

The quest for determinants of Chinese exchange rate policy

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Abstract

This paper examines the decision function of the People's Bank of China concerning setting of the renminbi exchange rate against the U.S. dollar. We use an ordinal dependent variable model to check whether main macroeconomic variables and repeated complaints from U.S. institutions and officials about the Chinese exchange rate had an influence on the Chinese exchange rate policy in the period 2000–2011. The results of estimation show that GDP growth, trade balance and pressure from the U.S. on greater exchange rate flexibility had a positive impact on the probability of renminbi exchange rate appreciation. These findings suggest that the primary goal of the exchange rate policy in China is to support the export sector. This goal, however, is compromised by allowing the renminbi to appreciate under pressure from the U.S. Treasury. This suggests that in large open economies the exchange rate policy cannot be pursued regardless of its international ramifications.

Keywords: exchange rate policy, ordinal dependent variable model, global rebalancing, renminbi, People Bank of China, currency manipulator

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1. Introduction

Exchange rate policy of the People's Bank of China (PBoC) has been a subject of numerous empirical studies. They usually focus on the assessment of the actual value of the renminbi (henceforth, RMB) real exchange rate relative to its equilibrium value suggested by fundamental factors. Since China abandoned a decade-long dollar peg in July 2005, many studies have revealed a significant undervaluation of RMB (Cline, Williamson 2010; Dunaway, Li 2005; Dunaway, Leigh, Li 2006; Sato et al. 2012; Tyers, Bain, Bu 2008). As a corollary, some authors advocated faster RMB appreciation so as to limit the current account surplus in China, reduce global imbalances and avoid boom-and-bust policy (Liu, Fan 2010; Goldstein, Lardy 2006; Frankel 2006). Others reject these calls by pointing to alternative and more efficient ways of restoring domestic and global equilibria, such as more expansionary fiscal policy in China (McKinnon 2009), fiscal policy coordination between U.S. and China (Soofi 2009) or simply a "benign neglect" policy (Corden 2009; McKinnon, Schnabl 2006).

Another stream of research examines the determinants of PBoC exchange rate policy. This paper belongs to this area of research. The introduction of a new exchange rate regime in 2005 made a leeway for gradual appreciation of RMB, whose pace varied over time and was temporarily put on hold in 2008–2010 as a response to global financial crisis. Over the whole period of increased RMB flexibility PBoC tightly managed the RMB exchange rate by means of sterilised foreign exchange intervention. In this context following questions should be addressed. First, to what extent RMB changes engineered by PBoC were motivated by the evolution of macroeconomic trends in the Chinese economy? In other words, the reaction function of the PBoC with respect to exchange rate should be estimated. Second, did China bow to suasion from the U.S. to increase the pace of exchange rate appreciation since the dollar peg was abandoned? Strong appreciation of RMB in October 2011, shortly before the U.S. Senate debated tariffs on imports from countries with undervalued currencies, suggests that the U.S. lawmakers were successful in urging China to accept stronger RMB appreciation (Rabinovitch 2011).

To the best knowledge of the authors the first issue mentioned above has not been a subject of empirical assessment yet. Frankel (2009) concludes that the appreciation of the RMB against the dollar in 2007 was attributable to the appreciation of the euro against the dollar, not a trend effective appreciation of the RMB. However, he considers neither fundamental nor institutional variables that might potentially explain the evolution of the RMB exchange rate, both effective and against the dollar. Further, we found only one paper addressing the second of the aforesaid problems. Frankel and Wei (2007) find that in 2005–2007 cumulative complaints from U.S. Treasury officials and officials of other government agencies about the Chinese exchange rate are associated with a reduction in the RMB's estimated weight on the U.S. dollar (in the implicit currency basket). However, they found no evidence of an association between the complaints from U.S. officials and appreciation of the RMB relative to the currency basket.

We think that a coherent framework has to be built in order to identify decision function of the PBoC concerning the setting of the RMB value. This framework should capture both domestic determinants of PBoC's exchange rate policy and external pressure exerted by U.S. officials and institutions. Therefore, we use an ordinal dependent variable model to check whether main macroeconomic variables and repeated calls from the U.S. officials for more exchange rate flexibility affected RMB exchange rate. This model framework is suitable for analysing discrete monetary policy decisions, such as interest rates changes (Spencer 2006), because it allows for a more flexible representation – in comparison to typical

linear models – of the dependent variable. This feature of ordinal and other limited dependent variable models is especially important in cases, when the empirical distribution of the dependent variable is more of a discrete character (i.e. some certain values appear very frequently) when the direction of change in the dependent variable is more important than the magnitude of this change, and when the goal of the estimation is to assess probabilities of certain events. All these three conditions that justify the use of ordinal dependent variable models are satisfied in our analysis. First, the most common decision by the PBoC was to leave the RMB rate unchanged, hence the frequency of zero value in the dependent variable sample is higher than 50% (i.e. value zero appears more often in the sample than all other variables together – see Figure 1). Second, the goal of our analysis, as it was stated above, is to investigate if the U.S. official complaints have an influence on the probability of PBoC's decision to appreciate the RMB. Hence, we decided to use ordinal dependent variable models and according to our knowledge in no other research so far such a tool was used to analyse the PBoC's exchange rate policy.

The paper is organized as follows. In the second section we present ordinal dependent and explanatory variables and model specification. In section three the results of estimation and sensitivity analysis are discussed. Section four concludes.

2. The model

2.1. Ordinal dependent and explanatory variables

In our analysis the value of RMB is represented by the USD/CNY exchange rate on the last day of the month rounded to two decimal places. The analysed period (January 2000 – December 2011)¹ included 53 months when RMB appreciated, 9 months when it depreciated and 82 months when the USD/CNY exchange rate remained constant (Table 1). In the analysed period the average monthly change of USD/CNY exchange rate equalled to -0.19%.

Due to the fact that some rates of change occurred infrequently (Figure 1) and we were more interested in the direction of the change (not the magnitude of the change itself) we decided that the dependent variable will take three different values, depending on whether the RMB rate appreciated, depreciated or it remained unchanged.

Therefore the dependent variable can take following values:

$$y_t^* = \begin{cases} 1 & \text{– if in month } t \text{ occurred appreciation of RMB} \\ 0 & \text{– if in month } t \text{ USD/CNY exchange rate remained constant} \\ -1 & \text{– if in month } t \text{ occurred depreciation of RMB} \end{cases} \quad (1)$$

Such form of dependent variable implicates the use of a discrete choice model (logit, probit) rather than linear regression model.

We included 15 potential explanatory variables in the set of factors that could possibly influence decisions of PBoC concerning RMB exchange rate:

¹ The length of the series was determined by the availability of the data on GDP growth rate, which was used as one of the explanatory variables.

- real GDP growth as an indicator of demand and inflationary pressure which could be contained by monetary policy tools including RMB appreciation,
- CPI inflation; increase in inflation is likely to prompt PBoC to engineer exchange rate appreciation as an anti-inflationary tool,
- change in foreign reserves measured in RMB as a signal of under or overvaluation of domestic currency (Rubaszek 2004),
- annual growth of Chinese exports and imports and changes in the trade balance as trade performance determines the equilibrium exchange rate (Williamson 1994),
- purchasing managers index (PMI) and its composites (employment, output and new export orders) describing current economic sentiment; PMI is widely used as a leading indicator for GDP growth,
- monetary aggregates (M0, M1, M2); more money in circulation leads to monetary policy tightening which may take form of controlled RMB exchange rate appreciation,
- deposit rate; increase in the deposit rate may imply greater foreign demand for domestic assets and RMB currency appreciation,
- mandatory reserve requirement ratio; higher reserve requirement hampers credit and domestic demand and may trigger rise in domestic interest rates and concomitant appreciation of RMB,
- financial markets' variables: stock index (S&P500), stock expected volatility index (VIX “fear gauge”) and nominal effective exchange rates (dollar, euro, yen) as a measure of investors risk aversion and reflection of over-all sentiment on financial markets.

