

Effects of Chinese Yuan's Volatility on Korea's Export to China

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Jiyoun An Research Fellow, International Finance Team, Department of International Economy (jyan@kiep.go.kr)

Dooyeon Cho Research Fellow International Macroeconomics Team, Department of International Economy
(dycho@kiep.go.kr)

In Huh Research Fellow, International Finance Team, Department of International Economy (ihuh@kiep.go.kr)

Da Young Yang Researcher, International Finance Team, Department of International Economy (dyyang@kiep.go.kr)

Exchange Rate Volatility and International Trade

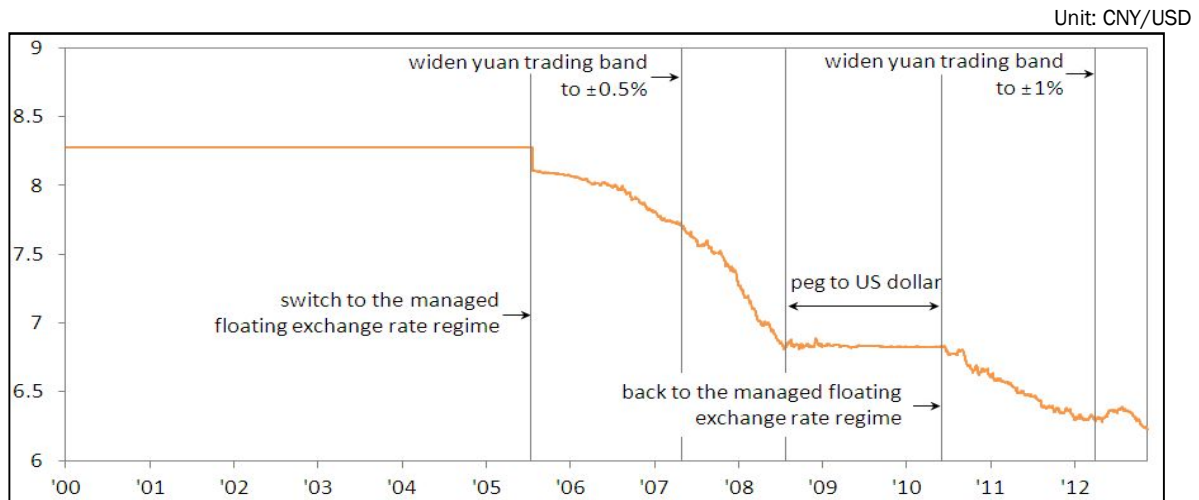
There have been debates whether the increasing volatility of the exchange rate has negative impacts on international trade. Ozturk (2006)¹ provides an extensive survey of relevant literature and roughly

concludes that empirical evidence from a large amount of literature seems to support the assumption that exchange rate volatility plays a role in decreasing the trade volume. However, Huchet-Bourdon and Korinek (2011)² also argue that there is no consensus regarding the impact of exchange rates and exchange rate volatility on the trade volume.

¹ Ozturk, Ilhan(2006), "Exchange Rate Volatility and Trade: a Literature Survey," *International Journal of Applied Econometrics and Quantitative Studies*, Vol. 3, pp. 85-102.

² Huchet-Bourdon, Marilyne and Jane Korinek (2011), "To What Extent Do Exchange Rates and their Volatility Affect Trade?" OECD Trade Policy Papers, No. 119.

Figure 1. Movement of CNY/USD



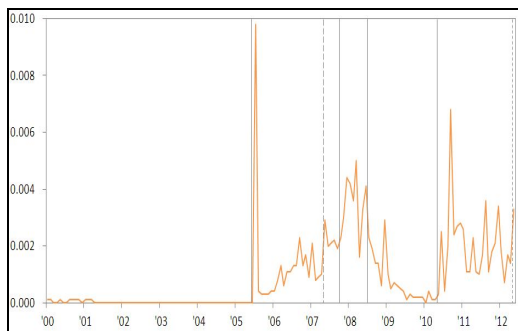
In their literature review, previous empirical research shows mixed results: positive, negative or no effect of exchange rate volatility on the volume of international trade. They indicate that these different results are probably due to different underlying assumptions, sample periods, and model specifications. Thus, still there is no clear view on the relationship between exchange rate volatility and international trade flows, although many practitioners and policy makers worry about the possible negative impacts of increasing exchange rate volatility on trade. This paper practically examines this issue by looking at the trade between Korea and China and Chinese Yuan's increasing volatility. In the following sections, we discuss the history of Chinese exchange rate regimes and the linkage between Chinese Yuan's volatility and Korea's export to China, and finally we show empirical evidence on their relationship.

