Exchange Rate Exposure of Chinese Security Markets:

Before and After American Subprime Crisis

Author: Ming Men Chao Yang

Abstract

This paper examines the pricing of exchange rate risk in segmented Chinese security markets during period of July 2005 to December 2008, sepcifically, before and after eruption of American Subprime Crisis in March 2007. The authors find that relationship between returns of industries and movements of yuan' value priced by dollar is significantly negative, and subprime crisis also deepens significant exposure of currency risk. Furthermore, optimal hedging theories are validated in Shanghai B-shares market with nonsignificant effects of currency fluctuations. The empirical results suggest that state-holding corporations are more exposed than non-state-holding firms. The weakening of nationalization, which strengthens firms' hedging motives to exchange rate exposure, brings on insignificant premium requirements of rational foreign investors in B-shares market.

I. Introduction

Under the flexible exchange rate system, multinational corporations around the world have been paying more attention to fluctuations of exchange rate. Many firms have formed self-management systems and hedging strategies to response foreign exchange risk. According to modern financial theories, exchange rate volatilities are significant and cannot be costlessly hedaged away, so exchange rate being at such an concerned positon attributes to direct and indirect impact to firms. Firms that are engaged in international trades are directly affected by appreciation or depreciation of the domestic currency. Besides, firms that are not explicitly involved in international transactions can also be directly affected by foreign competitors due to fluctuations of exchange rate. On the other hand, movements of exchange rate influence other industries related to the enterprise, which indirectly promotes or limits the enterprise's self-development. The direct and indirect impact both act on sales earning, input cost, market shares, net profit, real assets or other factors that affect cash flows of firms, and finally reflect an ex ante premium of their shares.

However, these fluctuations can in theory be actively diversified or hedged away in a well-developed financial market. Ross (1976) suggests that if the economy is described by a small number of pervasive factors, then these factors may well be priced in the sense that investors will be willing to pay the premium to avoid these sources of risk. In this framework, the literature on this areas has largely focused on estimating the statistically significant Beta coefficient of exchange rate exposure in some ways, which M. Bartram (2007) calls this phenomenon as "exposure puzzle".

Jorion (1990) selected 287 US multinationals as the sample covered the period of the 1970s and 1980s to investigate the exchange rate exposure. Evidence is presented that only 15 firms- 5.2% of the full sample- have the significant exchange rate exposure at 5% significant level. Amihud (1994) faced the similar failure that all 32 companies from Fortune magazine's "50 Leading Exporters" have not any significant exposure during 1982 to 1988. In the first multi-country study on the exposure of exchange rate, Bodnar and Gentry (1993) find that using industry portfolios to replace individual firms can gain more significant exposures at the 5% level in the USA, Canada and Japan, which all exceed 20% of the full sample. Still within the USA, Choi and Prasad (1995) suggest that significant exposure is related to a trade-weighted value of dollar. The poor performance of US evidence warrants broad investigation outside the USA based on international data. He and Ng (1998) examine 171 Japanese firms with the higher export-ratio level of 10% and find 26.3% of the firms with the significant exchange rate exposure over the period of 1979 to 1993. Dominguez and Tesar (2001) firstly study exchange rate exposure to firms in developing country. Bartram (2004) provides evidence that 7.5% of the 373 Germany nonfinancial firms have a significant exposure at 5% level. Lately, comprehensive global studies of exchange rate exposure across many countries become more arisen such as Bartram and Karolyi (2006) who pay attention to the large sample of nonfinancial firms in 18 European countries, the USA and Japan. However, these resultful investigations do not attempt to analyse the exchange rate exposure to Chinese corporations.

China has started the well-supervisory floating rates system, which was based on supply and demand in the market and adjusted by a basket of currencies, since July 21, 2005. A more flexible system of RMB exchange rate is bringing sustaining and stable appreciation of yuan (see Fig.1).