The quarterly real GDP growth was converted into monthly data using quadratic-match average. Most variables were obtained from Reuters Ecowin database except for nominal effective exchange rates, which were provided by the Bank for International Settlements.

2.2. External pressure variable

In the analysed period U.S. officials were intensely pressuring China to appreciate its currency. It took the form of their speeches and meetings between U.S. officials and Chinese policymakers (25 events), including talks during Strategic Economic Dialogue (SED). Moreover, in numerous Reports to Congress on International Economic and Exchange Rate Policies U.S. Treasury criticised Chinese exchange rate policy and suggested that China may be deemed as “currency manipulator” if measures allowing for greater appreciation of RMB are not taken. We identified a total of 15 such cases since 2000. The excerpts from U.S. Treasury reports and statements by U.S. officials are presented in Tables 2 and 3.

We believe that pressure exerted by the U.S. policymakers had an impact on Chinese exchange rate policy. Therefore we constructed two binary variables representing this pressure in our model. The first one (*meeting*) is equal to 1 in months when there was a meeting between Chinese and U.S. officials (visits of U.S. Treasury Secretaries Henry Paulson and Timothy Geithner to China, SED meetings or G-20 and G-7 summits) or other than aforementioned Reports to Congress form of persuasion, and equal to 0 in other months. The second variable (*report*) is equal to 1 in months when U.S. Treasury reports were published and 0 in other cases.

2.3. Model specification

We used an ordered logit model to identify the PBoC decision function. The dependent variable is a qualitative variable, but its subsequent categories, when quantified, may be ordered from the lowest to the highest one (Maddala 1994). For every time period the model assesses the probability of occurrence for each category. From the technical point of view, the estimation of such model requires calculation of the coefficients (β) in a linear equation of an unobserved dependent variable (y^*), which represents changes in particular explanatory variables (x) and then limit values (γ). Limit values are responsible for transforming the latent variable y^* into the ordinal variable (y). The model with a three-level ordinal variable can be presented as follows:

$$\hat{y}_t = \begin{cases} -1 & \text{when } y_t^* \leq \gamma_1 \\ 0 & \text{when } \gamma_1 \leq y_t^* \leq \gamma_2 \\ 1 & \text{when } \gamma_2 \leq y_t^* \end{cases} \quad (2)$$

$$y_t^* = x_t^T \beta + \varepsilon_t \quad (3)$$

Assuming a specific distribution (logistic or normal) for the random component ε_t , the parameters of equation (3) may be estimated using the maximum likelihood method.² Such function is presented in equation (5), where $1(\bullet)$ represents an indicator function, which returns value 1 if its argument is true.

$$l(\beta, \gamma) = \sum_{t=1}^N \sum_{i=-1}^1 \log(\Pr(y_t = i | x_t, \beta, \gamma)) \cdot 1(y_t = i) \quad (4)$$

Moreover the values of probability function for an ordered dependent variable with three levels are presented in the equation (4), where F represents cumulative distribution function.

$$\begin{aligned} \Pr(y_t = -1 | x_t, \beta, \gamma) &= F(\gamma_1 - x_t^T \beta) \\ \Pr(y_t = 0 | x_t, \beta, \gamma) &= F(\gamma_2 - x_t^T \beta) - F(\gamma_1 - x_t^T \beta) \end{aligned} \quad (5)$$

$$\Pr(y_t = 1 | x_t, \beta, \gamma) = 1 - F(\gamma_2 - x_t^T \beta)$$

In the literature of the subject the two most often used types of distribution of the random component are: normal and logistic distribution. For the purposes of this study it was assumed that random component ε_t has logistic distribution. There are two reasons for applying such distribution. Firstly, the density function of a logistic distribution compared to the density of a normal distribution (ordered probit model) offers slightly higher probability for the values located in the neighbourhood of the mean and in the tails of the distribution (heavy-tailed distribution). In other words, values with very slight chances amount to higher probabilities in case of a random component with logistic rather than normal distribution (Cramer 2003).

² In this study, a modified version of Newton-Raphson method (quadratic hill-climbing developed by Golfield and Quandt) was implemented in order to maximize the likelihood function (Griliches, Intriligator 1983).

3. Results and discussion

3.1. Data preparation

The majority of potential regressors are non-stationary. In order to avoid spurious regression due to inclusion of non-stationary independent variables, we differenced the initial time series and tested them for unit root existence (augmented Dickey-Fuller test). The null hypothesis assumes existence of the unit root, whereas the rejection of the null hypothesis suggests stationarity of the time series.

According to the results (Table 4), annual GDP growth rate and trade balance are stationary, annual changes of CPI and deposit rate are integrated of order 1 (which means they needed to be differenced once), and M0 aggregate is integrated of order 2 (which means it needed to be differenced twice).

3.2. Estimation results

The results of the estimation using the maximum likelihood procedure are shown in Table 5. Model 1 is our benchmark regression and simultaneously the final model described thoroughly further in this paper. The choice of the model was made with the help of the “general to specific” selection algorithm using all the variables outlined in the section 2.1 and subsequently on the basis of statistical significance of explanatory variables and goodness of fit statistics (pseudo R^2 , number of correct classified observation, Akaike and Schwarz information criteria). This model achieved the highest fraction of correctly classified observation and also the lowest values of information criteria. Although the pseudo R^2 value for this model was not the highest, the discrepancies compared to other models are negligible.

The results in Table 5 suggest a few things about the PBoC currency policy. Firstly, only the following variables have significant influence on exchange rate policy of PBoC. Annual real GDP growth rate and trade balance at significance level of 1%; and variable *meeting* at the significance level of 2.5%. We are thus reassured that the aforementioned variables were the most important determinants of the PBoC exchange rate policy in the analyzed period. The other potential explanatory variables (CPI, M0 aggregate and deposit rate) proved to be statistically insignificant. The variable *report* (representing months when U.S. Treasury reports were published) also did not acquire statistical significance in any model specification.

Secondly, all variables acquired the highest p-value (of the z-statistic³) if they represented the same month as the change of exchange rate (there are no lagged variables in the model). This could indicate that in the analyzed period PBoC attached more importance as policy determinants to current economic conditions than historical or expected performance of the Chinese economy.

Thirdly, higher GDP growth rate, higher balance of trade and pressure exerted by the U.S. officials all increase the probability of RMB appreciation. The signs of the calculated coefficients are correct and in line with our preliminary assumptions concerning the influences on decisions of PBoC. Taking

³ Z-statistic is calculated similarly to t-student statistic, with an exception that its distribution is asymptotically normal. It is used to assess significance of coefficients in estimation with maximum likelihood method (Griliches, Intelligator 1983).

into consideration the nonlinearity of logistic function, interpretation of coefficients of Model 1 and therefore analysis of sensitivity of the dependent variable to changes in the values of the explanatory variables requires further calculations. Coefficient itself informs only about the direction of influence on appreciation probability exerted by a particular variable.

