

An Exploration of Renminbi-USD Exchange Rate: China's Foreign Exchange Intervention

Ching Wai (Charles) Ng
Economics Undergraduate Honors Thesis
University of California, Berkeley
May 2013

Thesis Advisor: Professor Andrés Rodríguez-Clare

Acknowledgement: This paper would not have been a possibility without the indispensable guidance of Professor Rodriguez-Clare. It was an honor and privilege to have the opportunity to work with him and to benefit from his wisdom and inspiring insights. Also, I would like to sincerely thank my family for their continued support and unconditioned love throughout my academic years.

Section 1. Introduction

As the United States continues to suffer from severe trade deficit with China, interest and curiosity have drawn numerous attentions in search of the fundamental causes behind this phenomenon. Among the many existing hypotheses, the bilateral exchange rate between the U.S. dollar (USD) and the Chinese renminbi has been one of the most controversial culprits. Many have accused and blamed the Chinese government for manipulating its currency with the intention of gaining a pricing edge for its exported goods and services. These negative comments toward China are often heard even from the most well-known public figures within the United States. As the accusation remains heated, a review of the fundamental relationships between the various economic factors and currency rates and of the drivers behind the fluctuation in renminbi-USD exchange rate deem to be essential.

This paper hypothesizes that China's monetary authority has artificially intervened the foreign exchange market to influence the value of its domestic currency. Instead of an empirical approach involving extensive statistical analyses, a theoretical approach is adapted, in which the mechanism behind currency intervention is discussed and an evaluation against the real-world statistics is conducted. It shows the evidence that data matches up with the mechanism behind intervention and argues this as the probable cause of renminbi-USD depreciation prior to 1995 and of the constant renminbi-USD rate between 1995 and 2005. Additionally, an alternative explanation for high saving rate in China is also mentioned.

This paper is organized as follows. Section 2 discusses some accusations made by U.S. government officials regarding the "unfair" advantages China possesses through its "undervalued" currency rate. Following that, Section 3 studies the working mechanism of foreign exchange intervention and the natural economic outcomes in the case of no intervention. Also, an investigation of statistical data is presented in seek of support for the hypothesis that China has intervened the foreign exchange market to influence its currency rate. Next, Section 4 provides alternative explanations for high savings rate in China and includes a brief argument as to why these forces are probably not strong enough to generate exchange rate movement observed for the past decades. Finally, Section 5 serves as a conclusion for this paper.

Section 2. Perspectives on China's Currency Exchange Rate Policy

As many believe, one of the main causes of the U.S.'s trade deficits is the consistent undervaluation of the renminbi, with China avoiding currency appreciation in order to gain price competitive advantages on its exported goods and services. Back in 2010 during the Senate Democratic Policy Committee Issues Conference, Senator Arlen Specter claimed that China has taken the U.S.'s markets and jobs away and asked President Obama for his opinions on this matter. As his response, President Obama believed "one of the challenges that [the U.S. has] got to address internationally is currency rates and how they match up to make sure that our goods are not artificially inflated in price and [Chinese] goods are [not] artificially deflated in price. That puts us at a huge competitive disadvantage" (2010). Also in the semiannual report to Congress discussing international economic and exchange rate policies issues, the U.S. Treasury Department has stated that "over the past decade, China resisted very strong market pressures for renminbi appreciation, reflected in the substantial accumulation of foreign currency reserves. Over that period, China's real effective exchange rate exhibited persistent and substantial undervaluation" (Report to Congress on International Economic and Exchange Rate Policies 2012). In 2011, Senator Charles E. Schumer has expressed his opinion that China's unfair gaming of the exchange rate system needs to stop and that passing associated legislation is vital due to "China's history of half-truths and broken promises on currency" (Lowrey 2012). In 2012, during the third and final presidential debate, Mitt Romney, former Massachusetts governor and 2012 Republican presidential candidate, appealed, "On day one, I will label China a currency manipulator, which will allow me as president to be able to put in place, if necessary, tariffs where I believe that they are taking unfair advantage of our manufacturers" (Romney 2012). These claims and arguments against China being a currency manipulator continue to emerge even evidence has shown a rise in renminbi's value in the recent years. (Report to Congress on International Economic and Exchange Rate Policies 2013).

Section 3. Foreign Exchange Intervention

3.1. Foreign Exchange Intervention Background

Foreign exchange intervention refers to the purchase and sale of currencies in the foreign exchange (FX) market by a country's monetary authorities, such as a central bank, in an effort to influence the value of its domestic currency (Humpage 2003; Reinert et al. 2010). There are two types of intervention: sterilized and non-sterilized. Non-sterilized foreign exchange intervention is a policy in which authorities engage in the purchase or sale of foreign currencies or bonds with domestic currency. This would alter the monetary base, or the money supply, of the domestic currency, which in turn would have corresponding consequences on other factors such as interest rate and inflation. For example, if a central bank decides to strengthen its domestic currency, it can exchange its reserves of foreign currencies or bonds for its home currency on the FX market. By doing so, this essentially increases the demand for its home currency and increases the supply of foreign currencies or bonds, leading to a lower domestic exchange rate against those foreign currencies involved in the transaction. Additionally, this would reduce the monetary base and thereby raise the domestic interest rate, which in turn encourage more saving and less spending, leading to a decline in inflation. Note, however, that since such an intervention alters a country's monetary base, it can hinder domestic monetary policy objectives and thus most countries' central banks, including the People's Bank of China, are reluctant to utilize a non-sterilized foreign exchange intervention and thereby prefer the other intervention type—sterilized intervention.