Changes in Chinese Exchange Rate Regime

Figure 1 shows the movement of CNY/USD. The Chinese exchange rate had been fixed at

8.5 CNY/USD until July 2005, when the People's Bank of China adopted a managed floating exchange rate regime based on a currency basket. In the managed floating system, the Chinese exchange rate is determined under a supply and demand system, but the central bank or the government can influence the level of the exchange rate by selling or buying currencies. The daily band of the exchange rate was initially set to $\pm 0.3\%$, widened to $\pm 0.5\%$ in May 2007, and recently set to $\pm 1.0\%$ in April 2012. With the changes of the exchange rate system and the international pressure for currency depreciation, Yuan rose up by 21% against the US dollar from July 2005 to July 2008, which is before the Global Financial Crisis period. During the Crisis period, the exchange rate system was practically managed through a fixed exchange rate regime. In June 2010, the People's Bank of China announced that the Yuan exchange rate system got back to the managed floating system and that it would consider more flexibility with managing exchange rates in the near future.

Figure 2. Volatility¹⁾ of CNY/USD Exchange Rate and Structural Break Dates



Note: 1) Monthly standard deviation of log daily exchange rates.

2) The solid lines represent the months when there was an actual structural break and the broken lines represent the months when there was an announcement of Chinese authority to change the exchange rate regime.

In this paragraph, we examine whether the changes of the Chinese Yuan exchange rate regime have influenced the CNY/USD volatility using structural break tests as in Bai and Perron (1998, 2003)³. Figure 2 and Table 1 present the structural break dates of CNY/USD and one may see that the break points are close to the announcement dates of the changes in the exchange rate regime. These results show that the CNY/USD exchange rate volatility has increased since the introduction of the managed floating system and also that the changes of the regime have influenced the level of volatility.

Chinese Yuan's Increasing Volatility and Korea's Export to China

In the bilateral trade between Korea and China, the KRW/CNY exchange rate, which

³ Bai, Jushan and Perron Pierre(1998), "Estimating and testing linear models with multiple structural changes," *Econometrica*, Vol. 66, pp. 47-78.
Bai, Jushan and Perron Pierre(2003), "Computation and analysis of multiple structural change models," *Journal of Applied Econometrics*, Vol. 18, pp. 1-22.

Table 1. Dates of Announcement for Regime Changes and Actual Structural Break Dates

Announcement Dates	Structural Break Dates
Jul 2005	Jun 2005
May 2007	Oct 2007
Aug 2008	Jul 2008
Jun 2010	May 2010
Apr 2012	-

represents two countries' different currency values, is a key player in determining the trading costs. Based on the fact that KRW/CNY can be decomposed into KRW/USD and CNY/USD exchange rates, both the changes of CNY/USD and KRW/USD exchange rates are related to Korea and China's bilateral trade. Table 2 shows the changes of exchange rates and the volatilities of CNY/USD, KRW/USD, and KRW/CNY. CNY/USD has gradually appreciated up by 5.75 % since 2010 and its level (as of Nov. 13, 2012) was 6.23, which is the strongest value since the year 1995⁴.

Its volatility (calculated as an average of monthly standard deviations) in 2012 was 0.16 and this was lower than that of KRW/USD (0.76). KRW/CNY's volatility in 2012 is 0.72, which is similar to the level of KRW/USD's volatility. Still, CNY/USD's volatility is quite lower than KRW/USD's volatility, but the level of Yuan's volatility is expected to increase more as the People's Bank of China has shown signals to widen the daily Yuan's trading band against US dollar (USD) in the near future.

Korea's trade volume (exports plus imports) with China has continuously increased from 10% of country's total trade since 2001. China has become the top trading partner of Korea. In

⁴ China adopted a unified exchange rate system instead of its dual exchange rate system in 1995.

particular, Korea's export to China took up 23.9% (2012 year) of the total export. The main exporters of manufacturing industries are machinery and transportation equipment (42.5% of Korea's total export to China) followed by chemicals and allied products (19.0%) that are sensitive to changes in exchange rates and an increase in commodity prices. In this regard, there has been concern that recent changes of the Chinese Yuan's exchange rate may have

impacts on Korea's export to China. A possible explanation is that the appreciation of Yuan with respect to US dollar weakens Chinese exporting price competitiveness or that the increasing volatility of CNY/USD may raise exchange rate risk. Hence, when changes in the Chinese Yuan exchange rate occur along with China's growth slowdown, China's export is negatively affected and eventually Korea's export to China decrease.

Table 2. Exchange Rates of Chinese Yuan (CNY) and Korean Won (KRW) to US Dollar (USD)

	2010 Dec 31th	2011 Dec 30th	2012				Volatility ²⁾
			Mar 30th	Jun 29th	Sep 28th	Nov 13th	
CNY/USD	6.61 -	6.30 (-4.72%)	6.30 (-4.67%)	6.35 (-3.83%)	6.28 (-4.88%)	6.23 (-5.75%)	0.16
KRW/USD	1126 -	1152 (2.35%)	1133 (0.63%)	1145 (1.72%)	1111 (-1.30%)	1090 (-3.21%)	0.76
KRW/CNY	170.43 -	180.07 (5.66%)	179.90 (5.56%)	180.26 (5.77%)	176.84 (3.76%)	175.02 (2.69%)	0.72

Note: 1) The number in parenthesis denotes the percentage change compared to the exchange rate on Dec 31th, 2010.