Sensitivity of probability of a particular decision of PBoC to changes in explanatory variables can be calculated using partial derivatives of probability function with respect to explanatory variables. Equation (6) presents sensitivity of depreciation probability and equation (7) of appreciation probability.

$$\frac{\partial P(y_i = -1)}{\partial x_{it}} = -\beta_i \frac{\exp(\gamma_1 - x_i^T \beta)}{(1 + \exp(\gamma_1 - x_i^T \beta))^2} = -\beta_i \cdot P(y_i = -1)(1 - P(y_i = -1)) \quad (6)$$

$$\frac{\partial P(y_i = 1)}{\partial x_{it}} = \beta_i \frac{\exp(\gamma_2 - x_i^T \beta)}{(1 + \exp(\gamma_2 - x_i^T \beta))^2} = \beta_i \cdot P(y_i = 1)(1 - P(y_i = 1)) \quad (7)$$

The comparison of relative influences of particular variables in time on RMB appreciation probability cannot be made as they are expressed in different units. However if we analyze just one particular period, we are able to present some findings (Figures 2, 3 and 4). For example, our model suggests that an increase of real GDP growth by 1 percentage point in December 2011 would cause a rise in *ex post* forecasted appreciation probability of RMB by 9.6 percentage points, an increase of trade balance by USD 1 billion would cause 1.4 percentage point rise in appreciation probability. If U.S. officials had then exerted pressure on RMB appreciation it would rise the appreciation probability by 30.4 percentage points.

3.3. Model diagnostics

For an ordinal response model, it is imperative to perform a test of the parallel lines assumption. In order to fulfill this requirement we chose score test for the proportional odds assumption (Stokes, Davis, Koch 2000). Although for small sample sizes, this test might be too liberal in our case ($n > 100$) it can be correctly applied. The test statistic in Model 1 equaled to 10.534, which is a value lower than $\chi^2_{(3;0.01)}$ – the null hypothesis of the score test cannot be rejected at 1% significance level. Therefore the proportional odds assumption in our ordinal model is valid.

We also checked an *ex post* forecast ability of our model (Model 1). Appreciation was predicted correctly 36 out of 53 times (67.9%), lack of changes 74 out of 82 times (90.2%) and depreciation 2 out of 9 times (22.2%). In total, the mean forecast error of analyzed PBoC decisions was approx. 22.2% (32 erroneous indications out of 144 possible ones). Confusion matrix with detailed results is presented in Table 6.

Our model correctly forecasted *ex post* both periods when RMB was *de facto* pegged against dollar. The average probability of exchange rate remaining constant between January 2000 and July 2005 was 73.3% and between July 2008 and May 2010 48.0% (Figure 5). The probability of lack of changes during the second peg is significantly lower. The main reason for that is the unofficial character of the peg (temporary response to the global financial crisis) – in reality the USD/CNY exchange rate was not

constant but fluctuated at about 6.83. Therefore, the dependent value in this period showed not only lack of changes (11 times), but also appreciation (6 times) and depreciation (4 times). Moreover, periods of gradual appreciation were also predicted *ex post*. The average probability of appreciation between August 2005 and June 2008 was 67.1% and between June 2010 and June 2011 was 51.0%.

3.4. Sensitivity analysis

We have performed some alterations to the specification of our model in order to check how those changes affect the results of our study.

One could argue that it is incorrect to estimate changes in exchange rate policy as a result of macroeconomic and political conditions in the periods when the central bank keeps the exchange rate fixed (i.e. between 2000 and 2005 and between 2008 and 2010). By including those periods we were able to establish the determinants of PBoC decisions about the changes of the yuan exchange rate regime – i.e. in what situation the PBoC allows for a renminbi appreciation/depreciation. Nevertheless, to shield ourselves from such allegations we have shortened the estimation sample. We excluded most of the period when yuan exchange rate was fixed and made the estimations for the period between 2004 and 2011. Such operation did not alter our findings significantly. The variable *GDP* and *trade* remained significant at 5% significance level. The variable *meeting* was statistically significant at 6%.

One could also suspect that the influence of the U.S. political pressure is not only contemporaneous but has sort of cumulative and long-lasting nature (i.e. the PBoC decision is not only affected in the period when variable *meeting* is equal to 1, but also in successive months). To accommodate this assumption we have introduced a new variable (instead of the variable *meeting*), which is a simple moving average (SMA) of the variable *meeting*. By doing so we can measure the cumulative effect of the political pressure. We have tested model specifications using 3 to 12 month-period SMAs. In all of them the variables *GDP*, *trade* and *SMA(meeting)* proved to be statistically significant at least at 1%, 10% and 5% significance level, respectively, for the period 2000–2011.⁴

The two aforementioned changes do not crucially alter the results of the primary model estimation.

4. Conclusions

As the analysis presented here illustrates, in 2000–2011 the Chinese exchange rate policy was driven by two factors. First, it was used to protect the export sector and not as an anti-inflationary tool. We found evidence of People's Bank of China showing more tolerance for RMB appreciation against the U.S. dollar when the real economy (trade balance or GDP growth) improved. This finding is consistent with other studies suggesting that the primary goal of the exchange rate policy in China is to maintain employment in export industries and urban areas (Corden 2009; Fan 2008).

Second, while managing the RMB exchange rate, the People's Bank of China reacted positively to pressures from the U.S. urging China to increase the RMB value. Complaints from U.S. authorities

⁴ The robustness test results for estimations on the period 2004–2011 are roughly the same. For SMAs up to 5-month periods significance levels are the same as stated above. In case of estimation with longer period SMAs the trade parameter becomes statistically insignificant at the level of 10%.

and officials about the Chinese exchange rate led PBoC to appreciate RMB against the U.S. dollar. This finding is interesting in the context of impossible trinity dilemma which assumes that fixed exchange rate is compatible with independent monetary policy pursued under capital controls. This theorem, however, is usually applied for small open economies (with some reservations regarding effectiveness of capital controls). In large open economies, to which China clearly belongs, the exchange rate policy cannot be pursued regardless of its international ramifications.

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Appendix

Table 1
Descriptive statistics of USD/CNY exchange rate changes (in %)

	Appreciation	Depreciation
Mean	0.54	0.20
Median	0.36	0.20
Min	0.04	0.04
Max	2.06	0.48

Table 2
Excerpts from U.S. Treasury Reports

Date	U.S. Treasury Reports excerpts	Change in USD/CNY (this/next month)
December 2004	<p>The Administration has urged Chinese leaders to move as soon as possible to greater flexibility, and has initiated an unprecedented level of engagement with the Chinese government and other major trading partners of the United States to help bring this about. (...)</p> <p>The U.S. Government will pursue persistently and firmly its approach to promote economic, financial and market reforms in China and assist China to move as soon as possible to a flexible exchange rate regime.</p>	0.00%/ 0.00%
May 2005	<p>[The report] noted the importance of exchange rate flexibility in the adjustment of international imbalances. It also noted that China's fixed exchange rate created distortions and posed increasing risks to both China and the broader global economy, especially in constraining the flexibility of other Asian currencies. Since that report, the Treasury has engaged in an intensive dialogue with China and other key economies in the region to bring about needed adjustments. Given the risks and distortions noted above and in previous reports, the United States calls on the International Monetary Fund to intensify its efforts to promote greater flexibility in exchange rates for China.</p>	0.00%/ 0.00%