Sterilized foreign exchange intervention is a policy that attempts to produce the same result on exchange rate as the non-sterilized intervention does but in a way that prevents changes in the monetary base of domestic currency. This type of intervention is made up of at least two separate transactions: first, a monetary authority purchases or sells foreign currencies or bonds in exchange with domestic currency; second, the authority countervails the impacts the first transaction has on the domestic money supply through either open market operations, reserve requirement, or government deposit to remove reserves in excess of original levels. Below displays a simplified, two-column balance sheet that illustrates the effect of the two transactions:

People's Bank of China	
Assets	Liabilities
(1) Foreign assets (Euro) ↑	(1) Currency in circulation (renminbi) ↑
(2) Government Bonds ↓	(2) Currency in circulation (renminbi) ↓

Suppose China decides to utilize sterilized currency intervention to depreciate renminbi against the euro, assuming everything else to hold constant, China can first sell renminbi and buy euro, soaring the demand for euro-denominated assets and increasing the supply of renminbi. This step is marked with (1) on the balance sheet. Secondly, to restore the monetary base to levels consistent with its established monetary policy goals, China can engage in contractionary monetary policy, such as selling government securities, to remove the excess renminbi supply from the domestic market—marked with (2). With these two transactions, *ceteris paribus*, China would accomplish a depreciation of the renminbi against the euro while holding its monetary base constant to minimize, or even completely eliminate, any adverse economic consequence.

3.2. Reasons for Foreign Exchange Intervention

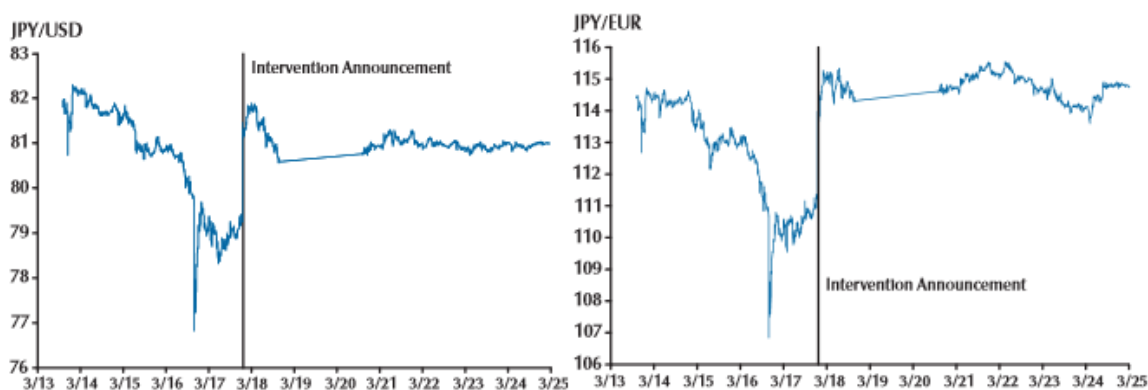
For countries with managed exchange rate regime, intervention is frequently used to influence the exchange rates of their countries' currencies based on their established targets. For countries with floating exchange rate system, in which exchange rates are allowed to float freely and to be determined merely by the supply and demand of the market, intervention is often used in attempt to help stabilizing domestic macroeconomic conditions. As unexpected or large fluctuation of a country's exchange rate can cause severe impacts on the health of its financial markets and goods and services market both domestically and internationally, a country may intervene at times to reduce its currency's exchange rate volatility.

For example, after the massive Tohoku earthquake and disastrous tsunami hit Japan in March, 2011, the Japanese yen rapidly appreciated against other major currencies as many investors sold foreign assets to exchange for yen to bring back to Japan, creating additional demand and thereby pushing up its value (Neely 2011). The Japanese yen's value rose by approximately five percent against the USD from March 10 to March 17, 2011. Such substantial

and disorderly fluctuations could create many potential adverse impacts on inflation and trade flows both in the domestic and global economy. Regarding the issue, the G-7 finance ministers and central bank governors decided to conduct a coordinated intervention to countervail the appreciation force of the Japanese yen and issued a press release containing the following statement:

“In response to recent movements in the exchange rate of the yen associated with the tragic events in Japan, and at the request of the Japanese authorities, the authorities of the United States, the United Kingdom, Canada, and the European Central Bank will join with Japan, on 18 March 2011, in concerted intervention in exchange markets. As we have long stated, excess volatility and disorderly movements in exchange rates have adverse implications for economic and financial stability. We will monitor exchange markets closely and will cooperate as appropriate” (G-7, 2011).

