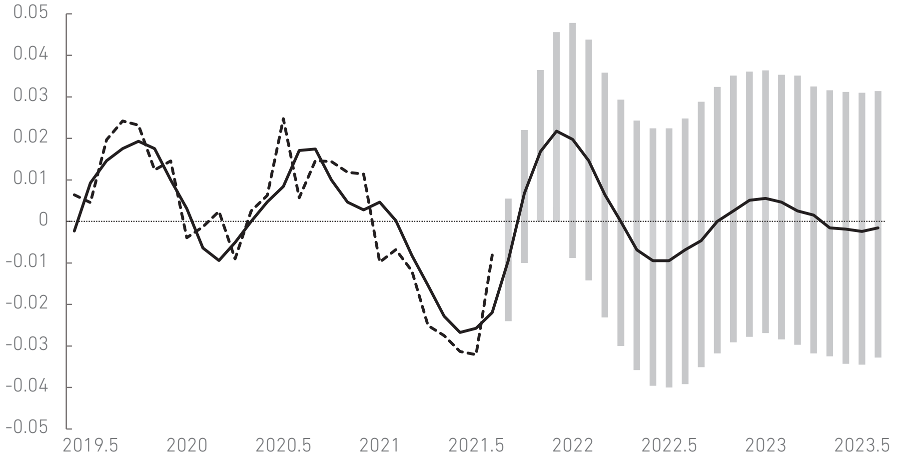
R^2=0,46, F=7,148*, AIC=-5,76, SC=-5,57, DW=1,10, AR roots=±0,70, MA roots=-0,00±0,59i, n=29, * = significant at 5 % level.

Since the values of the roots of AR and MA are less than one and the coefficients of AR and MA are also less than one, it can be said that the model converges towards equilibrium.

This ARIMA (2,0,2) model has been adjusted for the forecast up to 2023m5 as shown in Figure 5. It is found that the forecast line behaves cyclically reducing the amplitude of the fluctuation and ultimately moves towards equilibrium.

Figure 5

Forecast from ARIMA (2,0,2)



4.2. VEC model

The ADF unit root test is applied assuming that the series have intercept and trend. The results are shown in Table 1. It is found that the monthly series of Yuan per SDR(y), Yuan per US$(y1), REER of Yuan(y2) and NEER of Yuan(y3) from 2017m1 to 2021m7 contain unit roots in the series at levels but they have no unit root in the series at first differences.

Table 1

Unit root test

Log(y)	ADF = -1,582	P = 0,787	CV at 5 % = -4,133	Accepted for unit root
dlog(y)	ADF = -7,536	P = 0,000	CV at 5 % = -3,495	Accepted for no unit root
Log(y1)	ADF = -1,728	P = 0,724	CV at 5 % = -3,495	Accepted for unit root
dlog(y1)	ADF = -5,457	P = 0,000	CV at 5 % = -3,495	Accepted for no unit root
Log(y2)	ADF = -3,481	P = 0,051	CV at 5 % = -3,496	Accepted for unit root
dlog(y2)	ADF = -5,342	P = 0,000	CV at 5 % = -3,496	Accepted for no unit root
Log(y3)	ADF = -2,107	P = 0,529	CV at 5 % = -3,496	Accepted for unit root
dlog(y3)	ADF = -5,113	P = 0,000	CV at 5 % = -3,496	Accepted for no unit root

Johansen unrestricted cointegration rank test is applied to the first difference of Yuan per SDR, Yuan per US$, REER and NEER of Yuan during the 2017m1-2021m7 period considering intercept and trend. It is found that there is one cointegrating equation among those variables whose log likelihood is estimated as 767,5218 and the values of Trace

Statistic and Max Eigen Statistic belong to 5 % significant level. The hypothesized number of cointegrating equations, Eigen values, Trace Statistic, Max Eigen Statistic, their critical values at 5 % level with probabilities have been arranged in Table 2.

Table 2

Cointegration test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None *	0,5267	68,2361	63,8761	0,0205
At most 1	0,2550	28,5843	42,9152	0,5870
At most 2	0,1461	12,9781	25,8721	0,7399
At most 3	0,0831	4,6025	12,5179	0,6541
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.**
None *	0,5267	39,6518	32,1183	0,0050
At most 1	0,2550	15,6062	25,8232	0,5799
At most 2	0,1461	8,3755	19,3870	0,7867
At most 3	0,0831	4,6025	12,5179	0,6541

* denotes rejection of the hypothesis at the 0,05 level. **denotes probability values of MacKinnon-Haug-Michelis (1999), n=53

In turn, the Unrestricted Cointegrating Coefficients are given in Table 3.