November 2005	<p>China's actual operation of its new system is highly constricted. Distortions and risks previously identified still persist, as do the constraints thus imposed on exchange rate flexibility in the region. This is troubling, and future reports will intensely scrutinize whether and to what degree China is practicing what officials have repeatedly committed to undertake. It is imperative that China fully utilize its new system to move towards greater flexibility as quickly as possible.</p>	0.12%/ -0.12%
<hr/>		
May 2006	<p>Treasury will continue to intensify its bilateral and multilateral efforts to encourage China to move more rapidly to a market-based, flexible exchange rate. The G-7, the IMF, the Asian Development Bank, and the OECD have all called on China to introduce greater exchange rate flexibility. Discussions begun under the Technical Cooperation Program on foreign exchange market issues have developed into a broader discussion of strengthening China's financial and foreign exchange markets to support greater exchange rate flexibility. U.S. and Chinese financial regulators conducted their second Financial Sector Working Group talks on April 24. Also in April, Treasury's Financial Attaché assumed full-time permanent residence in Beijing. Treasury will continue to encourage Chinese economic leaders to interact with leaders of the major economies that share systemic responsibility, with the clear understanding that the role China now plays in global trade carries responsibilities for contributing to an orderly reduction of external imbalances and global conditions conducive to continued support for open trade and investment.</p>	0.12%/ -0.37%
<hr/>		
December 2006	<p>The Department of the Treasury engages intensively with Chinese economic policy makers on economic issues of both bilateral and global importance. China's exchange rate policy, its effect on Chinese domestic and external imbalances, and China's financial sector are particular focal points of that engagement. Recognizing that resolving imbalances in China requires reform across many economic sectors, Treasury convenes the Joint Economic Commission with the Chinese government as well as a Financial Sector Working Group to promote mutual understanding and guidance. Additionally, Secretary Paulson was appointed by President Bush to be the U.S. co-chair of the newly formed Strategic Economic Dialogue (SED) with China's top economic leaders, a forum for addressing critical economic issues and planning for long-term cooperation. China's currency policy is a core issue in the China-United States economic relationship. More flexibility in China's exchange rate will help it achieve more balanced economic growth, enhance the effectiveness of monetary policy, safeguard the health of the financial sector and promote over time an orderly reduction of external imbalances.</p>	-0.26% / -0.51%
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At the second session of the U.S.-China Strategic Economic Dialogue (SED) held on May 22 and 23, Chinese and U.S. officials discussed the Chinese government's reform agenda. Chinese officials emphasized the priority they place on continued implementation of reforms to address economic imbalances and to shift growth toward consumption and away from investment and exports. They also acknowledged the role of exchange rate reform in that process.

The Department of the Treasury concluded that, although the Chinese currency is undervalued, China did not meet the technical requirements for designation under the terms of Section 3004 of the Act during the period under consideration. Treasury was unable to determine that China's exchange rate policy was carried out for the purpose of preventing effective balance of payments adjustment or gaining unfair competitive advantage in international trade. Even though the Treasury has not designated China pursuant to the Act, Treasury forcefully raises the Chinese exchange rate regime with Chinese authorities at every available opportunity and will continue to do so. China's exchange rate has been a prominent feature of the SED, G-7 discussions with China, and G20 and IMF Board deliberations.

June 2007 -0.52%/
-0.53%

At the second session of the U.S.-China Strategic Economic Dialogue (SED) held in Washington on May 22 and 23, Chinese and U.S. officials discussed China's reform progress in detail. Chinese authorities reiterated the priority they place on shifting the composition of economic growth towards domestic consumption and correcting imbalances in the economy and the role that exchange rate reform plays in that process. Despite the progress that China has made and the continued public commitment to reform, China's exchange rate is undervalued against the U.S. dollar, even in the judgment of domestic observers. Prolonged, one-way intervention in foreign exchange markets by the central bank, an unprecedented amount of foreign exchange reserve accumulation, and a rapidly increasing current account surplus are clear indicators of fundamental RMB undervaluation. While China has taken some steps to increase the flexibility of the RMB, the pace of appreciation that the authorities have allowed is much too slow and should be quickened.

Concern over China's exchange rate management is multilateral. The G-7 stated in October: "We welcome China's decision to increase the flexibility of its currency, but in view of its rising current account surplus and domestic inflation, we stress its need to allow an accelerated appreciation of its effective exchange rate."

December 2007 -1.35%/
-1.64%

China should significantly accelerate the appreciation of the RMB's effective exchange rate in order to minimize the risks that are being created for China itself as well as the world economy, of which China is an increasingly critical part. Treasury reinforces the need for China to rebalance growth, including reform of the exchange rate regime, with Chinese authorities at every available opportunity and will continue to do so. China's exchange rate regime has been a prominent feature of the U.S.-China Strategic Economic Dialogue (SED), G-7 discussions with China, and G-20 and IMF Board deliberations.

May 2008	<p>The recent faster pace of appreciation should be maintained, as the currency remains substantially undervalued, particularly on a real effective basis and upward market pressures on the currency remains strong. The central bank's foreign exchange intervention to manage the currency's movements reached record levels in 2007, alongside a record-high current account surplus. China's exchange rate policy continues to support large-scale domestic liquidity creation, which threatens monetary and price stability. The associated sterilization of foreign exchange intervention by the Chinese central bank is a drag on financial sector reform. In addition, the current exchange rate policy hinders the transmission of economy-wide price signals that are important for the government's macroeconomic rebalancing agenda.</p> <p>In a welcome development, China has allowed the RMB to appreciate more quickly against the U.S. dollar. However, China's record current account surplus and unprecedented foreign exchange reserve accumulation in 2007 suggest that the RMB remains significantly undervalued indicating that the pace of appreciation seen in the first quarter of 2008 needs to continue.</p>	-0.72%/
		-1.30%
<hr/>		
December 2008	<p>If the current macroeconomic imbalances continue, in a period in which growth has slowed materially in the rest of the world, then the vulnerability of China's economy and the ultimate costs of adjustment will become much larger. China needs to move more quickly towards a market-determined exchange rate and allow greater appreciation of the RMB against the dollar in the near-term. The pace of appreciation against the dollar demonstrated in early 2008 is welcome and should be continued. Treasury continues to use every opportunity, both in bilateral and multilateral settings, to impress upon Chinese authorities the urgency and central importance of exchange rate reform.</p>	0.00%/
		-0.15%
<hr/>		
April 2009	<p>We will continue to use every opportunity, including the recently announced U.S.-China Strategic and Economic Dialogue, to engage the Chinese authorities to permit greater flexibility of the exchange rate and to encourage further policy measures to rebalance the Chinese economy in the direction of greater domestic demand led growth.</p> <p>Chinese authorities have stated that they recognize the need to address the imbalance in their domestic economy and have made "rebalancing" growth a key feature of China's 11th Five-Year Plan. Limited progress has been made and household consumption growth remains weak.</p>	-0.15%/
		0.15%
<hr/>		
October 2009	<p>Both the rigidity of the RMB and the reacceleration of reserve accumulation are serious concerns which should be corrected to help ensure a stronger, more balanced global economy consistent with the G-20 framework. Treasury remains of the view that the RMB is undervalued. The United States will continue to work with China both in the G-20 and the bilateral Strategic and Economic Dialogue to pursue policies that permit greater flexibility of the exchange rate and lead to more sustainable and balanced trade and growth.</p>	0.00%/
		0.00%