Below is a direct excerpt of two figures put together by the Federal Reserve Bank of St. Louis, depicting the intraday exchange rate of the Japanese yen against the USD (left) and the euro (right) with a vertical segment displayed the time of the G-7 intervention announcement:

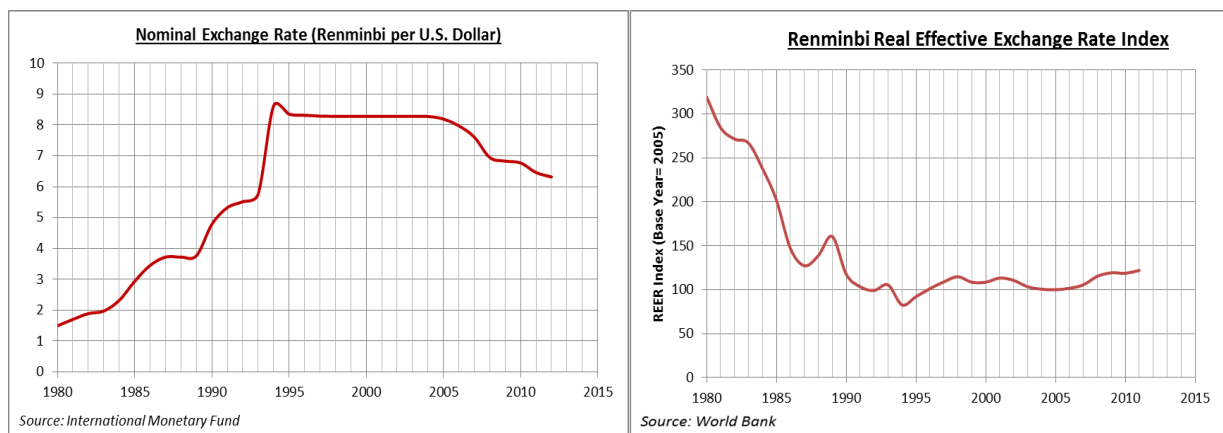


Source: Federal Reserve Bank of St. Louis

Upon the announcement, the Japanese yen's value immediately declined by about four percent with the volatility in the foreign exchange market substantially reduced after. That is, the G-7 reduced the risk of further Japanese yen deterioration by intervening the foreign exchange market collaboratively.

3.3. Empirical Evidence – Has China Intervened in the FX Market?

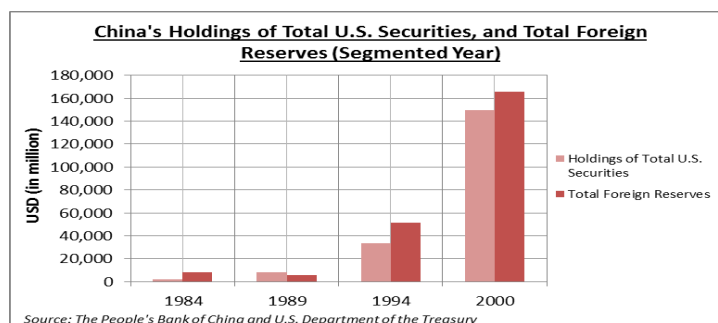
Below are figures that depict the nominal renminbi-USD exchange rate (left) and the real effective exchange rate (REER) index for the Chinese renminbi (right) for the past three decades. Looking at the nominal renminbi-USD exchange rate, it is evident that the value of renminbi depreciated dramatically against the USD between 1980 and 1995 and stayed at a level of about 8.28 renminbi per USD between 1995 and 2005 before it started to gradually appreciate again after 2005. Bilateral real exchange rate is an inflation-adjusted version of the nominal exchange rate, meaning that it gives a more accurate view of a country's currency real purchasing power. A real effective exchange rate (REER) index is an index that tracks the annual average of the bilateral real exchange rates between the country and its trading partners, weighted by the respective trade shares of each partner (Catão 2007; Catão 2012). Between 1980 and 1995, it is displayed that the index fell from 319.23 to 92.06, indicating a decline in renminbi's purchasing power against the currencies of its trading partners. After 1995, it is shown that the index remained relatively steady in a range between 100 and 115, implying the purchasing power did not experience any significant deterioration or growth during that period.



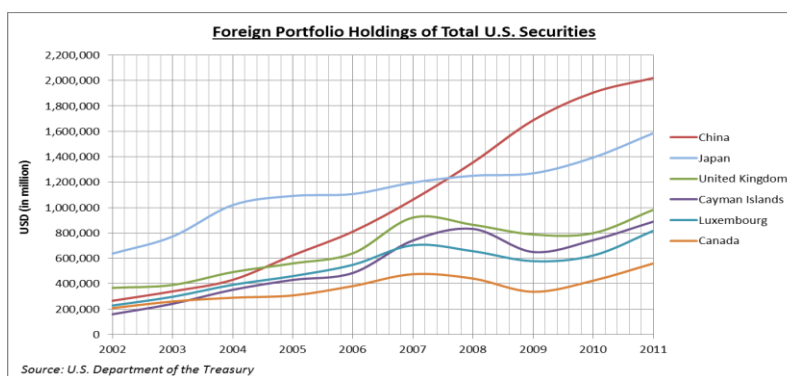
3.3.1. China's Foreign Reserve Portfolio - U.S. Securities Accumulation

To claim that China has artificially depreciated the renminbi against the USD, an accumulation of USD-denominated assets should be observed in its foreign reserve portfolio. Note that the depreciation was also against other currencies as well, as indicated by the downward movement of the REER index shown above; however, this paper will only discuss the partial equilibrium analysis between the renminbi and the USD. Looking at China's holdings of

total U.S. securities, including equities, both long-term and short-term Treasury securities, agency debt, and corporate debt, it is exhibited that its holdings had increased from \$2 billion, or 23.72% of its foreign reserve portfolio, in 1984, to \$33.7 billion, or 65.2% of its foreign reserve portfolio, in 1994. Note, although some consecutive data is not available prior to 2002, segmented data shows a rising trend and thus a consistent upward trend in China's accumulation of total U.S. securities since the mid-1980s is assumed (See Figure Below).