2) Volatility is calculated by averaging monthly standard deviations of log daily exchange rates from Jan 2012 to Aug 2012.

Effects of Chinese Yuan Volatility on Korea's Export to China

In this section, we empirically examine whether and to what extent Chinese Yuan volatility has impacts on Korea's export to China. In [Model 1], we investigate how KRW/CNY volatility and wider band of CNY affect Korea's export to China. In [Model 2], we explore the effects of changes in volatility after decomposing KRW/CNY volatility into CNY/USD and KRW/USD volatilities. We also include world economic variables and some other control variables related to business cycle fluctuations in both Korea and China. The sample period is from January 2000 to August 2012.

<Model 1>

$$\begin{aligned} & \text{Korea's export to China}_t \\ &= \alpha + \beta_1 \text{KRW/CNY Volatility}_{t-1} + \\ & \beta_2 \text{Korea's IP Growth Rate}_{t-1} + \\ & \beta_3 \text{China's IP Growth Rate}_{t-1} + \\ & \beta_4 \text{Korea's Inflation Rate}_{t-1} + \\ & \beta_5 \text{China's Inflation Rate}_{t-1} + \\ & \gamma \text{OECD MEI}_{t-1} + \varphi \text{Global Crisis}_{t-1} + \\ & \eta \text{Managed Floating System}_{t-1} + \varepsilon_t \end{aligned}$$

<Model 2>

$$\begin{aligned} & \text{Korea's export to China}_t \\ &= \alpha + \beta_1 \text{CNY/USD Volatility}_{t-1} + \\ & \beta_2 \text{KRW/USD Volatility}_{t-1} + \\ & \beta_3 \text{Korea's IP Growth Rate}_{t-1} + \\ & \beta_4 \text{China's IP Growth Rate}_{t-1} + \\ & \beta_5 \text{Korea's Inflation Rate}_{t-1} + \\ & \beta_6 \text{China's Inflation Rate}_{t-1} + \\ & \gamma \text{OECD MEI}_{t-1} + \varphi \text{Global Crisis}_{t-1} + \varepsilon_t \end{aligned}$$

The results from simple OLS (Ordinary Least Squares) regressions present that an increase in KRW/CNY volatility has negative impacts on Korea's export to China (Model 1). For example, the exporting volume decreases by 2.4% compared to the fixed exchange rate system period. In [Model 1], the coefficient of managed floating system dummy variable is statistically insignificant. We interpret that the effects of exchange rate regime changes have already been included in the increased

KRW/CNY volatility. By decomposing the KRW/CNY volatility into CNY/USD and KRW/USD volatilities, [Model 2] allows us to see which one of decomposed volatilities has an actual impact. In Table 3, the [Model 2] column shows that the negative effects of KRW/CNY volatility on the exports are dominated by the effects of KRW/USD volatility. As shown in Table 2, the current level of KRW/USD volatility is much higher than that of CNY/USD volatility.

Table 3. Regression Results on How CNY Volatility affect Korea's Export to China

Explanatory Variables		Model 1	Model 2
Exchange Rate	KRW/CNY Volatility	-3.395** (1.693)	N/A
	CNY/USD Volatility	N/A	-1.078 (9.874)
	KRW/USD Volatility	N/A	-3.335* (1.713)
	Managed Floating System	-0.057 (0.042)	N/A
Macroeconomic Variables in Korea and China	Korea's IP Growth Rate	-0.005** (0.002)	-0.004** (0.002)
	China's IP Growth Rate	0.029*** (0.004)	0.028*** (0.004)
	Korea's Inflation Rate	-0.046** (0.021)	-0.045** (0.022)
	China's Inflation Rate	0.035*** (0.011)	0.036*** (0.011)
World Economic Variables	OECD MEI	0.032 (0.025)	0.016 (0.022)
	Global Crisis	0.148* (0.084)	0.140* (0.085)
Constant		17.723 (2.550)	19.328 (2.232)
Number of Observations		145	145
R-squared		0.965	0.965

Note. Standard errors are reported in parentheses. *** denotes statistical significance at the 1 percent level, **, at the 5 percent level, and *, at the 10 percent level.

Thus, so far exchange rate risk caused by KRW/USD fluctuations is the main concern of the bilateral trade between Korea and China. However, one should be careful when interpreting the statistically insignificant coefficient of CNY/USD volatility. The regressions results only reflect the historical effects of exchange rate volatilities on Korea's export to China. It has been just seven years since China adopted the managed floating system and, moreover, China practically

managed a fixed exchange rate system during the Global Financial Crisis period. Hence, it may be yet early to determine whether the Chinese Yuan volatility has affected Korea's export to China. Nonetheless, the results from [Model 1] imply that the KRW/CNY fluctuation has impacts on the exports and when the CNY/USD exchange rate fluctuates more, it is clear that its impacts on the exports will become significant. **KIEP**