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The Chinese Yuan Special Drawing Right Basket and Currency Risk Management

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ABSTRACT

The focus of this short paper is on special drawing right (SDR) based currency risk management including the choice of the appropriate currency index, pattern of adjustment of currency weights following financial shocks and the exchange rates to be used in the process of calculations. The new change in the SDR basket, namely the introduction of the Yuan, may introduce new challenges to currency risk management at multilateral development banks and other institutions using SDR to hedge against currency fluctuations. This study analyze the impact of including the Yuan in the SDR currency basket compared to original no Yuan basket and the change the introduction of the Yuan make on the characteristics of the SDR and other proposed indices (adjustment pattern, Stability and return). The study covers the period 2000-2016. The overall result suggest that the Yuan basket will be less volatile but will have limited impact on SDR dominated assets and the stability of their value.

Keywords: Special Drawing Right, Currency Risk, Multilateral Development Banks
JEL Classifications: F13, F31, F33, G32

1. INTRODUCTION

This study is a continuation our previous work on currency risk management based on special drawing right (SDR) neural currency weights. The first two papers completed are Hassanain et al., (2008), and Hassanain (2015). The first is on Islamic dinar as a unit of account of Islamic Development Bank: Implications for competitiveness and operational efficiency and the second on the SDR and currency risk management. Both studies provide important insight into the process of currency risk management for multilateral development banks. The objective of this study is to identify the potential impact of adding the Yuan to the SDR Basket for institutions using SDR as unit of account or for currency risk management and to suggest policy for currency risk management based on the adjustment pattern of the Yuan SDR.

2. ADDING THE YUAN TO THE SDR BASKET

The SDR's value is based on a basket of key international reserve currencies and their weights reflect their relative importance in the world's trading and financial system over the previous 5-year period.

Starting October 1, 2016, Rule O-1, which determine the amounts of the currencies in the SDR valuation basket, was updated to as follows: The value of the SDR shall be the total of the values of the following amounts of the following currencies (Table 1).

This add the Yuan (the Chinese currency) to the SDR basket for the first time.

The SDR could reduce portfolio variance and provide a convenient method of diversification in the management of large institutional portfolios. This study focus on SDR as unit of account and not as a reserve currency.

Several institutions and MDBs seek to minimize the potential fluctuation in the value of their net worth/equity denominated in SDR by matching to the extent possible, the currency composition of their net assets with the currency basket of the SDR.

The SDR's stability results from the fact that exchange rate shifts among the currency basket tend to offset one another depending on the degree of correlations among the component currencies. Currency risk arises from the possibility that changes in foreign exchange rates affect the value of the financial assets and liabilities denominated in foreign currencies.

SDR Realignment can be done by computing the deviation between the net asset position (%) and the neutral position (%) and generating the amount needed to buy or sell from each currency if any.

We start by looking at the properties of standard no Yuan SDR basket index and other suggested indices for more operational efficiency for MDBs that use the SDR to hedge against currency risk, and in the second part we analyze the Yuan based SDR basket index and related indices for operational efficiency, the last part is summary and conclusion.

2.1. Exchange Rate Indices

In this section we attempt to assess the stability of four exchange rate indices, namely, the IMF-SDR, an index based on Anchor, reserves, debt, trade & currency invoicing average, IMF-SDR with the Yuan included and finally a US dollar Euro index, the ratios in the second and third indices are based on Ilzetzki et al. (2017) and the references mentioned there in, which also appear to be consistent with the operational ratios for some MDBs. Specifically, the ratios of the average weights of the currencies of disbursement and repayment over 5-year period are close to these ratios for some MDBs. Table 2 provides a summary of weights in each index. The currency amount for the dollar weight is measured in terms of Euro.