This trend did not stop in 2000, but it continues even in the present. The figure below displays countries with at least \$500 billion USD worth of U.S. securities in their foreign reserve portfolios between 2002 and 2011. China is the largest holder throughout the whole world with



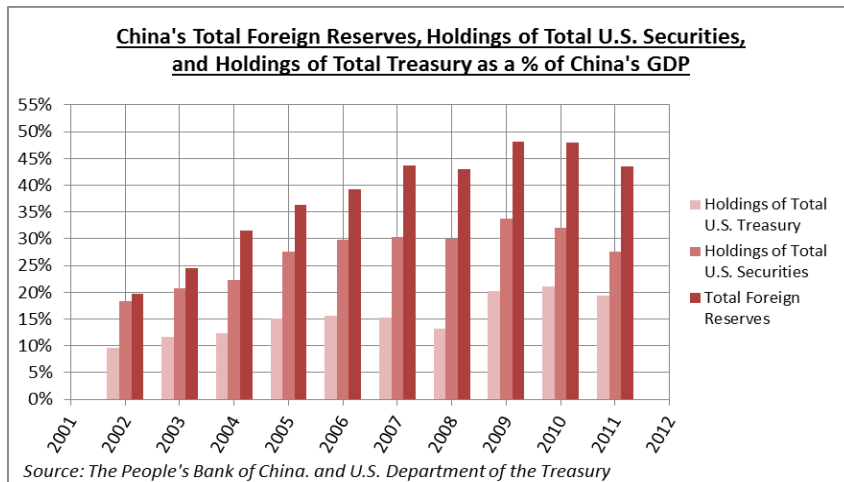
approximately \$2 trillion USD worth of U.S. securities in its foreign portfolio. Coming in second is Japan, owning about \$1.6 trillion USD, with United Kingdom (U.K.) following as the third largest holder with \$982 billion USD of holdings. Expressing China's U.S. securities holdings as a percentage of the total U.S. securities outstanding held by all foreign countries, China has increased its holdings from only 6% in 2002 to 17.8% in 2010. Further examining the structure of China's reserve portfolio, it is revealed that U.S. securities made up of approximately 63.5% of its portfolio in 2011 (See Figure Below).



Notice, albeit the total share of U.S. securities in China’s portfolio remains substantially large, the share has been falling since 2002, indicating a diversification in China’s foreign reserves. Furthermore, the holdings of both long-term and short-term U.S. Treasury debt within the holdings of total U.S. securities have increased from 52.5% in 2002 to 70.3% in 2011, implying a change in preference away from U.S. equities to U.S. government debts. In particular, the rate of change in China’s holdings of U.S. Treasury debts has been above 10% relative to each prior year with the highest rate peaked at 68.4% in 2009 (See Figure Below). Based on further calculations, out of the \$877 billion increase in total U.S. Treasuries held by all foreign countries in 2009, China acquired \$411 billion, or approximately 47%, of that total.



To recognize the magnitude of these foreign reserves in China’s portfolio, the figure below expresses each of the three items mentioned above as a percentage of China’s GDP.



Back in 2002, the value of China’s total foreign reserves could be compared to about 19.7% of its GDP with total U.S. securities and total Treasuries comparing to 18.3% and 9.6%, respectively. During the ten years showed, the increase in magnitude of each item had been significant. In 2011, China’s total foreign reserve portfolio has more than doubled in value relative to its 2002 level to 43.5%. Additionally, total holdings of U.S. securities and U.S. Treasuries have also risen to 27.6% and 19.41% of China’s 2011 GDP, respectively. With China representing 10% of the World GDP, the value of its holdings of U.S. government bonds can be estimated to be approximately 2% of the World GDP. As a side-note, there are indeed alternative reasons as to why China maintains high level of foreign reserves, such as to develop a financial cushion in case of an economic crisis; yet, given the magnitude of accumulation, it is almost certain that sustaining a depreciated exchange rate is one of its major intentions.

3.3.2. A Comparison against the Intervention-Free Market Outcomes

Depreciation of the renminbi against the USD occurred prior to 1995. During the same period, it is evident that China accumulated massive amount of U.S. securities in its foreign reserve portfolio. This supports the hypothesis that China has intervened the FX market through purchasing USD-denominated assets with renminbi to influence its domestic currency’s value. But what happens after the year of 1995? Since the depreciation stopped, has China given up its intervention and allowed its currency to flow freely? Evidence suggests otherwise.

