Effect of China's New Trade Settlement Policy on the Value of Dollar

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While swap agreements greatly relieves two trading nations of the shortage of international liquidity, they have several implications for the countries issuing an international currency. Such agreements, by lowering the demand for an international currency, lower its relative price and, thereby, change the balance of payments and the real income of the nation issuing the currency. Since, the U.S. dollar dominates all other international currencies in trade settlement and in reserve composition of sovereign states, such swap agreements are expected to affect U.S. dollar's exchange rate, and, thereby, the U.S. balance of payments and real income. This study, therefore, attempts to evaluate the impact of China's swap agreements with Indonesia on U.S. dollar's exchange rate with Indonesian rupiah, which has never been done before. In this study, we have developed a model in which the exchange rate of the U.S. dollar is a function of a number of variables, such as, the natural logs of the U.S. real GDP, Indonesian real GDP, U.S. money supply, and Indonesian money supply plus one-period lagged value of the dependent variable and a swap dummy. Our study found that China's swap agreement with Indonesia has no effect on the exchange rate (value) of U.S. dollar. One explanation of this finding can be the amount of swap agreement being relatively too small compared to the volume of Indonesia's annual trade volume to influence the value of the dollar. Also, the swap amount is meant to settle bilateral trade over several years rather than one year, which makes the swap amount a much smaller percentage of Indonesia's annual trade volume making the swap agreement ineffective in changing the exchange rate (relative value) of U.S. dollar with respect to rupiah.

INTRODUCTION

The objective of this study is to assess the impact of China's swap agreements on the value of U.S. dollar. Initially aimed at bypassing the U.S. dollar in international trades and thereby keeping bilateral trades unaffected by the fluctuations in the value of the dollar, China's bilateral swap agreements (BSAs) are also seen as China's attempt to establish its Yuan as an international currency. However, such swap agreements may have some other international economic implications as well. As one of the means of international payments – under which two trading partners agree to use each other's currency as a settlement currency – bilateral swap agreements can change the reserve composition of sovereign states changing, thereby, the dynamics of international capital movements. Moreover, by changing the demand for an international currency, swap agreements can influence the relative price of international currencies, leading to a change in international flow of goods and services and, in turn, the balance of payments of sovereign states.

Under a swap agreement, two trading partners agree to exchange a stipulated amount of domestic currency for a foreign currency in the amount determined by a specified exchange rate within a specified period of time. And when the swap agreement expires, the two nations would make a reverse exchange of

the remaining amount of the foreign currency at the same exchange rate. For example, suppose the People's Bank of China (PBOC) signs a RMB70-billion swap agreement with the Central Bank of Argentina (CBA). Then, China will exchange RMB70 billion and receive Argentine peso at a specified exchange rate. Subsequently CBA will inject RMB70 billion and PBOC will inject the exchanged amount of peso into their own financial systems, which will be borrowed by domestic traders to pay for their imports from each other country. And when the agreement expires, PBOC and CBA will exchange the other nation's currency for their domestic currency at the same exchange rate.

A number of countries, such as, South Korea, Argentina, and Indonesia who were facing short-term liquidity problem in the wake of the financial crisis, as their central banks did not have enough U.S, dollar to meet the demand by their importers, viewed this arrangement as an attractive option. China, on the other hand, sitting on vast amounts of foreign currency reserves, had an opportunity to enhance its capabilities of providing liquidity to world financial markets, thereby, moving one step forward toward its goal of internationalizing its currency. In addition, such an agreement would also help China secure the supplies of needed natural resources (e.g. oil and minerals) for its ever expanding industrial sector. This proper match of interest initiated several bilateral swap agreements between China and several other countries around the world (see Appendix – A).

In addition to relieving two trading nations of the shortage of international liquidity, swap agreements have several implications for the countries issuing an international currency. Such agreements, by lowering the international demand for the currency – U.S. dollar for example – lower its relative price and, thereby, change the balance of payments and the real income of the nation issuing the currency.

The purpose of this study, therefore, is to evaluate the impact of China's swap agreements with other nations on U.S. dollar's exchange rate. One of the top 12 swap agreements China has signed is the one with Indonesia (RMB 100 billion). This study aims to evaluate the impact of China's swap agreements on U.S. dollar's exchange rate with Indonesian rupiah.