July 2010	<p>China's exchange rate reform must be reinforced by macroeconomic policies that support domestic demand and other structural reforms to create a strong foundation for consumption-led growth. China committed to continue its efforts to enhance the contribution of domestic consumption to its GDP growth, including through policies to: gradually increase the share of household income in national income; accelerate development of the service sector; speed up the reform of monopolies; increase access to finance for small- and medium-sized enterprises; and continue to strengthen the social safety net. If successfully implemented, and accompanied by market-based exchange rate reform, these initiatives should increase the role of domestic demand, particularly consumption, in China's GDP growth, reduce China's reliance on exports for growth, and maintain China's overall strong economic rate of growth.</p>	-0.15%/ 0.59%
<hr/>		
February 2011	<p>China committed in a joint statement of Presidents Obama and Hu that "China will continue to promote RMB exchange rate reform and enhance RMB exchange rate flexibility, and promote the transformation of its economic development model."</p> <p>Based on the resumption of exchange rate flexibility last June and the acceleration of the pace of real bilateral appreciation over the past few months, Treasury has concluded that the standards identified in Section 3004 of the Act during the period covered in this Report have not been met with respect to China. Treasury's view, however, is that progress thus far is insufficient and that more rapid progress is needed. Treasury will continue to closely monitor the pace of appreciation of the RMB by China.</p>	-0.45%/ -0.30%
<hr/>		
May 2011	<p>This Report highlights the need for greater exchange rate flexibility, most notably by China, but also in other economies. During the recent Strategic and Economic Dialogue (SED), China stressed that it "will continue to promote RMB exchange rate flexibility." Based on the on-going appreciation of the RMB against the dollar since June 2010, China's public statements asserting that it will continue to promote RMB exchange rate flexibility, and China's recent policy commitments through the G-20 and the SED to address external imbalances, Treasury has concluded that the standards identified in Section 3004 of the Act during the period covered in this Report have not been met with respect to China. Treasury's view, however, is that progress thus far is insufficient and that more rapid progress is needed. Treasury will continue to closely monitor the pace of appreciation of the RMB by China. We will continue to encourage China to open markets and to pursue policies that level the playing field and support a shift to domestic-demand led growth. It is a high priority for Treasury, working through the G-20, the IMF, and through direct bilateral discussions to encourage policies that will produce greater exchange rate flexibility.</p>	-0.15%/ -0.31%

The close relationship between China's exchange rate policy and broader economic agenda also was highlighted by the IMF in their July 2011 "Article IV" consultation on China's economy. IMF staff indicated in the report that a stronger exchange rate was a key ingredient to accelerate the transformation of China's economic growth model. In a positive step, China agreed to publish the IMF's estimate of RMB undervaluation in the report. According to the IMF's the models, the RMB was estimated to be undervalued by 3%, 14%, or 23% depending on the model used.

China's relatively inflexible exchange rate regime complicates efforts both to support growth and to rebalance and control inflation. Foreign exchange intervention to limit RMB appreciation increases the domestic money supply that the PBoC must absorb through sterilization to contain inflationary pressures. In addition to issuing bonds through open market operations, the PBoC has shifted some of the cost of this sterilization to the banking sector by requiring banks to hold a large share of their deposits as reserves paying negative real interest rates. The desire to compensate banks for the sterilization costs they bear as a result of China's currency policies has made it more difficult to liberalize deposit rates.

December
2011

-1.33%/
0.23%

Low bank deposit rates mean that Chinese households earn very little on what is the largest component of their savings, and a declining amount in real terms, as interest earnings fail to keep up with inflation. This not only constrains the growth of household income, but forces households to save more to meet their financial goals. The IMF recently concluded that a rise in deposit rates would lead to an increase in Chinese household consumption, as Chinese households not only would see an increase in their income, but would be able to save less while still meeting their savings targets. The heavy reliance on administrative controls, combined with negative returns on household deposits, also encourages savings and credit to flow outside formal loan channels, complicating the PBoC's and banking regulator's tasks of managing financing conditions and strengthening financial supervision. Moreover the combination of low real lending rates and a quota on loans leads to an imbalance between the demand and supply of credit, with small and private companies largely bearing the brunt of credit rationing. As China pursues the rebalancing agenda in the 12th Five Year Plan, prompt progress on its stated objective of advancing interest rate liberalization could be particularly useful.

Table 3

Excerpts from statements by U.S. officials

Date	Pressure description	Change in USD/CNY (this/next month)
20 April 2006	<p>Meeting between Chinese President Hu Jintao and President George W. Bush¹</p> <p>Bush said: "We would hope there would be more appreciation [of the currency]".</p> <p>Hu said: "We have taken measures and will continue to take steps to resolve the issue" though he did not give any details.</p>	-0.12%/0.12%
21 April 2006	<p>G7²</p> <p>"In emerging Asia, particularly China, greater flexibility in exchange rates is critical to allow necessary appreciations, as is strengthening domestic demand, easing reliance on export-led growth strategies, and actions to strengthen financial sectors", the G-7 finance ministers and central bank governors said in a statement after meeting in Washington.</p>	-0.12%/0.12%
21 September 2006	<p>Henry Paulson visits China³</p> <p>"The biggest risk we face is not that China will overtake the U.S. but that China will not move ahead with the reforms necessary to sustain its growth", Paulson declared. "I wanted to put the relationship and these economic issues in a longer-term focus. But I also needed to emphasise how important certain steps were going to be in the short term." For example, he said, on the currency front "the intermediate-term viewpoint is that it is very, very important to open up their capital markets, to have healthy competition within the domestic financial system, so they can have a currency that is freely tradable." But he added: "They also need to show more flexibility in the short term." He defended open markets, saying: "Globalisation and interdependence are here to stay. No nation can turn back the clock." But he warned: "If China does not move quickly to continue reforming its economy it will face a backlash from other international economic stakeholders."</p>	-0.50%/-0.38%
13 December 2006	Strategic Economic Dialogue	-0.26%/-0.51%

¹ BBC News (2006), *Bush presses China over currency*, 21 April, <http://news.bbc.co.uk/2/hi/americas/4925704.stm>.

² Laidi A. (2006), *Dollar hit by G7's boldness, central bank diversification*, Forexnews, 24 April, <http://www.safehaven.com/article/5028/dollar-hit-by-g7s-boldness-central-bank-diversification>.

³ Guha K. (2006), *Paulson sets out new China strategy*, *Financial Times*, 13 September, <http://www.ft.com/intl/cms/s/0/7443b020-433e-11db-9574-0000779e2340.html>.

Henry Paulson and Ben Bernanke visit China⁴

Paulson was aggressive in his follow-up speech, saying that the U.S. government's "strong view" is that China should allow its currency, the yuan, to be more flexible. Most countries allow the value of their currencies to be set in global markets, but China intervenes to keep its currency pegged to the dollar at an exchange rate that many Western economists regard as skewed in China's favour.

The Chinese economy "would be more effective under a regime where currency values are determined in a competitive, open marketplace based upon economic fundamentals", Paulson said. A revaluation of the yuan upward would make U.S. goods cheaper in China and Chinese goods more expensive in the United States. In his remarks before the Chinese Academy of Social Sciences, Bernanke argued that flexible exchange rates were in China's best economic interest. During the two-day session, Paulson said, Chinese officials responded to U.S. pressure for more currency flexibility by expressing concerns over the country's economic stability if its currency rose in value.

In his speech, though, Bernanke said that while a more flexible rate "would be helpful", a more direct way to address the global imbalance is to reduce China's savings rates. The country's high savings rates, he said, reflect China's "thin social safety net"; families save for medical expenses and old age. But in the language of "global economic imbalances", it's hard to complain about Chinese families hoarding their earnings without the Chinese bringing up the American practice of spending far more than they earn. So, like Paulson, Bernanke balanced his critique of Chinese savings rate with a declaration that the U.S. needs to save more and borrow less.