With C being consumption, I being investment, G being government expenditure, X being exports, M being imports, and Y being gross domestic product (GDP), below is the basic accounting identity that determines a country's GDP:

$$Y = C + I + G + (X - M)$$

Subtracting government revenue, or taxes (T), from government spending and subtracting consumption from both sides, the following is resulted:

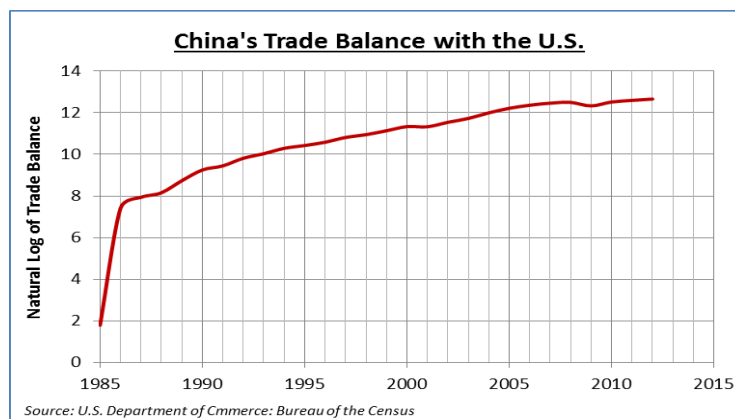
$$I - (T - G) + (X - M) = Y - T - C$$

Note that $(T - G)$ on the left side of the equation represents government's savings (S_G) while $(Y - T - C)$ on the right side of the equation signifies private savings (S_P). By rearranging, a relationship is established between investment, savings, and the differences between imports and exports:

$$S - I = X - M, \text{ where } S = (S_G + S_P)$$

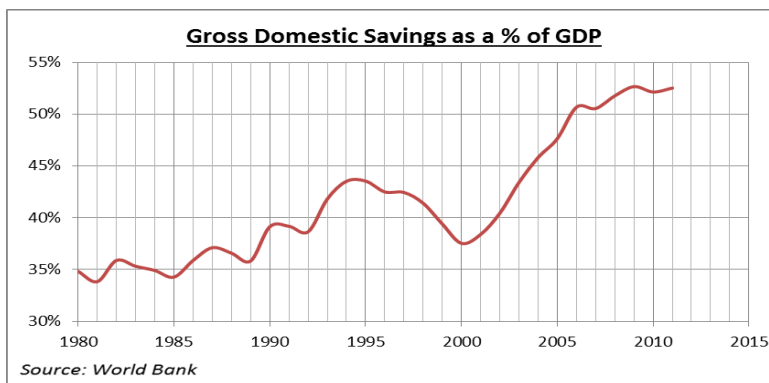
This relationship illustrates the fact that the difference between a country's total savings and investment will always equal to the difference between its exports and imports, or trade balance.

Given the renminbi depreciation, foreign goods imported became relatively more expensive to domestic residents and domestic goods exported became relatively cheaper to foreign countries, prompting to higher demand for exported goods and lower demand for imported goods and thereby yielding an imbalance to the identity with a now higher $(X - M)$ term. That is, this would generate a trade surplus with the United States. Based on statistics, this was indeed the case (See Figure Below). In 1995, China's trade surplus with the U.S. increased more than 20 times its 1986 level, from \$1.66 billion USD to \$33.79 billion USD.

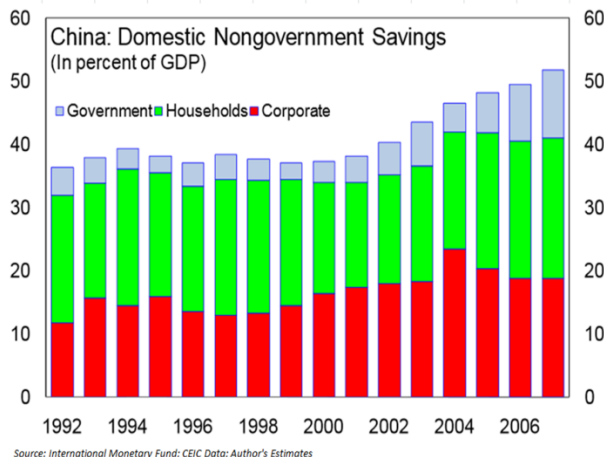


Normally, if there are no artificial interventions of any type after 1995, with excess renminbi supply from the foreign exchange intervention before 1995, domestic interest rate will fall, leading to lower savings and higher investment and therefore a smaller $(S - I)$ term. Under a floating exchange rate regime, this would naturally result in a currency appreciation, causing the $(X - M)$ to fall and reducing China's trade surplus with the U.S. Furthermore, in the long run, China's bilateral REER with the U.S. should converge to a rate equal to the difference in productivity between them; that is, if China has a relatively high rate of productivity growth compared to the U.S., this should naturally lead to a real appreciation of the renminbi against the USD. The renminbi -USD exchange rate, however, was constant between 1995 and 2005. In other words, the natural adjustments discussed above was completely absent with no sight of appreciation during that whole period despite the rapidly rising productivity growth in China relative to the U.S.'s counterpart as measured by the growth in GDP per worker using 1980 as the base year. Additionally, domestic interest rate has experienced an increase instead of a decline expected above. As mentioned previously, along with the purchases of U.S. securities with renminbi for its foreign reserve portfolio, China's monetary authority also engaged in monetary policies to sterilize its intervention. To neutralize the increase in monetary base, among the three possible tools—open market operation, reserve requirement, and government deposit—China chose to sell government bonds and raise the required reserve ratio (RRR) to decrease the money multiplier (Wang 2010). In particular, since September 2002, China has replaced all outstanding securities with central bank bills (Ouyang et al., 2007). As China has employed different tools at different times, "it is not straightforward to assess exactly how much sterilization has taken place" (Goodfriend & Prasad 2006). For the purpose of this discussion, a general sense of the trend of China's open market operation, as measured by its central bank's debt issuance, would be adequate as it is the main policy China has adopted for neutralization purpose (The change in neutralization tool employed by China will be investigated in Section 3.4). Prior to 2002, China's bond issuance has increased from 4.866 billion yuan (\$2.85 billion in 1981's USD) in 1981 to 488.4 billion yuan (\$59 billion in 2001's USD) in 2001. After the transition from bond to bill, China has rapidly increased its central bank bills outstanding value from 165 billion yuan (\$19.93 billion in 2003's USD) in 2003 to approximately