None of the studies on swap agreements, so far, have looked into the effect of such agreements on the exchange rate of an international currency. For example, a study by Aizenman, Jinjarak, and Park (2011) has found that such swap agreements by China will only have limited effect in terms of establishing Renminbi (RMB) as a substitute to other reserve currencies. Liao and McDowell (2015), in their study, on the rise in swap agreements, have concluded that the ability of such agreement to insulate the trading nations from international liquidity shocks and reduced transaction costs of cross-border exchange for local firms are the major reasons for such agreements. However, to Garcia-Herrero and Xia (2013), the gravity motif is the predominant reason for the choice of swap agreements. A study by Yelwa (2016), on the impact of Nigeria's currency swap agreement with China on Nigerian economy, concludes that it will boost the Nigerian economy. Zhitao, Wenjie and Cheung (2016), on the other hand, look into the determinants of China's bilateral local currency swap lines and conclude that factors such as trade intensity, economic size, strategic partnership, free trade agreement, corruption, and stability affect the decision of signing a swap line agreement. An article in The Washington Times by Alex VanNess (2014), on the impact of China's swap agreements with countries on U.S. economy, argues that such agreements will make international community rely less and less on the dollar, eliminating the dollar's reserve currency status resulting in higher interest rates, a rise in prices, and a greater difficulty servicing the debts for the United States. Atkins (2016) analyzes both the benefits and dangers of Nigeria's swap agreement with China. To him, while increased trade with China is a benefit to Nigeria, a possible political turmoil is the danger of the swap agreement. Durden (2014) foresees a danger in making for U.S. dollar. He argues that as many countries, through swap agreements, begin to reject the dollar due to the exported inflation that is growing in nations that are relegated to having to hold them for global oil purchases, alternatives such as the Chinese Yuan will become a more viable option. However, Murphy and Yuan (2009) see no immediate danger to the dollar from China's currency swap agreements. They argue that, since the United States is still the number one destination for Chinese exports and, as transactions are still denominated in dollars, the country will continue to build its dollar reserves. And given its vast holdings and limited investment options, Beijing has little choice but to continue to support the U.S. dollar.

So, none of the studies on swap agreements, thus far, at least empirically, has looked into the impact of such agreement on the value of U.S. dollar. Therefore, this study will make a net contribution to existing literature. In this study, we develop a model in which the exchange rate of the U.S. dollar (the dependent variable) is a function of a number of variables, such as, the natural logs of the U.S. real GDP, Indonesian real GDP, U.S. money supply, and Indonesian money supply. In this model, we also include one-period lagged value of the dependent variable as well as a swap dummy – which takes on a value of 1 for the years since 2009 (the year in which China had signed a swap agreement with Indonesia) and zero otherwise. We, then, empirically test the model.

This paper is organized as following: section 2 lays out the model, section 3 explains the methodology, section 4 identifies the data source, section 5 reports the empirical findings, and finally, section 6 concludes the study.

THE MODEL

In our model, we make use of the Fisher's equation given as,

$$MV = PY \tag{1}$$

Here M is the quantity of domestic money supply, V is the velocity of domestic currency, P is the domestic price level, and Y is the domestic real output (GDP). Dividing both sides by Y yields,

$$P = \frac{MV}{Y} \tag{2}$$

Since the relationship shown in equation (2) also holds for any foreign country, equation (2) for a foreign country (Indonesia) can be rewritten as,

$$P^* = \frac{M^* V^*}{Y^*} \tag{3}$$

Here, $P^*, M^*, V^*, and\ Y^*$ stand for Indonesia's price level, money supply, velocity of money, and real output respectively. Substituting equation (2) and (3) in Absolute Purchasing Power Parity equation,

$R = \frac{P}{P^*}$ yields,

$$R = \frac{MVY^*}{M^* V^* Y} \tag{4}$$

Here, R is the exchange rate between U.S. dollar and Indonesian rupiah – defined as number of U.S. dollar needed to purchase one rupiah. Taking natural lag of both sides of equation (4) yields,

$$lnR = lnM + lnV + lnY^* - lnM^* - lnV^* - lnY \tag{5}$$

If velocities of money are assumed to be constant, as Fisher himself assumes, so that $lnV + lnV^* = \alpha_0$, a constant, then equation (5) can be rewritten as,

$$lnR = \alpha_0 + lnM + lnY^* - lnM^* - lnY \tag{6}$$

Equation (6) is simplified as,

$$e = \alpha_0 + m + y^* - m^* - y \tag{7}$$

Here $e = lnR, m = lnM, y^* = lnY^*, m^* = lnM^*, and\ y = lnY.$

METHODOLOGY

In stochastic and estimable form with a time subscript, equation (7) can be rewritten as,

$$e_t = \alpha_0 + \alpha_1 m_t + \alpha_2 y_t^* + \alpha_3 m_t^* + \alpha_4 y_t + u_t \tag{8}$$