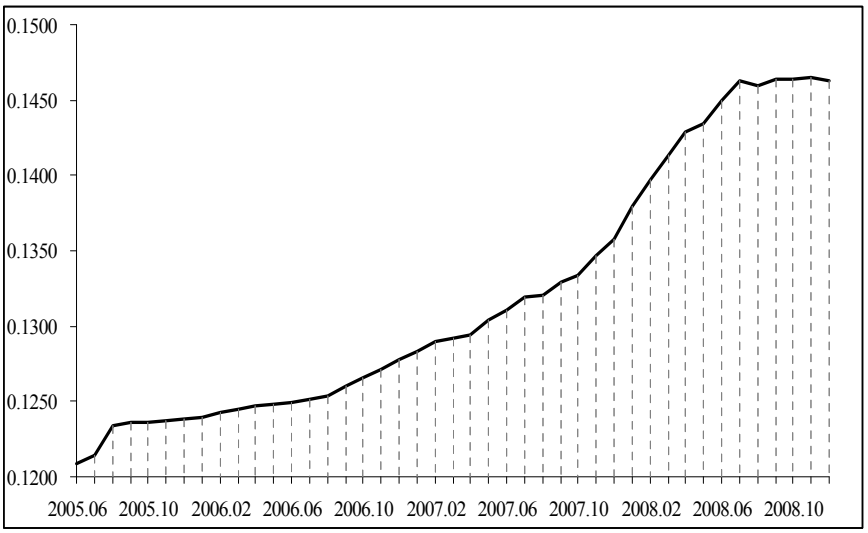

Fig.1. Stable appreciation of yuan, 2005.6-2008.12

Increasing in value of yuan and the expectation of more increasing will bring influence upon entire economy of China, and lead to the extensive concern of Chinese corporations facing the tremendous pressure of losing international competitiveness.

There is self-evident that the Chinese securities markets which are easy to be cashed and with excellent flowability will reflect the risk of exchange rate fluctuations.The securities markets of China is in the phase of getting mature, so that paying attention to the influence of increasing in value of yuan means much to healthy development of China's securities market. Thus, China must be an attractive candidate for our study.

This paper investigates the impact of exposure to exchange rate fluctuations on the returns of industry portfolios during the period of July 2005 to December 2008 in China. The classic market model suggested by Adler and Dumas (1984) is adopted to measure extent to exposure of risk factors selected by Chinese present situation. We note that He and Ng (1998) have shown that there exists expressly weak evidence of a lagged exposure effect. Synchronously considering statistical validity of monthly data that stock price could reflect efficient information in a month, there is no need to test the relationship by regressing returens of industry portfolios against lagged exchange rate movements.

Using a sample of 20 industries in both segmented Chinese scurity markets, we find that there are 12 industries experienced significant negative exposure effects in the Shanghai Security Market comparing with 14 industries in the Shenzhen Security Market during the whole period from July 2005 to December 2008. More specially, although empirically result is presented that numerical alteration of exposure effects is not significant across two subsample period, the American Subprime Crisis increases the industries' pressure to hedging currency risk. After the onset of the financial crisis, more pronounced fluctuations of exchange rate led Chinese investors to expect more risk premium on their investment added for exposure to exchange rate risk. Common industries with significant exposure for the two security market are concentrated into 10 sectors as follow: Food & Beverages, Metals & Metalloid, Machinery, Medicines, Electric Power, Construction, Transportation, Real Estate, Banking & Insurance, and Wholesale & Retail. This evidence is consistent with veritable situation that Chinese economic development highly depend on international export.Exporting industries' value would be hurt by an appreciation of the domestic currency.

Furthermore, this paper studies the pricing of bilateral Yuan/Dollar exchange rate risk in Shanghai B-shares market to analyze whether more rational foreign investors expect the risk premium generated by exposure of exchange rate risk. Selecting entire 53 firms listed in Shanghai B-shares market as the sample, we find that only 6 firms have a significant negative exchange-rate exposure at significant level of 5%, and 11 firms at significant level of 10%. Besides, it is so puzzling that less firms experienced significant exposure of drastic Yuan/Dollar movements after the onset of US financial crisis. To explain the phenomenon, it is necessary to investigate unique characteristic of Chinese enterprises, namely nationalization.