14 December
2006

-0.26%/
-0.51%

Henry Paulson visits China⁵

During Paulson's visit to China, he tried to convince Chinese officials of the need to open their country's capital markets to foreign investment and take steps to end currency controls. But his broader message to both Chinese and American politicians is that expanding Sino-American trade and investment ties should be seen as the common interest of the two economic powers. That message runs contrary to the view of many U.S.

lawmakers who blame Chinese policies, including its currency controls, for the growing trade deficit with Beijing (which reached USD 232.5 billion last year) and the loss of American manufacturing jobs – hence, Paulson's need to conciliate these members of Congress by demonstrating that.

He added: "China is a large and powerful country and you should not limit your own potential by restricting your access to world-class financial expertise that can enhance your capital markets". "We are dissatisfied with the speed with which China is appreciating its currency, the value of which is not market-determined, and with China's intellectual property protections", Paulson said.

March
2007

-0.13%/
-0.26%

⁴ Eunjung Cha A. (2006), U.S., China clash on currency, *Washington Post*, 15 December, <http://www.washingtonpost.com/wp-dyn/content/article/2006/12/14/AR2006121400681.html>.

⁵ Hadar L. (2007), Paulson's stride through Asia, *The National Interest*, 12 March, <http://nationalinterest.org/commentary/paulsons-stride-through-asia.1502>.

Geoff D. (2007), Paulson urges Beijing to speed up reform, *Financial Times*, 8 March, <http://www.ft.com/intl/cms/s/0/9f4f846e-cd0a-11db-a938-000b5df10621.html>.

NYT (2007), Paulson, warning about trade barriers, says economy is slowing but healthy, *The New York Times*, 2 March, http://www.nytimes.com/2007/03/02/business/02treasury.html?_r=2&fta=y.

22 May 2007	Strategic Economic Dialogue	-0.78%/
		-0.52%
	Henry Paulson visits China ⁶	
	China should allow its currency to advance “quicker” and so far there is “no evidence it has hurt the Chinese economy”, Paulson said, noting that the officials he met had warned that faster increases may destabilize their economy. “I heard from everyone, right up to the top, they are committed to currency flexibility, to currency reform”, Paulson told reporters.	
1 August 2007	The U.S. Senate is considering two bills aimed at pressuring China to overhaul its currency system. Paulson rejected such legislative measures, saying they would harm Washington’s efforts to encourage Beijing to reform.	-0.40%/
	“Legislation would be counterproductive and would undermine what we’re trying to do here”, Paulson said.	-0.53%
	“I will not say anything other than the Treasury’s view that legislation is not the proper way to proceed and deal with the currency issue”, Paulson told Xinhua News Agency. “I believe it is much more productive to have bilateral talks and engagement”.	
12 December 2007	Strategic Economic Dialogue	-1.35%/
		-1.64%
	Henry Paulson visits China (speech to the Chinese Academy of Sciences) ⁷	
	“Although the process of adjustment is not complete, the accelerated pace of appreciation is significant and welcome, and should continue”, Paulson said. “China’s economy is so large, complex and integrated that it is dangerous if it does not have an RMB that reflects fundamentals.” [...]	-0.29%/
3 April 2008	“I won’t be satisfied until there is a market-determined currency. The Chinese aren’t ready to have a market-determined currency yet.” [...]	-0.72%
	“I believe they’ve got a ways to go”.	
17 June 2008	Strategic Economic Dialogue	-1.30%/
		-0.29%
4 December 2008	Strategic Economic Dialogue	-0.15%/
		0.15%
	Timothy Geithner – confirmation hearing ⁸	
22 January 2009	In written testimony at a confirmation hearing, Geithner said that “President Obama – backed by the conclusions of a broad range of economists – believes that China is manipulating its currency.”	0.15%/
		0.15%

⁶ Carmichael K. (2007), *Paulson says U.S. economy can weather market drop*, Bloomberg, 1 August, <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aOAYVfPHJdvQ&refer=home>.

The Standard (2007), Beijing committed to currency reform, *The Standard*, 2 August, http://www.thestandard.com.hk/news_detail.asp?we_cat=3&art_id=50324&sid=14753646&con_type=1&d_str=20070802&fc=7.

⁷ DT (2008), Paulson says US economy faces a tough quarter, *Daily Times*, 4 April, http://www.dailytimes.com.pk/default.asp?page=2008%5C04%5C04%5Cstory_4-4-2008_pg5_34.

MSNBC (2008), *Paulson: “More bumps” ahead for U.S. economy*, MSNBC, 2 April, http://www.msnbc.msn.com/id/23914208/ns/business-world_business/t/paulson-more-bumps-ahead-us-economy/#.UABLHbX0iUI.

⁸ Wearden G. (2009), Obama team accuses China of manipulating its currency, *The Guardian*, 23 January, <http://www.guardian.co.uk/business/2009/jan/23/china-us-dollar-yuan>.

11 March 2009	Meeting between Timothy Geithner and Chinese Foreign Minister Yang Jiechi ⁹ The two are expected to discuss a host of issues, including Beijing's purchase of U.S. debt and China's currency regime.	-0.15%/ -0.15%
1 June 2009	Timothy Geithner visits China (speech at Beijing University) ¹⁰ "Our common challenge is to recognize that a more balanced and sustainable global recovery will require changes in the composition of growth in our two economies. An important part of this strategy is the government's commitment to continue progress toward a more flexible exchange rate regime" – Geithner said.	0.00%/ 0.00%
3 April 2010	Geithner's statement ¹¹ Geithner's statement said countries such as China "with inflexible exchange rates" can promote global growth by "combining policy efforts to strengthen domestic demand with greater exchange-rate flexibility". "A move by China to a more market-oriented exchange rate will make an essential contribution to global rebalancing", he said.	-0.15%/ 0.15%
8 April 2010	Meeting between Timothy Geithner and Chinese Vice Premier Wang Qishan ¹² "The two sides exchanged views on U.S.-China economic relations, the global economic situation and issues relating to the upcoming economic track dialogue of the second U.S.-China Strategic and Economic Dialogue, to be held in Beijing in late May".	-0.15%/ 0.15%
9 July 2010	Geithner's statement ¹³ "What matters is how far and how fast the RMB appreciates", Treasury Secretary Timothy F. Geithner said. "We will closely and regularly monitor the appreciation of the RMB and will continue to work towards expanded U.S. export opportunities in China that support employment in the United States, in close consultation with Congress".	-0.15%/ 0.59%

⁹ Weeks J. (2009), U.S. Treasury's Geithner to host China's yang, *China Digital Times*, 9 March, <http://chinadigitaltimes.net/2009/03/us-treasurys-geithner-to-host-chinas-yang/>.

¹⁰ Hille K. (2009), Geithner calls for closer ties with China, *Financial Times*, 1 June, <http://www.ft.com/intl/cms/s/0/1a0d4fa4-4e70-11de-9233-00144feabdc0.html>.

¹¹ Stohr G., Mattingly P. (2010), *Geithner delays currency report, urges flexible yuan for China*, Bloomberg, 4 April, http://www.bloomberg.com/apps/news?pid=newsarchive&sid=azQRzn_a9eP8.

¹² Bloomberg News (2010), *China may post trade deficit, undermining criticism*, Bloomberg, 9 April, <http://www.bloomberg.com/news/2010-04-08/china-may-post-march-trade-deficit-undermining-criticism-against-yuan-peg.html>.

¹³ Christie R., Katz I. (2010), *U.S. says no country manipulates currency, yuan "undervalued"*, Bloomberg, 9 July, <http://www.bloomberg.com/news/2010-07-09/u-s-will-monitor-china-progress-on-allowing-for-faster-yuan-appreciation.html>.