A priori, the sign of α_1 is expected to be positive, because when domestic money supply (m_t) rises, the interest rate at home falls, causing a capital outflow and thereby forcing the exchange rate of domestic currency (e_t) to rise. Similarly, the sign of α_2 is expected to be positive, because when the foreign real GDP (y_t^*) rises, the demand for money in the foreign country also rises, causing the interest rate in the foreign country to rise, which, in turn, causes a capital inflow into the foreign country and out of the domestic country, thereby forcing the exchange rate of domestic currency (e_t) to rise. On the contrary, the sign of α_3 is expected to be negative, because when foreign money supply (m_t^*) rises, the interest rate there falls, causing a capital outflow from the foreign country and into the domestic country, and thereby forcing the exchange rate of domestic currency (e_t) to fall. Similarly, the sign of α_4 is expected to be negative, because when domestic real GDP (y_t) rises, the transaction demand for money rises causing the interest rate at home to rise, which in turn, causes a capital inflow and forcing the exchange rate of domestic currency (e_t) to fall.

To capture the effect of previous value of the dependent variable on its current value, we include a one-period lagged value of the dependent variable, e_{t-1}, as an extra regressor. Also, since the purpose of this study is to examine the effect China's swap agreements on the value (exchange rate) of U.S. dollar with Indonesian rupiah, we include a swap dummy in equation (8). The swap dummy will take a value of 1 for the years since 2009 – the year in which China signed a swap agreement with Indonesia – and zero otherwise. With the inclusion of the lagged value of the dependent variable and the swap dummy, equation (8) is re-specified as following:

$$e_t = \alpha_0 + \delta e_{t-1} + \alpha_1 m_t + \alpha_2 y_t^* + \alpha_3 m_t^* + \alpha_4 y_t + \alpha_5 S_t + u_t \tag{9}$$

If α_5 turns out to be positive and significant, we will conclude that China's swap agreements will raise the exchange rate (lower the value) of U.S. dollar with respect to Indonesian rupiah.

DATA

We use annual data on the U.S. and Indonesia's real gross domestic product (GDP) from the World Development Indicators (World Bank), data on average annual exchange rate of U.S. dollar with Indonesian rupiah from the Federal Reserve Bank of St. Louis, and the data on U.S. and Indonesian money supply – defined as M1 – from International Financial Statistics (IMF) for the years 1995 - 2015. The information on China's swap agreements with other countries is obtained from the People's Bank of China. All above data is shown in Appendix – B & C.

EMPIRICAL FINDINGS

We estimated equation (9) and obtained the following function:

$$e_t = -36.46 + 0.03\ e_{t-1} - 0.38 m_t + 1.97 y_t^* - 2.64 m_t^* + 0.01 y_t + 0.10 S_t \tag{10}$$
$$\quad (-2.20)\quad (0.16)\quad\quad (-0.72)\quad (2.20)\quad (-3.14)\quad (1.92)\quad (0.53)$$
$$R^2 = 0.8637;\ \text{F-statistics} = 13.7306;\ \text{Prob. (F-stat.)} = 0.000059;\ \text{Durbin-Watson Stat.} = 2.0741$$

The numbers in the parentheses are corresponding t-statistics. The d_L and d_U for 20 observations and 6 slope coefficients are 0.515 and 1.918 respectively, while the actual D-W statistic (d) is 2.0741. Thus the actual D-W statistic is greater than the D_U, indicating no presence of positive autocorrelation. On the other hand, (4 − d) is also greater than d_U, indicating no presence of negative autocorrelation either. Therefore, we can safely use our estimates, presented in equation (10), to interpret our findings. The corresponding t-statistics, given in the parentheses, show that, at 5% significance level, only variable that are significant are Indonesia's money supply, m_t^* and Indonesia's real GDP, y_t^*. The negative sign associated with the variable, m_t^*, indicates that an increase (decrease) in Indonesia's money supply lowers (raises) the U.S. dollar's exchange rate, which is as expected. On the other hand, the positive sign associated with the variable, y_t^*, indicates that an increase (decrease) in Indonesia's real GDP raises (lowers) the U.S. dollar's exchange rate, which is also as expected. However, our interest is in swap dummy which turned out to be insignificant, indicating that China's swap agreement with Indonesia has no effect on the exchange rate (value of) U.S. dollar. One explanation of this finding can be the amount of swap agreement being a very small percentage of Indonesia's annual trade volume. For example, Indonesia's total trade volume in 2015 was $361,500 million, while the amount of the China's swap agreement with Indonesia was RMB100 billion, which at the same year's average annual exchange rate of RMB 1 = $0.159175, is equal to $15,917.5 million, which in turn is equal to only 4.4% of Indonesia's total trade volume. Also, the swap amount is meant to settle bilateral trade over several years rather than one year, which makes the swap amount a much smaller percentage of Indonesia's annual trade volume making, thereby, the swap agreement ineffective in changing the exchange rate (relative value) of U.S. dollar with respect to rupiah.