He and Ng (1998) indicate that significance of exchange rate exposure is related to firm size, export ratio, liquidity, financial distress and growth opportunity.The significance of exposure to currency fluctuations can be explained by proxies of the firm's hedging motives. The more extensive the firm's foreign activities, the greater hedging incentives, the less significant exposure. The similar relationship to firm size, growth opportunity and financial distress, except liquidity which is positive correlated

to the significance of bilateral exchange rate exposure. Based on these determinants, our empirical results indicates that the nationalization of Chinese corporates plays the more important role in determining the significance of exchange rate exposure for the Shanghai B-shares market. The nationalization implies the powerful support from the government, the close-knit banking ties for financial inpouring, the stable operational mechanism of management, the affluent accumulation of manpower, and the steady structure of staff. According the optimal hedging theories, a state-holding firm, which generally has a lower danger of cash flows breaking than an independent private firm, would be likely to hedge less and exposed more significantly by variability of the changes of yuan' value priced by US dollar. Our result provides strong evidence that the private enterprises tend to be more likely with nonsignificant exposure to currency fluctuations than state-owned enterprises.

The paper is organized as follow. Secton II discusses the pricing of exchange rate risk in two segmented Chinese stock markets across industries. Secton III discuss the relationship between bilateral Yuan/Dollar exchange rate and individual stock returns in Shanghai B-shares market. Section IV explores the nationalization to probability of significant exposure. Section V concludes the paper.

II. Exposures of Exchange Rate Fluctuations to Industries Returns

In this section, we examine the exposure of bilateral Yuan/Dollar exchange rate to returns of the industry portfolios in both Shanghai security market and Shenzhen security market. In the framework of which Adler and Dumas (1984) define exchange rate exposure as the effect of exchange rate changes on the value of a firm, exposure can be measured by the market model as following regression:

$$R_{it} = \beta_{i0} + \beta_{iFX} R_{FXt} + \beta_{iMKT} R_{MKTt} + \varepsilon_{it} \tag{1}$$

where R_{it} is the rate of return on the ith individual stock or industry portfolio, R_{FXt} is the rate of return on a trade-weighted exchange rate index or a bilateral exchange rate index, R_{MKTt} is the rate of return on the market portfolio, ε_{it} is the random error. Hence, the risk factors' exposure is measured by the slope coefficient of the regression. So, the β_{iFX} coefficient describes the sensitivity of returns to movements of exchange rate.

In most literature, model (1) is applied, like Jorion (1990), He and Ng (1998), Bartram (2004). Simultaneously, interest rate as the proxy of national monetary policy could be adopted comprehensively to be a risk factor, like Jorion (1991), Bailey and Chung (1995), Hahm (2004). The regression model can be redescribe as follow:

$$R_{it} = \beta_{i0} + \beta_{iFX} R_{FXt} + \beta_{iINT} R_{INTt} + \beta_{iMKT} R_{MKTt} + \varepsilon_{it} \tag{2}$$

where R_{INTt} is the rate of return on the current saving ratio or the deposit reserve ratio. In general, the three economic factors are not independent for each others, and some correlation exist in statistics and economy. The orthogonalization is applied. Studies usually orthogonalize exchange rate with interest rate, and orthogonalize market index yield with both other two factors to control the real significance.

In order to restrain the deteriorative inflation, the People's Bank of China, which

play the important role of the central bank in China, continues to implement the tight monetary policies from June 2006. Besides strengthening open market operations, the deposit reserve ratio is also adjusted more to prevent overheated growth of Chinese economy (see Fig.2). It is no doubt that the changes of macroeconomic environment influence the Chinese security markets and even the yuan'value price by US dollar. According to the Chinese actual situation, the movements of interest rate should be another risk factor in our investigation. The model (2) is applied in this paper.