4.5 trillion yuan (\$647.6 billion in 2008's USD) in 2008. This possesses important impacts on China's domestic interest rate. With the significant rise in bond/bill supply, ceteris paribus, bond/bill prices would fall. As interest rates are inversely related to bond/bill prices, this implies a rise in domestic interest rate and thereby leads to an increase in savings. As shown in the figure below, China's gross domestic savings—defined as a country's GDP less its total consumption expenditure—as a percentage of its GDP has proceeded on an upward trend despite volatility due to natural business cycles. China has been saving at a level of more than



35% of its GDP ever since 1980 and has increased its saving rate to approximately 53% of GDP by 2011. As a comparison, the United States' gross savings rate has declined from its 20% level in 1980 to just above 10% in 2011. Examining savings in different sectors of the Chinese economy, below displays two figures with the first (right) showing personal saving rate and the second (left) being a direct excerpt from an International Monetary Fund publication exhibiting China's domestic savings as a percentage of its GDP.

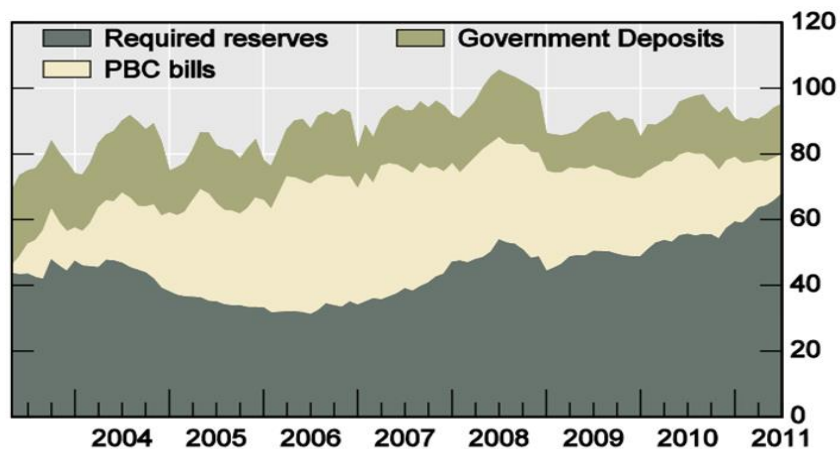


Looking at the data gathered from household survey conducted in 31 provinces in China above, savings rate in both urban and rural areas have been rising since the 1990s with urban saving rate peaked at 29.5% and rural saving rate peaked at 38.2% of personal disposable income in 2010. To provide a comparison, the U.S.'s counterpart declined on a downward trend from a range of 8% and 11% back in the 1970s to a range of only 1% and 6% in the 2000s. According to International Monetary Fund's estimates, focusing on the period between 1995 and 2005, a rise in corporate savings is also evident. With increases in savings in all personal, corporate, and government sector, the term $(S - I)$ increases, which allow the original increase in trade balance from the exchange rate depreciation to be sustainable with the identity remaining in equilibrium. In contrast to the natural adjustment of a currency appreciation, the identity balance is balanced from China's sterilized foreign exchange intervention.

3.4. Side Discussion on China's Sterilization Tools Preference

As early as the 1960s, Robert Mundell has hypothesized the impossibility of a simultaneous fixing of both the exchange rate and money supply (Mundell 1968). According to Tan and Yang, statistical results show that it has become increasingly difficult for China to pursue a neutralization policy (2012). With two subsamples defined as the first being July 1999 to July 2005 and the second being August 2005 to June 2006, it is found that an increase of 1 yuan in net foreign assets would generate a rise of about 1 yuan in the money supply in the first period, and a 1.56 yuan in the second period. Specifically, their results suggest that "growth of foreign reserves accounts for 29% of the increase in the money supply in the first period, but 64% in the second one."

Because of this difficulty, based on another academic paper published by the Bank for International Settlements, it is observed that there is a change in China's preference and utilization of neutralization tools from government bonds/bills to the use of RRR (Ma, Yan, & Liu 2011). Below is a direct excerpt of a figure from Ma et al. paper, depicting the sterilization tools of the People's Bank of China as a percentage of its foreign reserves portfolio:



Looking at the figure, in 2005, China's government debt securities and required reserves each financed approximately 30% of China's foreign reserves outstanding. In 2011, the portion of foreign reserves outstanding financed by debt securities has declined to about 12% while the portion by required reserves has risen to about 67%. Throughout the period shown, government deposits have financed about 10 to 20% and have no significant changes.