SUMMARY AND CONCLUSION

Starting in 2009 and by May 2016, China has signed bilateral swap agreements with 31 countries. In a typical bilateral swap agreement, two trading partners agree to exchange a stipulated amount of domestic currency for a foreign currency in the amount determined by a specified exchange rate within a specified period of time. And when the swap agreement expires, the two nations would make a reverse exchange of the remaining amount of the foreign currency at the same exchange rate. Initially aimed at bypassing the U.S. dollar in international trades and thereby keeping bilateral trades unaffected by the fluctuations in the value of the dollar, China's bilateral swap agreements (BSAs) are also seen as China's attempt to establish its Yuan as an international currency. As one of the means of international payments – under which two trading partners agree to use each other's currency as a settlement currency – bilateral swap agreements can change the reserve composition of sovereign states changing, thereby, the dynamics of international capital movements. Such agreements, by lowering the demand for an international currency – U.S. dollar for example – lower its relative price and, thereby, change the balance of payments and the real income of the nation issuing the currency.

One of the top 12 swap agreements China has signed is the one with Indonesia (RMB 100 billion). This study, therefore, aims to evaluate the impact of China's swap agreement on U.S. dollar's exchange rate with Indonesian rupiah.

There have been several studies on swap agreements, so far, but none have, at least empirically, examined the impact of such agreement on the value of U.S. dollar. Therefore, this study will make a net contribution to existing literature. In this study, we have developed a model in which the exchange rate of the U.S. dollar (the dependent variable) is a function of a number of variables, such as, the natural logs of the U.S. real GDP, Indonesian real GDP, U.S. money supply, and Indonesian money supply. In this model, we have also included one-period lagged value of the dependent variable and a swap dummy – which takes on a value of 1 for the years since 2009 (the year in which China had signed a swap agreement with Indonesia) and zero otherwise. We, then, empirically tested the model.

In our results, the swap dummy turned out to be insignificant, indicating that China's swap agreement with Indonesia has no effect on the exchange rate (value) of U.S. dollar. One explanation of this finding can be the amount of swap agreement being relatively too small compared to the volume of Indonesia's

annual trade volume to influence the value of the dollar. Also, the swap amount is meant to settle bilateral trade over several years rather than one year, which makes the swap amount a much smaller percentage of Indonesia's annual trade volume making the swap agreement ineffective in changing the exchange rate (relative value) of U.S. dollar with respect to rupiah.

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APPENDICES

Appendix – A
Dependent Variable: LEXCH$R (e_t)
Method: Least Squares
Date: 11/06/16   Time: 20:45
Sample (adjusted): 2 21
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (α_0)	-36.46052	16.55856	-2.201914	0.0463
LAGEXCH$R (e_{t-1})	0.031024	0.199067	0.155848	0.8785
LUSMS (m_t)	-0.384281	0.531497	-0.723016	0.4825
LINDGDP (y_t^*)	1.971848	0.896290	2.200011	0.0465
LINDMS (m_t^*)	-2.640295	0.841356	-3.138142	0.0078
LUSGDP (y_t)	0.010607	0.005527	1.919019	0.0772
SWAP (S_t)	0.103406	0.193829	0.533488	0.6027

R-squared	0.863708	Mean dependent var	-9.051640
Adjusted R-squared	0.800804	S.D. dependent var	0.410202
S.E. of regression	0.183079	Akaike info criterion	-0.288583
Sum squared resid	0.435732	Schwarz criterion	0.059923
Log likelihood	9.885832	Hannan-Quinn criter.	-0.220551
F-statistic	13.73057	Durbin-Watson stat	2.074061
Prob(F-statistic)	0.000059		