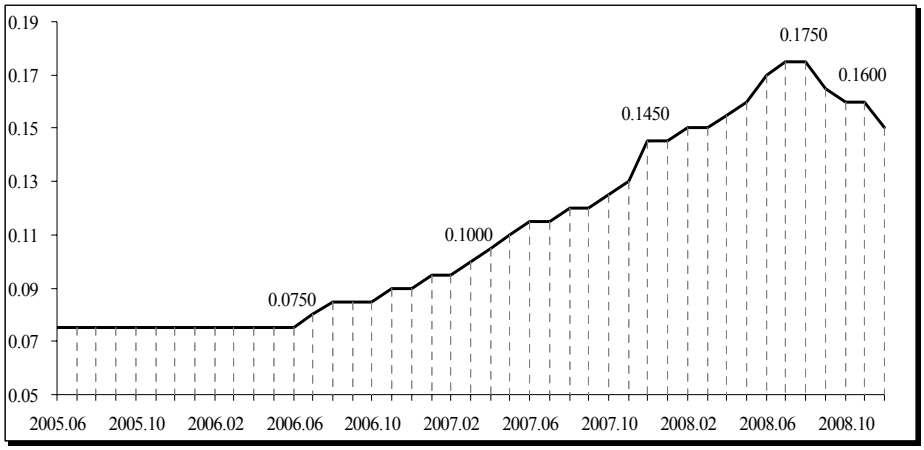

Fig.2. Adjustments of monetary policies, 2005.6-2008.12

Three economic factors are adopted in this study: (1) the currency risk factor-FX, which is measured by the continuous rate of change in bilateral Yuan/Dollar exchange rate index. (2) the interest risk factor-INT, which is measured by volatility of deposit reserve ratio as the proxy for macroeconomic vane. (3) the market risk factor-MKT, which is measured by the returns of value-weighted market portfolios in Shanghai security market and Shenzhen security market. Although Choi and Prasad (1995), He and Ng (1998) find that significant exposure is related to the trade-weighted value of foreign currencies, Bartram (2007) summarizes that using trade-weighted multilateral exchange rate is arguable for diversification effects across currencies, thus reducing the significance of the empiriacl exposure estimates. In this paper, we still choose to apply the bilateral Yuan/Dollar exchange rate attributed to eruption of American Subprime Crisis. Spread of this financial crisis accelerates the appreciation of RMB with regard to weaker US dollar. So, whether Subprime Crisis directly influence the Chinese security markets by bilateral exchange rate as an intermediary becomes a crucial reason why we need to use bilateral Yuan/Dollar exchange rate index.

Now, turning to sample selection and subperiod selection. Following Dominguez and Tesar (2001), industry portfolios substitute for individual firms' stocks. We select industry portfolios based on information from Shanghai Security Exchange (SSE) and Shenzhen Security Exchange (SZSE). According to the industries classification from China Securities Regulatory Commission (CSRC), there are each 20 industries in both security markets: Agriculture, Mining, Food and Beverages, Textile and Apparel, Wood and Furnitures, Paper and Printing, Petroleum and Chemical, Electricity, Metals and Metalloid, Machinery, Medicines, Electric Power, Construction, Transportation,

Communication, Wholesale and Retail, Banking and Insurance, Real Estate, Social Services, Media and Cultural. Sample period begins from July 2005, when China has pushed the floating exchange rate system, and end to December 2008. Considering the arguments of the exact time when American Subprime Crisis erupted, we must have recourse to abnormal fluctuations of bilateral Yuan/Dollar exchange rate (see Fig.3). Interestingly, Russian security market suffered a heavy blow caused by the subprime crisis in March 14, 2007, which is the first shock outside of the USA. So, the sample can be divided into two approximately equal subperiods: July 2005 to March 2007 and April 2007 to December 2008. Analyzing subsample period helps to unveil any structural change in corporations' exposure to exchange fluctuations.

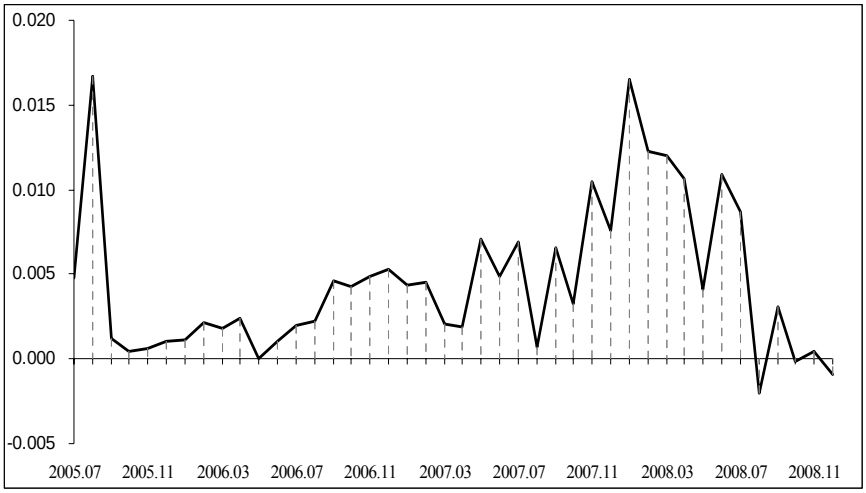

Fig.3. Fluctuations of bilateral exchange rate, 2005.7-2008.12

Our weekly data used in this section are obtained from China Stock Market and Accounting Research Database (CSMAR), which is exploited by the GTA Research Service Center. We also gain available information from websites of People's Bank of China, Shanghai Security Exchange (SSE) and Shenzhen Security Exchange (SZSE).