	Timothy Geithner's statement before Senate Banking Committee ¹⁴	
17 September 2010	<p>"It makes it more difficult for goods and services produced by American workers to compete with Chinese-made goods and services".</p> <p>Geithner urged China to "end discriminatory trade and investment measures" and allow its currency to undergo significant appreciation.</p> <p>"We are concerned, as are many of China's trading partners, that the pace of appreciation has been too slow and the extent of appreciation too limited", Geithner said. Geithner told the committee that the administration would use "all tools available" to improve trade imbalances, including "direct engagement" between President Obama and China's senior leaders.</p>	-1.76%/ -0.30%
	Meeting between Timothy Geithner and Chinese Vice-Premier Wang Qishan ¹⁵	
1 November 2010	<p>"They're an independent country, a large economy, they need the flexibility to run their policies in a way that makes sense for China", Geithner said. "That requires that their exchange rate move up over time as they're now doing, and we want to see that continue. They've got a way to go, but I think they are committed to do that. I think you're going to see them continue to move".</p>	0.00%/ -1.20%
	Meeting between Timothy Geithner and Chinese Vice-Premier Wang Qishan ¹⁶	
14 December 2010	<p>They discussed the importance of accelerating efforts to promote strong, sustained and more balanced growth and reducing barriers to foreign trade and investment.</p>	-1.20%/ 0.15%
	G-20 ¹⁷	
19 February 2011	<p>"China's currency remains substantially undervalued, and its real effective exchange rate – the best measure to judge its currency against all of its trading partners – has not moved much in this latest period of exchange-rate reform", Geithner said.</p>	-0.45%/ -0.30%
	Geithner visits China (speech at U.S.–China Business Council) ¹⁸	
11 May 2011	<p>"China needs to let the exchange rate adjust at a faster pace. We want to see these commitments... translate into action".</p>	-0.15%/ -0.31%

¹⁴ Steffen J. (2010), Geithner signals growing impatience with China's trade, currency policies, *Los Angeles Times*, 17 September, <http://articles.latimes.com/2010/sep/17/business/la-fi-geithner-china-20100917>.

¹⁵ Pilkington E. (2010), China signals shift on currency, *Mail & Guardian*, 1 November, <http://mg.co.za/article/2010-11-01-china-signals-shift-on-currency>.

¹⁶ Palmer D., Eckert P. (2010), *U.S. and China make progress on beef, software trade*, Reuters, 15 December, <http://www.reuters.com/article/2010/12/16/us-usa-china-trade-idUSTRE6BE4N120101216>.

¹⁷ Somerville G. (2011), *Geithner points to China yuan spillover to others*, Reuters, 19 February, <http://ca.reuters.com/article/businessNews/idCATRE7112EW20110219>.

¹⁸ CDT (2011), Heavy agenda at annual strategic dialogue as US, China try to manage their differences, *China Digital Times*, 8 May, <http://chinadigitaltimes.net/2011/05/heavy-agenda-at-annual-strategic-dialogue-as-us-china-try-to-manage-their-differences/>.

	U.S. bill concerning Chinese currency ¹⁹	
28 September 2011	<p>Harry Reid, Democratic leader of the Senate, said he would invoke “cloture” – a procedure to prevent delay – for senators to vote on a bill that would require the U.S. to use estimates of currency undervaluation when calculating anti-subsidy import tariffs.</p> <p>“China’s history of half-truths and broken promises on currency makes passing this legislation an economic imperative. There will be a bipartisan push to send this bill to the president’s desk this year”, said Charles Schumer, Democratic senator from New York.</p>	0.12%/ -0.49%

	Ben Bernanke’s talk with congressional committee ²⁰	
4 October 2011	<p>“Right now, our concern is that the Chinese currency policy is blocking what might be a more normal recovery process in the global economy”, he said. “It is to some extent hurting the recovery”.</p>	-0.49%/ 0.38%

¹⁹ Beattie A. (2011), US Senate to vote on China tariffs, *Financial Times*, 28 September, <http://www.ft.com/intl/cms/s/0/3e1fa864-e9dd-11e0-a149-00144feab49a.html#axzz1ZdVg4VZL>.

²⁰ Beattie A., Hille K. (2011), Bernanke criticises China over currency, *Financial Times*, 4 October, <http://www.ft.com/intl/cms/s/0/b1f7be1c-eeaa-11e0-959a-00144feab49a.html>.

Table 4

Augmented Dickey-Fuller test statistics (higher cell) and p-values (lower cell)

Variable	GDP	Trade balance	CPI	M0	Deposit rate
X	-2.55 0.10*	-3.60 0.01***	0.24 0.24	8.20 1.00	-1.65 0.46
ΔX			-5.61 0.00***	-2.25 0.19	-7.75 0.00***
$\Delta^2 X$				-9.88 0.00***	

Notes:

Grey highlighted cells present MacKinnon (1996) one-sided p-values.

***, ** and * indicate significance at 1%, 5%, 10%, respectively.

The test equation includes only the intercept and lags of the tested variable. The lag length has been selected based on Schwarz information criterion.

Table 5
Logistic regression estimation results

	Model 1	Model 2	Model 3	Model 4
GDP	0.4375*** (0.1154)	0.4591*** (0.1199)	0.4303*** (0.1155)	0.4383*** (0.1220)
Meeting	1.3799** (0.615982)	1.3853** (0.616592)	1.3046** (0.614661)	1.3819** (0.625885)
Trade balance	$6.24 \cdot 10^{-8}$ *** ($2.16 \cdot 10^{-8}$)	$6.04 \cdot 10^{-8}$ *** ($2.18 \cdot 10^{-8}$)	$6.89 \cdot 10^{-8}$ *** ($2.25 \cdot 10^{-8}$)	$6.22 \cdot 10^{-8}$ *** ($2.33 \cdot 10^{-8}$)
$\Delta(\text{CPI})$		-0.2062 (0.2860)		
$\Delta^2(\text{M0})$			-0.0001 (0.00006)	
$\Delta(\text{Deposit rate})$				-0.0274 (1.5351)
γ_1	1.7253* (1.6422)	1.9036* (1.0834)	1.6931* (1.0526)	1.7309 (1.0952)
γ_2	5.7609*** (4.9998)	5.9474*** (1.1869)	5.7582*** (1.1544)	5.7667*** (1.1956)
Pseudo R ²	0.213	0.215	0.219	0.213
AIC	1.426	1.436	1.430	1.440
BIC	1.529	1.560	1.554	1.564
Correct classifications	77.8%	77.1%	77.1%	76.4%
Log likelihood	-97.666	-97.405	-96.956	-97.666

Notes:

Each regression was calculated using data from the period: January 2000 – December 2011.
The values in brackets are standard errors.