The data used is monthly average exchange rate from 2000 to 2016 (USD, Euro, Yen, Pound and Yuan) from the IMF IFS. Currency weights change as the Euro dollar exchange rate changes. The geometric average is used to calculate the indices- and not the IMF-SDR method - to assess the stability of the indices and not to generate a precise unit value for a proposed unit of account. Using this method enable us to avoid the computational details involved in the procedure required to estimate the IMF-SDR currency amounts, see the 6 (2005; 2010) for the calculation of currency amounts. The use of a weighted average exchange rate index of bilateral exchange rates is a practice followed by central banks, international organizations and private sector financial institutions. One advantage of using geometric averaging is that proportionately equal currency appreciation and depreciation has the same effect on the index and causes no bias.

Table 1: Amount of currencies in SDR

Currency	Amount in SDR
U.S. dollar	0.58252
Euro	0.38671
Chinese Yuan	1.0174
Japanese yen	11.900
Pound sterling	0.085946

IMF (2016a) SDR: Special drawing right

Table 3 and Figure 1 show the basic descriptive statistic, namely the average and the standard deviation, for the four indices.

The results indicate that the average value of the Euro dollar index is lowest measured against the Euro followed by the IMF-SDR and the ARDT&C indices respectively. Volatility measured by the standard deviation of each series throughout the period of analysis indicates that the IMF-SDR is the most stable index followed by the $ Euro, ARDT&C, and finally the IMF SDR_Yuan index. The ratio to the highest average and the least volatile shows that the IMFSDR is over 99% of the highest average which is (IMF SDR Yuan) while the latter is more than twice volatile as the least volatile index which is the (IMF SDR) measured by simple standard deviation. While the average value is clear, it will not be easy to assess the stability of each index relying on standard deviation alone, in the next section we do model each index and track its adjustment pattern following shocks.

3. EXCHANGE RATE INDICES AS AUTOREGRESSIVE MOVING AVERAGES

To formally compare the stability of the different exchange rate indices each index is modeled as autoregressive integrated moving average process Tables 4 and 5. For each process representing an exchange rate index, the impulse response is used to trace the response to a one-time shock in the innovation. In simple terms, the impulse response of a system is its output when presented with a very brief signal, an impulse. If the estimated process is

Table 2: Currency weights for each index (in percent)

	IMF-SDR		Anchor, reserves, debt, trade & currency invoicing average index (ARDT&C)	69/31 index Anchor currency Us dollar & Euro	Yuan-with IMF-SDR
	2000	2006			
U.S. dollar	45	44	66	69	41.73
Euro	29	34	25	31	30.93
Japanese Yen	15	11	5	0	8.33
Pound Sterling	11	11	4	0	8.09
Yuan	0	0	0	0	10.92
SDR weights over time					
Currency	**USD**	**Euro**	**JPY**	**GBP**	**Yuan**
Weight (current)	41.9	37.4	9.4	11.3	0.0
Average since 2005	42.95	35.7	10.2	11.15	0.0
The 2015 Review – SDR basket composition and size for October 2016					
	41.73	30.93	8.33	8.09	10.92

IMF (2016a) SDR: Special drawing right

stationary, the impulse responses will asymptote to zero. If the estimated process is not stationary, the asymptotic values do not exist. A summary measure of how long it takes for the impact of a unit shock on the exchange rate index to dissipate by half often employed in the literature is called the half-life. The half-lifes are derived from impulse response analysis and are used to assess the stability of the exchange rate indices. The models that passed the diagnostic test are reported in Tables 6 and 7.

The results show that the impulse responses of each of the three indices asymptote to zero indicating stationary processes Table 6 and Figure 2. The graph of the first 16 impulse responses for each of the three indices indicates the followings: The IMF-SDR Yuan index is the fastest to adjust and hence the most stable (the value of a currency based on the IMF-SDR Yuan index will be the first to return to its average level in the wake of any destabilizing shock) with half-life of about 42 periods. The half-life of the other indices occur within 49 to 50 impulse responses implying slower adjustment. Based on their half-life adjustment the other indices can be ranked as follows: The IMF SDR, the other two adjust almost at the same time. One note is that slower adjustment can be linked to greater the share of the dollar in index.