The reasons behind the change in tools are beyond the scope of this paper and will not be pursued further. However, it is a fact that the China has been adapting away from government bonds/bills to other sterilization policies, particularly the use of RRR, in the 2000s.

Section 4. Alternative Explanation of Rising Savings in China

Although evidence supports the hypothesis that China's accumulation of U.S. securities and open market operations contribute to the rise in savings, an alternative view can be given to explain the phenomenon. It is often argued that one reason of the high saving rate is the need for precautionary saving due to the inadequacy of China's social safety net system such as a government-provided healthcare system (Hung and Qian 2010). According to a published paper by International Monetary Fund, evidence has shown an existence of a statistically significant relationship between government expenditure on healthcare and urban saving (Barnett and Brooks 2010). In particular, based on the study, 2 yuan decrease in saving, or presumably 2 yuan increase in consumption, is resulted with each 1 yuan increase in government health expenditure. Barnett and Brooks also stated the discrepancy between the growths of household incomes and GDP as another fundamental reason of the high saving rate.

Other authors have further reinforced this argument and proposed additional reasons. Based on an academic paper published by the Bank for International Settlements, it is claimed that China's rising national saving reflects high savings rate in all corporate, household, and government sectors (Ma and Yi 2010). Particularly, the rise in corporate saving is attributed to the tough corporate restructuring and the government policy allowing corporations to not pay dividends to the government. These two factors led to higher efficiency and profitability, which in turn causes further rises in retained earnings, or corporate saving. In terms of government savings, both Ma and Yi and Kuijs (2005) have found that the Chinese government favors government-financed investment, which is equivalently considered as government savings, over government consumption due to government officials' anticipation of rapid population aging and natural tendency of launching investment projects to enhance their chances of career advancements and/or re-election.

Aside from the commonly discussed reasons, Wei and Zhang (2009) have hypothesized sex ratio imbalance as another important driver of high household saving rate in China. Based on their research, Chinese parents often prefer sons than daughters for cultural reasons. Because of that, for today's generation, there are 122 boys born for every 100 girls today, which indicate the fact that one in five Chinese men will be dropped out of the marriage market when this generation of children grows up. Wei and Zhang claimed that families attempt to increase their savings, and thus wealth, to boost their sons' competitiveness in the marriage market. According to statistical results, it is evident that, for both urban and rural regions, households with sons save more than households with daughters, on average. Furthermore, if these households reside in areas with more skewed sex ratio, they tend to increase their savings rate.

Any of the above hypotheses is plausible as a reason why saving rate in China has been increasing throughout the past three decades. If that is the case, one can counter-argue that the increase of $(S - I)$ term could have been caused by these natural adjustments and not by China's action of reserve accumulation and monetary policies. However, it is unlikely that these are the sole reasons of the phenomenon because it is improbable that the massive issuance of Chinese government bonds/bills has no influence on the domestic interest rate and thereby

domestic savings. It is also unconvincing that these cultural and behavioral factors are large enough to affect and maintain the renminbi-USD exchange rate for such an extensive period of time.

Section 5. Conclusion

This paper hypothesizes that the observed exchange rate movement was not an output of natural economic forces and argues the main driver to be China's sterilized foreign exchange intervention. The statistical evidence indicates that China's monetary authority has accumulated massive amount of U.S. securities throughout the past three decades and has issued government bonds/bills as its major neutralization tool for countervailing changes in domestic currency monetary base. Independent of government policies, market forces would naturally raise renminbi-USD exchange rate and thereby reduce China's trade surplus with the U.S. However, data points out that evidence of a renminbi appreciation against the USD is lacking until after the year of 2005. Furthermore, with China's open market operations, it makes theoretical sense that the downward pressure on domestic interest rate and savings from the accumulation could be offset, or even overturned, by the sales of government bonds/bills and thus allows the discussed identity to sustain balance without any alteration of the currency rate.

Whether the depreciation prior to 1995 was completely caused by the U.S. securities accumulation in China's foreign reserve portfolio remains arguable. However, in spite of the alternative possibilities for China's increase in savings, the constant renminbi-USD exchange rate between 1995 and 2005 is most likely not a result of these natural market forces. It is, of course, possible that our assumption for consistent trends from missing consecutive data is not accurate. It is also possible that omitted factors, such as technology development and productivity improvement, have significant influence on the renminbi-USD exchange rate during the period discussed in this paper. Nevertheless, evidence suggests China's foreign exchange intervention contributed to the renminbi-USD currency rate depreciation prior to 1995 and has resisted natural market pressures for a renminbi appreciation between 1995 and 2005.