***, ** and * indicate significance at 1%, 5%, 10%, respectively.

Table 6
Confusion matrix

		Real category		
		appreciation	constant	depreciation
Predicted category	appreciation	36	8	3
	constant	17	74	4
	depreciation	0	0	2

Figure 1
Histogram of relative monthly changes in USD/CNY exchange rate

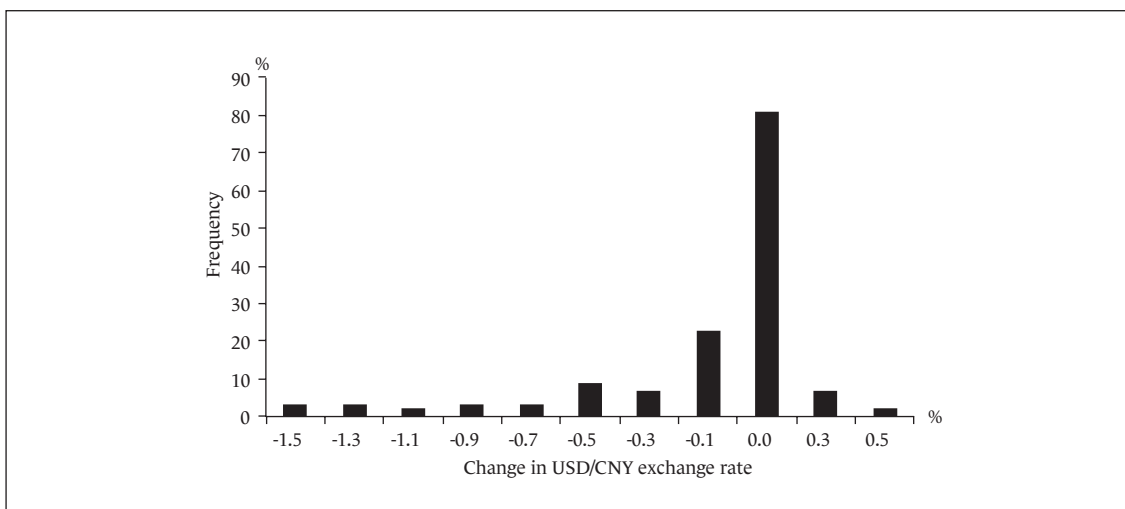


Figure 2
Changes in probability of RMB appreciation in case of an increase of GDP growth rate by 1 percentage point

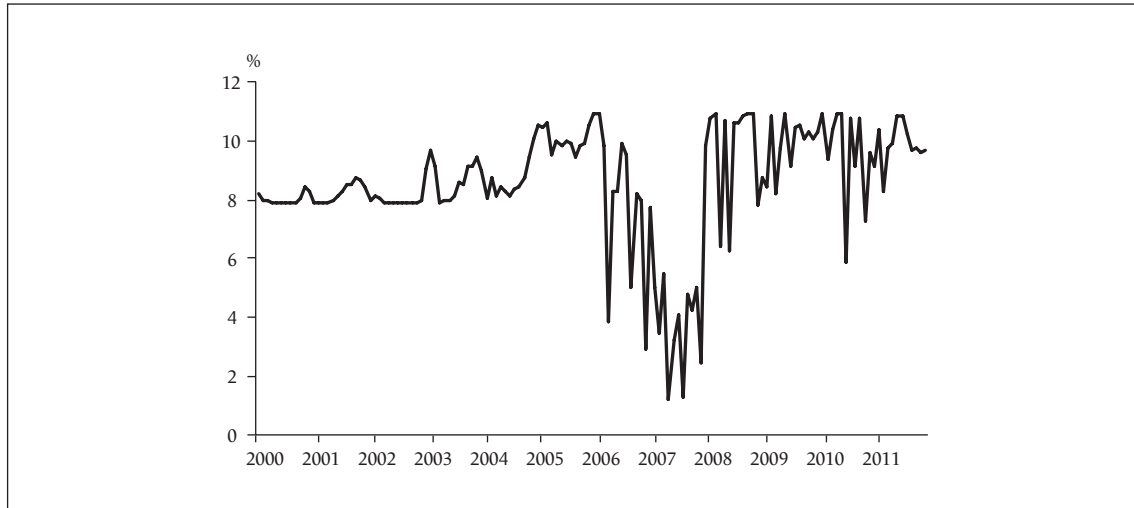


Figure 3
Changes in probability of RMB appreciation in case of an increase in balance of trade by USD 1 billion

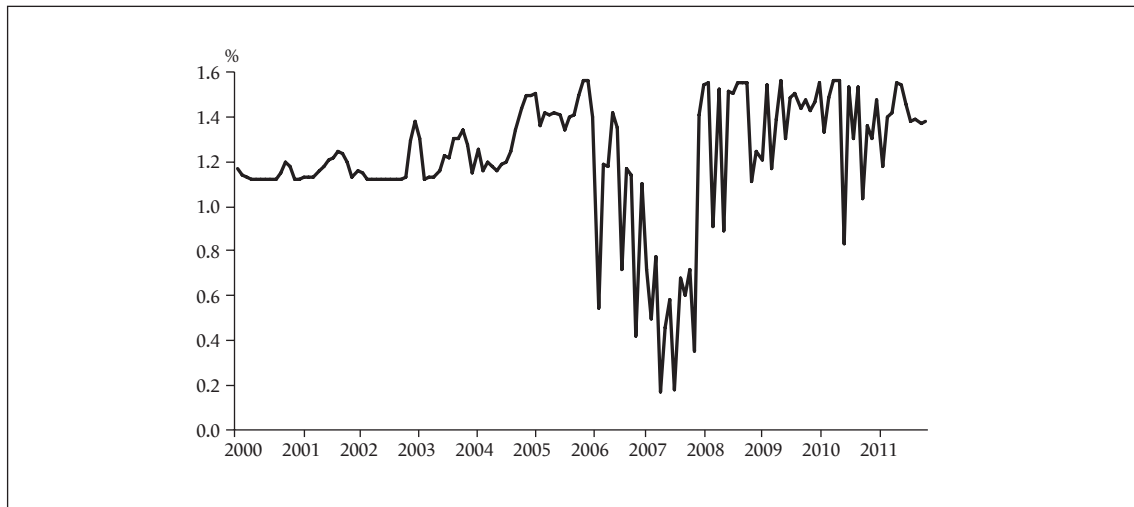


Figure 4

Changes in probability of RMB appreciation in case of a meeting between U.S. and China

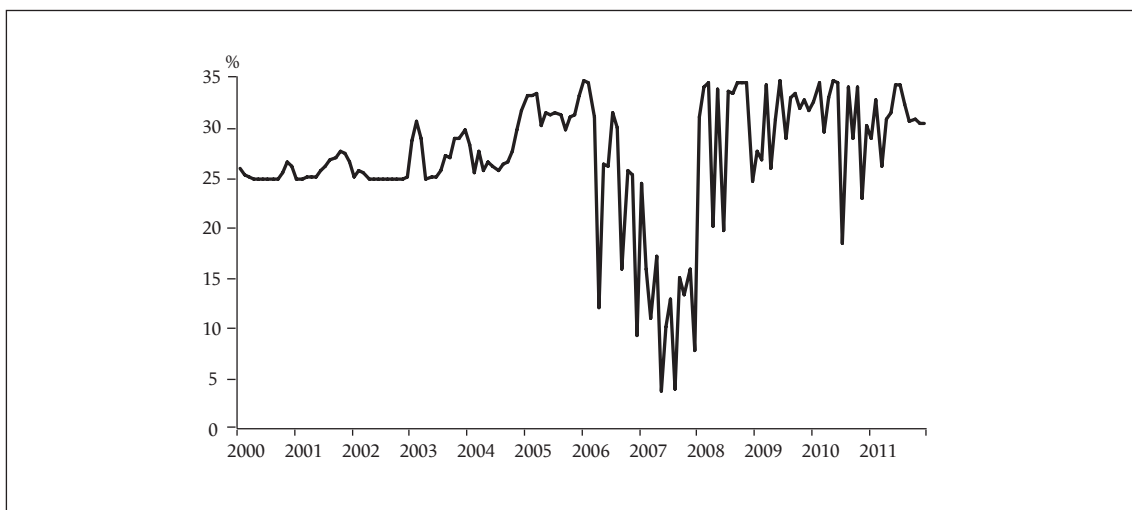


Figure 5

Probability values of particular PBoC decisions