3.1. Confidence Intervals for the Indices

We also constructed 90, 95 and 99 confidence intervals respectively for the volatility of each index and as the table and the graph show the indices appear to be in the following order with the first having the smallest confidence interval IMF SDR_ ¥, $ €.69-.31, ARDT&C, and finally the IMF SDR. Hence the IMF SDR_ ¥ appear to the least volatile among all, Figure 3 and Table 5.

4. CONCLUSION

In this study we attempt to assess the stability of the SDR after adding the Chinese Yuan to the basket of currencies included in the SDR compared to the no Yuan SDR and two more indices suggested for operational efficiency. The result will help the institutions using SDR as unit of account or for currency risk management and suggest policy change for currency risk management based on the adjustment pattern of the Yuan SDR.

Figure 1: Indices over time 2000-2016

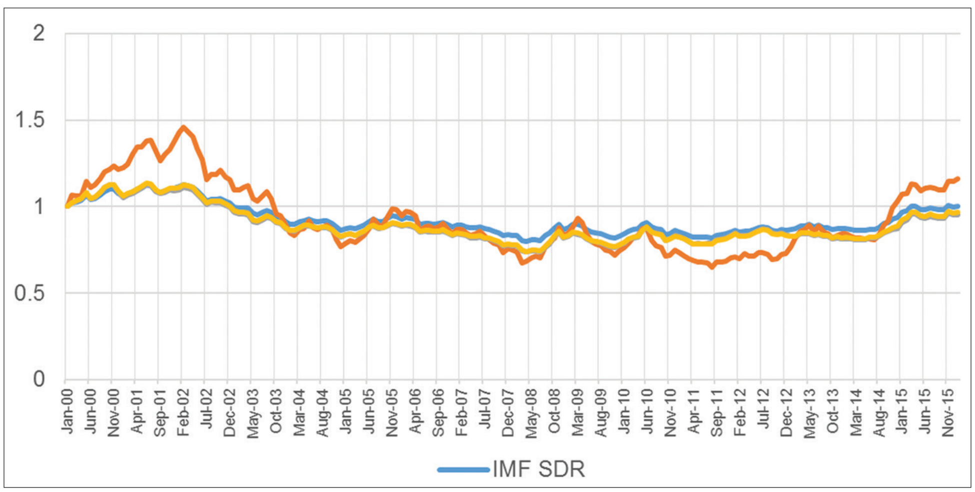
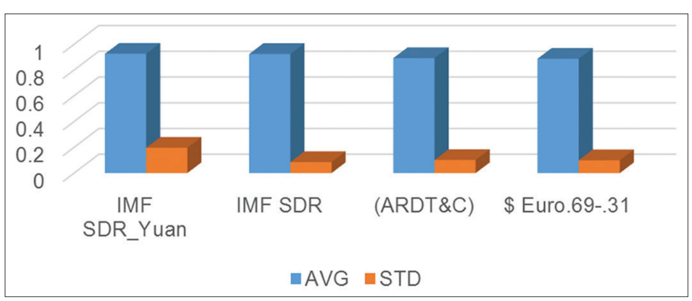


Table 3: Descriptive statistics



Variable	IMF SDR_Yuan	IMF SDR	ARDT&C	$ Euro. 69-.31
AVERGE	0.92658	0.92454	0.89249	0.88782
STANDARD	0.19625	0.08553	0.10163	0.09945
RATIOS				
AVG/IMFSDR	1.000	0.998	0.963	0.958
IMFSDRYUAN/STD	2.295	1.000	1.188	1.163