Table 3

Unrestricted Cointegration Coefficients

log(y)	log(y1)	log(y2)	log(y3)	@Trend(17m2)
5,9672	-70,2926	-11,2634	-154,0045	0,0809
35,7679	32,1530	-107,1177	154,5621	0,0033
-184,0281	50,0696	-17,9057	-88,7783	0,0969
51,9258	14,6194	62,6275	-12,8351	-0,0779

The results of the VEC model aer presentend in Table 4. The results indicate that the increment of Yuan per SDR in the previous period has a significant positive relation with the increment of Yuan per US$, and a significant negative relation with the increment of REER and the increment of NEER during the 2017m1-2021m7 period. Moreover, there is a positive significant relation between the increment of Yuan per SDR and the REER of Yuan in the previous period. The other observed relations are found to be insignificant.

Table 4

Vector Error Correction Model

	dlog(y)	dlog(y_1)	dlog(y_2)	dlog(y_3)
CointEq1	-0,2158	-0,1458	0,2321	0,1448
T values	[-3,4204]*	[-1,5454]	[4,7840]*	[3,1014]*
dlog(y_{t-1})	-0,2136	0,7902	-0,5367	-0,4651
T values	[-1,0343]	[2,5587]*	[-3,3794]*	[-3,0418]*
dlog(y_{t-2})	0,1272	0,4731	-0,2467	-0,1861
T values	[0,5761]	[1,4333]	[-1,4536]	[-1,1389]
dlog(y_{1t-1})	0,1141	-0,0767	0,0143	0,0776
T values	[0,5243]	[-0,2358]	[0,0854]	[0,4820]
dlog(y_{1t-2})	-0,0569	9,99E-05	0,0564	-0,0711
T values	[-0,2629]	[0,0003]	[0,3390]	[-0,4436]
dlog(y_{2t-1})	0,4152	0,5621	-0,3087	-0,2574
T values	[1,6820]*	[1,5229]	[-1,6267]	[-1,4089]
dlog(y_{2t-2})	-0,0919	-0,0592	0,0657	0,1204
T values	[-0,3680]	[-0,1584]	[0,3420]	[0,6510]
dlog(y_{3t-1})	-0,5606	-0,1093	0,1654	0,2546
T values	[-1,3094]	[-0,1707]	[0,5026]	[0,8034]
dlog(y_{3t-2})	-0,1018	0,2103	-0,0862	-0,1066
T values	[-0,2971]	[0,4105]	[-0,3275]	[-0,4205]
C	0,0002	-0,0014	0,0010	0,0009
T values	[0,1913]	[-0,7724]	[1,1068]	[1,0603]
R-squared	0,4190	0,2805	0,6728	0,5575
F-statistic	3,3667	1,8196	9,5975	5,8800
Akaike AIC	-6,4563	-5,6520	-6,9821	-7,0579
Schwarz SC	-6,0810	-5,2768	-6,6068	-6,6827

*n=52, Log likelihood= 758,4386, *=significant at 5 % level.*

In addition, it is found that there are significant long run causalities among the exchange rates, so that Yuan per SDR has significant long run causalities from the Yuan per US$ and NEER of Yuan. In turn, the long run causality from REER to Yuan per SDR has the right sign but it was not found significant at the 5 % level. The trend relationship is observed as significant and positive. All the observations have come out from the cointegrating equation in which the value of the coefficient log(y_{t-1}) is negative but insignificant, which indicates that the cointegrating equation converges towards equilibrium. However, the t value of the coefficient $\log(y_{2t-1})$ is insignificant at 5 % level, so that the convergent process is not stationary but its speed of adjustment is 22,02 % per annum.

The cointegrating equation including trend (trend 2017m1) is given below:

$$dlog(y_t) = 20,6 - 0,22log(y_{t-1}) - 2,07log(y_{1t-1}) - 0,41log(y_{2t-1}) - 3,56log(y_{3t-1}) + 0,002t$$

(-3,42)* (-4,92)* (-0,721) (-3,37)* (3,12)*

From the VECM, it was found that the normalized cointegrating equation is:

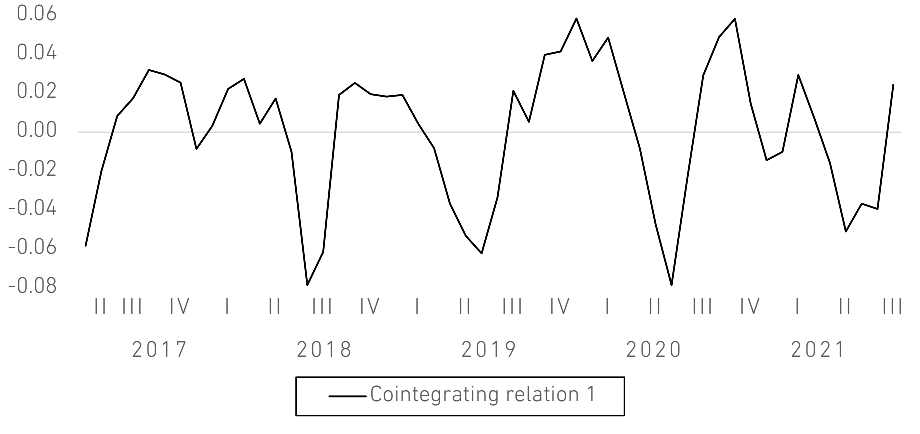
$$Z_{t-1} = 20,6009 - 2,0717log(y_{1t-1}) - 0,408log(y_{2t-1}) - 3,563log(y_{3t-1}) + 0,00178t$$

(-4,92)* (-0,721) (-3,37)* (3,12)*

The cointegrating equation can be depicted in the Figure 6 below and it appears as nonstationary.

Figure 6

Cointegrating equation



In addition to the long-term causality, there are short term causalities from the Yuan per SDR to the Yuan per US$, the REER and the NEER of Yuan respectively, as shown by means of the Wald in the Table 5.

Table 5

Short-term causality

Short term causality from Yuan per SDR to Yuan per US$	Chi-square (2) = 6,735	Probability = 0,034	F(2,43) = 3,367	Prob = 0,043
Short term causality from Yuan per SDR to REER	Chi-square (2) = 12,228	Prob = 0,002	F(2,42) = 6,114	Prob = 0,004
Short term causality from Yuan per SDR to NEER	Chi-square (2) = 10,310	Prob = 0,005	F(2,42) = 5,115	Prob = 0,009

Figure 7 shows the impulse-response functions. In the first row second column, the impulse response function shows that the response of Yuan per SDR to REER of Yuan passed through the equilibrium after one year. The response of Yuan per SDR to NEER of Yuan reached equilibrium and was diverging which was shown in figure of first row third column. The responses of Yuan per US$ to REER and NEER reach the equilibrium before two and six years and then moved away from equilibrium, as observed in the second and third columns of the second row, respectively. The responses of REER to Yuan per SDR and NEER reach the equilibrium before five years and after two years, respectively, and then are divergent, as observed in the first and third columns of the third row.