References

- Barnett, S. & Brooks, R. (2010, January). China: Does Government Health and Education Spending Boost Consumption? *International Monetary Fund*. Retrieved April 12, 2013, from <http://www.imf.org/external/pubs/ft/wp/2010/wp1016.pdf>
- Brown, Sherrod. (2012, August 15). Time to act on China's currency manipulation. *Financial Times*. Retrieved March 8, 2013, from <http://www.ft.com/cms/s/0/37dfd436-e0a1-11e1-8d0f-00144feab49a.html#ixzz2NOTqxogH>
- Catão, L. (2012, March). Real Exchange Rates: What Money Can Buy. *Finance & Development*, 49. Retrieved March 3, 2013, from <http://www.imf.org/external/pubs/ft/fandd/basics/realex.htm>
- Catão, L. (2007, September). Why Real Exchange Rates? *Finance & Development*, 44, 46-47. Retrieved March 2, 2013, from <http://www.imf.org/external/pubs/ft/fandd/2007/09/pdf/basics.pdf>
- Economic Report of the President. (2007, February). *U.S. Congress*. Retrieve March 5, 2013, from <http://www.gpo.gov/fdsys/pkg/ERP-2007/pdf/ERP-2007.pdf>
- European Central Bank. (2011, March 18). Statement of G7 Finance Ministers and Central Bank Governors. *Press Release*. Retrieved March 31, 2013, from <http://www.ecb.int/press/pr/date/2011/html/pr110318.en.html>
- Federal Reserve Bank of New York. (2007, May). U.S. Foreign Exchange Intervention. *Fedpoint*. Retrieved March 30, 2013, from <http://www.newyorkfed.org/aboutthefed/fedpoint/fed44.html>
- Feldstein, M. (2008, April). Resolving the Global Imbalance: The Dollar and the U.S. Saving Rate. *The National Bureau of Economic Research*. Retrieved March 2, 2013, from <http://www.nber.org/papers/w13952>
- Goodfriend, M. & Prasad, E. (2006, May). A Framework for Independent Monetary Policy in China. *International Monetary Fund*. Retrieved April 8, 2013, from <http://www.imf.org/external/pubs/ft/wp/2006/wp06111.pdf>
- Humpage, O. (2003, November). Government Intervention in the Foreign Exchange Market. *Federal Reserve Bank of Cleveland*. Retrieved March 31, 2013, from <http://www.clevelandfed.org/research/workpaper/2003/wp03-15.pdf>

- Hung, J. & Qian, R. (2010, November). Why is China's Saving Rate So High? A Comparative Study of Cross Country Panel Data. *Congressional Budget Office*. Retrieved April 12, 2013, from <http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/119xx/doc11958/2010-07-chinasavingrate.pdf>
- Kuijs, L. (2005, June). Investment and Saving in China. *World Bank Policy*. Retrieved April 12, 2013, from http://www.wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/06/14/000016406_20050614112417/Rendered/PDF/wps3633.pdf
- Lowrey, A. (2012, October 22). A Tightrope on China's Currency. *The New York Times*. Retrieved March 8, 2013, from <http://www.nytimes.com/2012/10/23/us/politics/romney-pledge-to-call-china-a-currency-manipulator-poses-risks-experts-say.html?r=0>
- Ma, G. & Yi, W. (2010, June). China's High Saving Rate: Myth and Reality. *Bank for International Settlements*. Retrieved April 12, 2013, from <http://www.bis.org/publ/work312.pdf>
- Ma, G., Yan, X. & Liu, X. (2011, November). China's Evolving Reserve Requirements. *Bank for International Settlements*. Retrieved April 8, 2013, from <http://www.bis.org/publ/work360.pdf>
- Mundell, R. (1968). Barter Theory and the Monetary Mechanism of Adjustment. *International Economics*. (pp. 130-133). New York: Macmillan.
- Neely, C. (2011, September). A Foreign Exchange Intervention in an Era of Restraint. *Federal Reserve Bank of St. Louis Review*. Retrieved March 31, 2013, from <http://research.stlouisfed.org/publications/review/11/09/303-324Neely.pdf>
- Ouyang, A., Rajan, R., Willett, T. (2007). China as a Reserve Sink: The Evidence from Offset and Sterilization Coefficients. *Hong Kong Institute for Monetary Research*. Retrieved May 10, 2013, from <http://www.sciencedirect.com/science/article/pii/S0261560609001387>
- Reinert, K., Rajan, R., Glass, A., & Davis, L. (2010). Foreign Exchange Intervention. *The Princeton Encyclopedia of the World Economy* (pp. 488-491). Princeton: Princeton University Press.
- Report to Congress on International Economic and Exchange Rate Policies. (2012, May 25). *U.S. Department of the Treasury Office of International Affairs*. Retrieved March 8, 2013, from <http://www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/Foreign%20Exchange%20Report%20May%202012.pdf>
- Report to Congress on International Economic and Exchange Rate Policies. (2013, April 12). *U.S. Department of the Treasury Office of International Affairs*. Retrieved March 8, 2013, from <http://www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/Foreign%20Exchange%20Report%20April%202013.pdf>

- President Obama Discusses China, Trade and Jobs With Democratic Senators. (2010, February 3). *Office of the United States Trade Representative*. Retrieved March 8, 2013, from <http://www.ustr.gov/about-us/press-office/blog/2010/february/president-obama-discusses-china-and-trade-democratic-senator>
- Romney, M. (2012, October 22). Third Presidential Debate. Boca Raton, FL: Lynn University.
- Wang, Y. (2010, May). Effectiveness of Capital Controls and Sterilizations in China. *China & World Economy*. Retrieved April 8, 2013, from <http://onlinelibrary.wiley.com/doi/10.1111/j.1749-124X.2010.01199.x/pdf>
- Wei, S., & Zhang, X. (2009, June). The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China. *National Bureau of Economic Research*. Retrieved April 12, 2013, from http://www.nber.org/papers/w15093.pdf?new_window=1