Table I shows the Beta coefficients representing the exposure of each 20 industry portfolios to fluctuations of the bilateral Yuan/Dollar exchange rate in the two security market, as the result of equation (2) during the full sample period and two subsample periods. An appreciation in RMB makes exporting goods more expensive in terms of the US dollar, and this may lead to a fall in international trade balanced by US dollar because of lower foreign demand and the sales revenue. Consequently, the exporting industries' value would be hurt by an appreciation of the domestic currency, and the importing industries would benefit from the appreciation of home currency. We find that for the full sample period, 12 industries present the significant negative exposure coefficients in SSE, and 14 industries in SZSE. And, the number of significant positive Beta coefficients equal zero. This empirical results are consistent with the actual situation that Chinese economic development highly depend on international trade. Following the statistical data from Department of Commerce, the ratio of Chinese foreign-trade volum and GDP is up to 70 percent, which means that Chinese dependence on foreign trade has exceed all-sided open economies such as United

States and Janpan. So, Chinese exporting economic pattern makes most industries to experience an adverse valuation effect when the yuan appreciates, and benefit when the yuan depreciates. Although our evidence is logical and explanatory, we still lack plenitudinous information to distinguish "real" exportings from "real" importings. In general, however, we can conclude that the Chinese industry portfolios' exposure to bilateral exchange rate is approximately negative, indicating that industries suffer (benefit) from appreciation (depreciation) of yuan.

The industries with significant exposure coefficients during full sample period in both security markets are listed as follow: Food and Beverages, Metals and Metalloid, Machinery, Medicines, Electric Power, Construction, Transportation, Wholesale and Retail, Banking and Insurance, Real Estate. On the other hand, the industries without significant exposure coefficients during full sample period in two security markets are

Table I

Exposures Coefficients of Exchange Rate to Industry Portfolios

The table reports estimated β_{iFX} to volatility of bilateral Yuan/Dollar exchange rate, with P-values in parentheses. At the bottom of the table, the results of a Wald test on the equality of the betas across portfolios are reported. The statistics indicate that the null hypothesis is rejected obviously.

Panel A: Exposure Coefficients of Exchange-Rate to Industries In SSE

		2005.07-2008.12		2005.07-2007.03		2007.04-2008.12	
CSRC	Industry	Coef	P-value	Coef	P-value	Coef	P-value
A	Agriculture	0.9662	(0.740)	-1.7657	(0.732)	5.4891	(0.197)
B	Mining	-4.4311*	(0.038)	-2.3516	(0.424)	-3.7321	(0.201)
C0	Food & Beverages	-4.4864*	(0.003)	-7.5655*	(0.008)	-4.1737	(0.073)
C1	Textile & Apparel	-4.7711	(0.104)	-2.7756	(0.720)	-3.1996	(0.507)
C2	Wood & Furnitures	-6.0934	(0.067)	0.9169	(0.860)	-8.2572	(0.160)
C3	Paper & Printing	-4.4414	(0.112)	-3.2061	(0.282)	-2.4512	(0.564)
C4	Petroleum & Chemical	-4.2547	(0.133)	-2.4037	(0.647)	-2.1689	(0.602)
C5	Electricity	-1.9448	(0.473)	2.7331	(0.691)	-0.3735	(0.923)
C6	Metals & Metalloid	-9.2160*	(0.001)	-4.6116	(0.351)	-7.7215	(0.070)
C7	Machinery	-6.8972*	(0.000)	-2.6306	(0.418)	-7.1709*	(0.028)
C8	Medicines	-4.6084*	(0.036)	-0.4015	(0.925)	-5.3153	(0.185)
D	Electric Power	-6.8720*	(0.001)	-5.2868	(0.146)	-6.8063	(0.064)
E	Construction	-4.8805*	(0.009)	-1.9371	(0.692)	-5.0517	(0.140)
F	Transportation	-5.3914*	(0.002)	0.1430	(0.974)	-4.6632*	(0.045)
G	Communication	-2.4865	(0.260)	0.6749	(0.764)	-1.9043	(0.626)
H	Wholesale & Retail	-5.6138*	(0.003)	-3.7515	(0.307)	-4.2671	(0.169)
I	Banking & Insurance	-7.0380*	(0.000)	-8.0345	(0.121)	-8.3739*	(0.006)
J	Real Estate	-5.7370*	(0.050)	-3.8127	(0.062)	-3.9905	(0.359)
K	Social Services	-4.2695	(0.092)	-0.2965	(0.915)	-2.3819	(0.531)
L	Media & Cultural	-5.4377*	(0.010)	-2.0175	(0.641)	-3.6810	(0.282)
Test of equal Betas(TEB) (P-value)			0.000		0.001		0.003