Figure 7

Impulse Response Functions

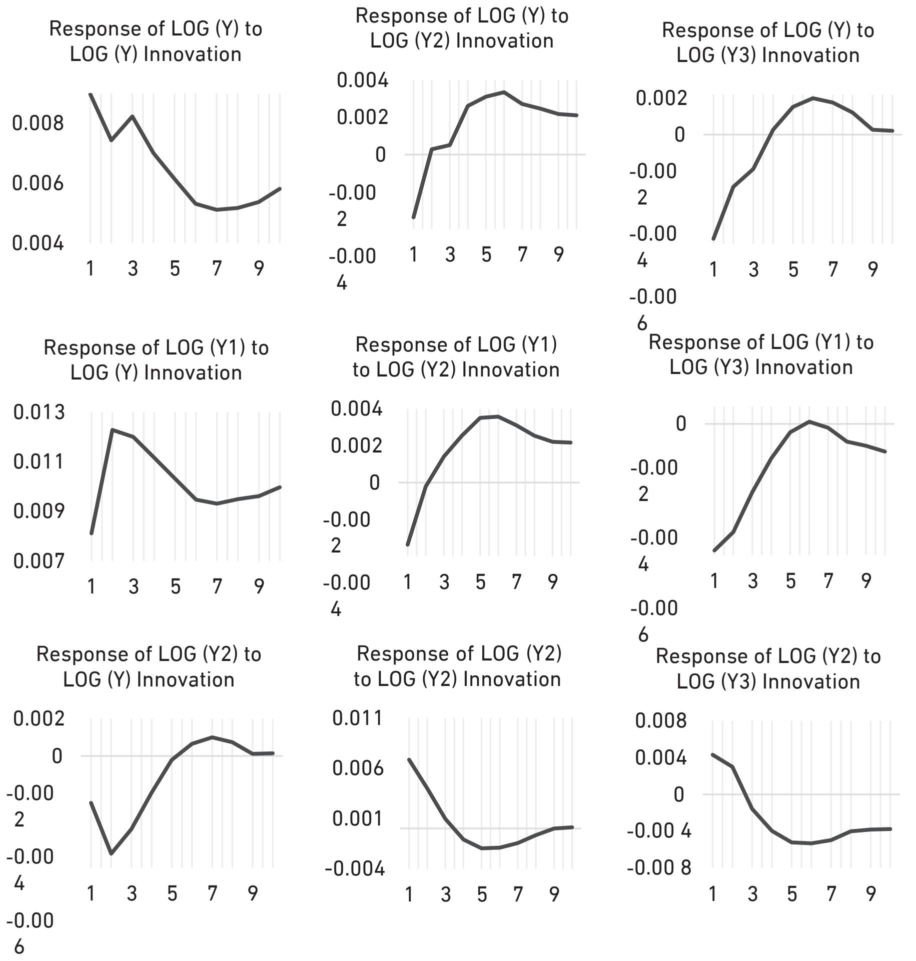
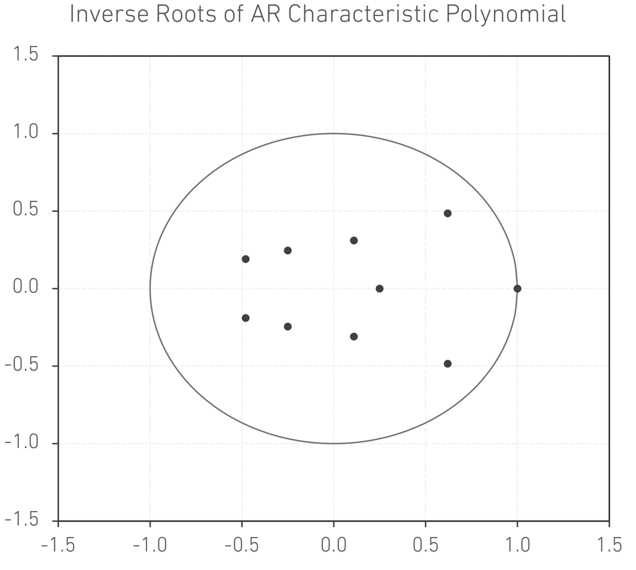


Figure 8 shows the unit circle. It is observed that all the roots lie on or inside the unit circle. Consequently, it can be affirmed that the VECM satisfies the stability condition.

Figure 8

Unit circle



Given these results, it can be said that this model poses some important policy issues for the Chinese economy. It was found that the US dollar, the NEER and the REER were volatile because of huge exchange rate adjustments of devaluations and revaluations. So, the exchange rate stability is the central concern. The patterns of NEER and REER should have minimum seasonal variation. For this purpose, it is necessary to guarantee stability of daily exchange rate of Yuan per SDR, Chinese price stability, capital and current account balance, reform of capital market indicators, forex reserves, and interbank lending. Adoption of freely floating exchange rate mechanism is necessary to compete in the international currency market efficiently as a key player in the international monetary system; otherwise, the weight in the SDR basket would not be improved.

5. CONCLUSION

This paper finds that Yuan per SDR has a nonlinear trend with three phases during the period from 2017m1 to 2021m7 showing an inverse U-shaped trend and cyclical behaviour. Meanwhile, Hamilton regression filter model gives a forecast that converges towards equilibrium in 2023m5 reducing its amplitude in a nonstationary process. Additionally, cointegration test and vector error correction model proved that the variables have one cointegrating equation and there are long run causalities from the Yuan per US$ and NEER of Yuan to Yuan per SDR. In turn, there are short term causalities from the Yuan per SDR to the Yuan per US$, the REER and the NEER of Yuan, respectively. The response of Yuan per SDR to the REER of Yuan, the response of Yuan per US$ to the REER and the NEER, and the response of the REER to Yuan per SDR and the NEER moved towards equilibrium but finally diverged away from equilibrium due to nonstationary.

This paper suffers from some limitations too. Since it concentrates on the issues of exchange rate mechanism, there are other variables excluded such as the macro fundamentals (GDP, inflation rate, foreign exchange reserves, exports and imports) and indicators of the capital market (market capitalization, bond yields, equity financing, interbank lending, share index, foreign direct investment). So, there is ample scope of research in the future to examine those impacts on the Yuan-SDR exchange rate.

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Debesh Bhowmik: Conceptualization, methodology, software, validation, analysis of data, research, treatment of data, drafting - preparation of first draft, drafting - review and editing.

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