Figure 2: Impulse Response for the Indices

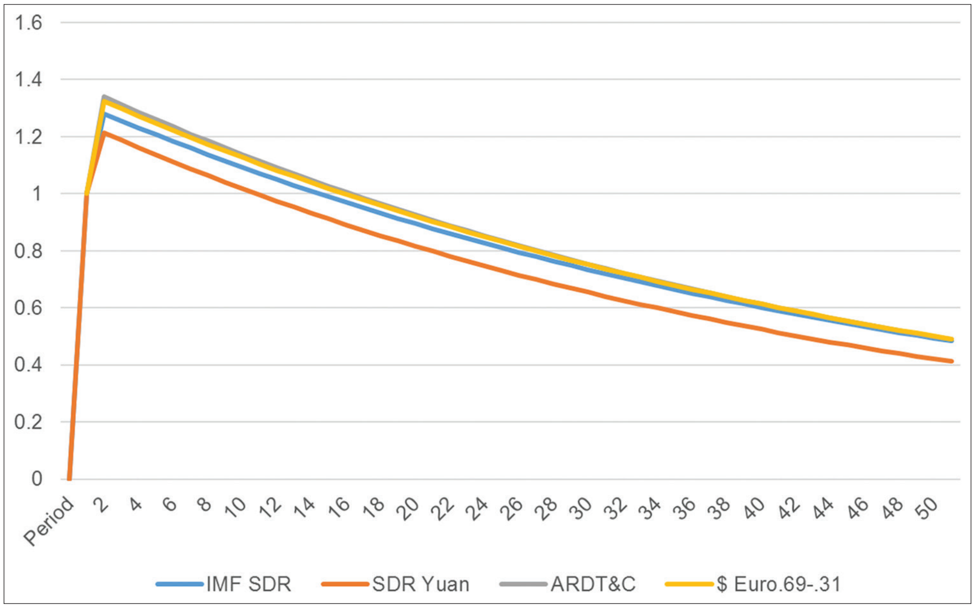


Figure 3: Confidence interval for the Indices

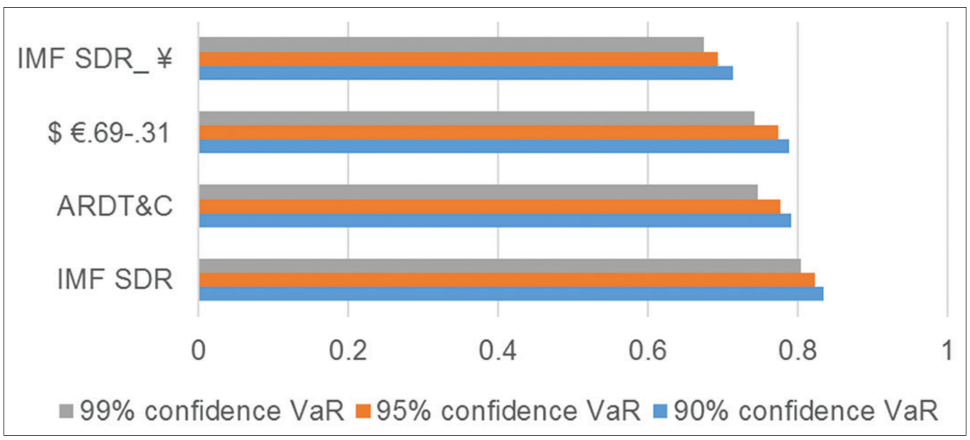


Table 4: The four SDR based series are (Dollar, Euro), (Dollar, Euro, Yuan), (no Yuan) and (with Yuan) Respectively

Indices arima models	IMF_SDR			IMF_SDR_YUAN		
Variable	Coefficient	Standard error	P	Coefficient	Standard error	P
C	0.95	0.06	0.00	0.97	0.13	0.00
AR (1)	0.98	0.01	0.00	0.98	0.01	0.00
MA (1)	0.30	0.08	0.00	0.24	0.07	0.00
SIGMASQ	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.98	Mean dep variable	0.92	0.97	Mean dep variable	0.93
Adjusted R^2	0.98	SD dependent variable	0.09	0.97	SD dependent variable	0.20
SE of regression	0.01	Akaike I c	−5.86	0.03	Akaike I c	−3.98
Sum squared resid	0.03	Schwarz c	−5.79	0.20	Schwarz c	−3.91
Log likelihood	569.22	Hannan-Quinn c	−5.83	387.63	Hannan-Quinn c	−3.95
F-statistic	2864.47	D-W	1.95	2281.81	D-W	1.94

Compared to all exchange rate indices tested, the average value of a unit of account based on the no Yuan IMF-SDR index is the highest, the most stable and the fastest to return to equilibrium following a shock.