Appendix – B

	China's Bilateral Swap Agreements with Other Countries						
S.N.	Country	Swap Agreement Date	Swap Amount (Billions of RMB)	S.N.	Country	Swap Agreement Date	Swap Amount (Billions of RMB)
1	Indonesia	Mar. 2009	100	17	Sri Lanka	Sep. 2014	10
2	Uzbekistan	Apr. 2011	0.7	18	South Korea	Oct. 2014	360
3	UAE	Jan. 2012	35	19	Russia	Oct. 2014	150
4	Turkey	Feb. 2012	10	20	Qatar	Nov. 2014	35
5	Ukraine	Jun. 2012	15	21	Canada	Nov. 2014	200
6	Singapore	Mar. 2013	300	22	Hong Kong	Nov. 2014	400
7	Brazil	Jun. 2013	190	23	Kazakhstan	Dec. 2014	7
8	UK	Jun. 2013	200	24	Thailand	Dec. 2014	70
9	Hungary	Sep. 2013	10	25	Pakistan	Dec. 2014	10
10	Albania	Sep. 2013	2	26	Suriname	Mar. 2015	1
11	Iceland	Sep. 2013	3.5	27	Armenia	Mar. 2015	1
12	EU	Oct. 2013	350	28	Australia	Apr. 2015	200
13	New Zealand	Apr. 2014	25	29	South Africa	Apr. 2015	30
14	Argentina	Jul. 2014	70	30	Malaysia	Apr. 2015	180
15	Switzerland	Jul. 2014	150	31	Belarus	May 2016	7
16	Mongolia	Aug. 2014	15				

Source: The People's Bank of China (http://www.pbc.gov.cn/english/130437/index.html)

Year	U.S. GDP ($)	Indonesia's GDP ($)	U.S. Money Supply (M1) (Millions of $)	Indonesia's Money Supply (M1) (Millions of Rupiah)	Exchange Rate ($/Rupiah)	Exchange Rate (Rupiah/$)	Swap Dummy
1995	7.66E+12	8.65E+11	1.15E+06	5.27E+07	4.42E-04	2,262.00	0
1996	8.10E+12	9.48E+11	1.11E+06	6.41E+07	4.25E-04	2,350.50	0
1997	8.61E+12	1.01E+12	1.10E+06	7.83E+07	3.13E-04	3,198.50	0
1998	9.08917	8.86E+11	1.12E+06	1.01E+08	9.54E-05	10,487.50	0
1999	9.66062	9.07E+11	1.15E+06	1.25E+08	1.30E-04	7,720.50	0
2000	1.03E+13	9.73E+11	1.11E+06	1.62E+08	1.15E-04	8,675.00	0
2001	1.06218	1.03E+12	1.21E+06	1.78E+08	9.54E-05	10,478.75	0
2002	1.10E+13	1.09E+12	1.25E+06	1.92E+08	1.10E-04	9,085.00	0
2003	1.15E+13	1.17E+12	1.33E+06	2.24E+08	1.17E-04	8,511.75	0
2004	1.23E+13	1.26E+12	1.40E+06	2.46E+08	1.10E-04	9,115.50	0
2005	1.31E+13	1.38E+12	1.40E+06	2.71E+08	1.02E-04	9,833.25	0
2006	1.39E+13	1.50E+12	1.39E+06	3.47E+08	1.09E-04	9,157.50	0
2007	1.45E+13	1.64E+12	1.39E+06	4.50E+08	1.09E-04	9,182.00	0
2008	1.47E+13	1.77E+12	1.63E+06	4.57E+08	1.03E-04	9,692.50	0
2009	1.44E+13	1.86E+12	1.72E+06	5.16E+08	9.78E-05	10,220.25	1
2010	1.50E+13	2.00E+12	1.87E+06	4.84E+08	1.11E-04	9,028.25	1
2011	1.55E+13	2.17E+12	2.21E+06	7.23E+08	1.14E-04	8,799.25	1
2012	1.62E+13	2.34E+12	2.51E+06	8.42E+08	1.05E-04	9,479.50	1
2013	1.67E+13	2.52E+12	2.71E+06	8.87E+08	9.21E-05	10,862.50	1
2014	1.73E+13	2.69E+12	2.99E+06	9.42E+08	8.33E-05	12,006.25	1
2015	1.79E+13	2.84E+12	3.14E+06	1.06E+09	7.50E-05	13,333.33	1

Source: (1) International Monetary Fund, "International Financial Statistics." (http://data.imf.org/regular.aspx?key=60998116); **(2)** World Bank, "World Development Indicators," (http://data.worldbank.org/data-catalog/world-development-indicators);

Note: GDP is measured as GDP, PPP (Current international $).