For the Yuan based index and the related indices (dollar Euro) and the (Yuan dollar, Euro) Compared to the no Yuan index, the Yuan index appeared to be less volatile but have lower average value between 2000 and 2016. The introduction of the Yuan appear not introduce any significant contribution to the stability of the SDR or to enhance currency risk management for institutions using SDR as hedging instrument.

Therefore, for institutions that hedge against currency risk relying more on currency alignment adding the Yuan to the SDR Basket does not appear to suggest any significant change in SDR

Table 5: Variable confidence intervals for the indices

Number of obs	IMF SDR_ ¥	$ €0.69-0.31	ARDT&C	IMF SDR
90% confidence vaR	0.713	0.788	0.791	0.834
95% confidence vaR	0.694	0.773	0.777	0.823
99% confidence vaR	0.675	0.742	0.747	0.803

Table 6: Models for IMF SDR & IMF SDR Yuan indices

INDICES ARIMA MODELS	IMF_SDR			IMF_SDR_YUAN		
Variable	Coefficient	Standard error	P	Coefficient	Standard error	P
C	0.95	0.06	0.00	0.97	0.13	0.00
AR(1)	0.98	0.01	0.00	0.98	0.01	0.00
MA(1)	0.30	0.08	0.00	0.24	0.07	0.00
SIGMASQ	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.98	Mean dependent variable	0.92	0.97	Mean dependent variable	0.93
Adjusted R^2	0.98	S.D. dependent variable	0.09	0.97	S.D. dependent variable	0.20
S.E. of regression	0.01	Akaike I c	−5.86	0.03	Akaike I c	−3.98
Sum squared residual	0.03	Schwarz c	−5.79	0.20	Schwarz c	−3.91
Log likelihood	569.22	Hannan-Quinn c	−5.83	387.63	Hannan-Quinn c	−3.95
F-statistic	2864.47	D-W	1.95	2281.81	D-W	1.94

Table 7: Models for Dollar Euro & Anchor reserves debt indices

INDICES ARIMA MODELS	DOLLAR 69 EURO 31			ANCHOR__RESERVES__DEBT_		
Variable	Coefficient	Standard error	P	Coefficient	Standard error	P
C	0.92	0.06	0.00	0.92	0.06	0.00
AR(1)	0.98	0.01	0.00	0.98	0.01	0.00
MA(1)	0.36	0.07	0.00	0.34	0.07	0.00
SIGMASQ	0.00	0.00	0.00	0.00	0.00	0.00
R^2	0.98	Mean dependent variable		0.98	Mean dependent variable	0.89
Adjusted R^2	0.98	S.D. dependent variable	0.89	0.98	S.D. depependent variable	0.10
S.E. of regression	0.01	Akaike I c	0.10	0.01	Akaike I c	−5.55
Sum squared residual	0.04	Schwarz c	−5.60	0.04	Schwarz c	−5.48
Log likelihood	543.92	Hannan-Quinn c	−5.53	539.75	Hannan-Quinn c	−5.52
F-statistic	2983.84	D-W	−5.57	2983.99	D-W	1.97

behavior and pattern of adjustment based on the suggested new Yuan weight using historical data from 2000 to 2016. The result does not suggest change in currency management policy except for smaller CI for the Yuan based SDR. Our previous findings suggests a currency management policy with longer time span and tolerance for deviation from SDR weights (in excess of 1 month) before adjusting currency composition.

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