*Significant at the 5 percent level.

Table I − Continued

Panel B: Exposure Coefficients of Exchange-Rate to Industries In SZSE							
		2005.07-2008.12		2005.07-2007.03		2007.04-2008.12	
CSRC	Industry	Coef	P-value	Coef	P-value	Coef	P-value
A	Agriculture	-0.1649	(0.933)	-6.9579	(0.103)	2.1420	(0.450)
B	Mining	-2.7623	(0.408)	-6.3512*	(0.047)	-2.4957	(0.594)
C0	Food & Beverages	-6.6833*	(0.000)	-9.6131*	(0.000)	-6.8949*	(0.000)
C1	Textile & Apparel	-3.6319	(0.093)	-2.9415	(0.331)	-3.7432	(0.241)
C2	Wood & Furnitures	0.5100	(0.847)	1.4315	(0.810)	2.0052	(0.520)
C3	Paper & Printing	-4.5174*	(0.034)	-9.9724*	(0.001)	-2.6656	(0.342)
C4	Petroleum & Chemical	-2.9080*	(0.018)	-5.2291*	(0.024)	-2.0430	(0.322)
C5	Electricity	-3.7023*	(0.014)	-7.3139*	(0.024)	-2.6221	(0.216)
C6	Metals & Metalloid	-6.9254*	(0.000)	-5.5890*	(0.031)	-7.4477*	(0.000)
C7	Machinery	-4.5917*	(0.000)	-4.6368*	(0.002)	-5.1076*	(0.012)
C8	Medicines	-5.3399*	(0.000)	-4.7891*	(0.004)	-6.9702*	(0.001)
D	Electric Power	-7.0074*	(0.000)	-7.0676*	(0.000)	-7.8889*	(0.001)
E	Construction	-7.3304*	(0.000)	-7.8131	(0.056)	-7.0902*	(0.004)
F	Transportation	-3.9266*	(0.001)	-6.1459	(0.051)	-2.1383*	(0.034)
G	Communication	-1.3885	(0.456)	-3.1093	(0.173)	-0.2450	(0.931)
H	Wholesale & Retail	-6.4408*	(0.000)	-6.7298	(0.051)	-7.2790*	(0.000)
I	Banking & Insurance	-7.8492*	(0.024)	-6.6029	(0.184)	-9.1927	(0.104)
J	Real Estate	-6.6584*	(0.020)	-0.7907	(0.834)	-4.8517	(0.221)
K	Social Services	-6.2818*	(0.001)	-4.2450	(0.128)	-5.7202*	(0.035)
L	Media & Cultural	-0.9636	(0.743)	2.8013	(0.660)	-4.4432	(0.266)
Test of equal Betas(TEB)							
(P-value)			0.000		0.000		0.007

*Significant at the 5 percent level.

The left tier of table masks a two-digit standard industrial classification from CSRC.

listed there: Agriculture, Wood and Furnitures, Textile and Apparel, Communication.

Table II reports the Proportion of significant exposure coefficients from Table I and significant exposure coefficients to other two risk factors by regressive model (2). Table II shows that numerical difference between two subsample periods' empircial results seems nonsignificant. In Shanghai security market, only one industry presents significant exposure coefficient before onset of American Subprime Crisis, comparing to three industries after subprime crisis. In Shenzhen security market, there are both nine industries exposed significantly before and after the crisis. The lack of significant coefficients' increment never reflects accelerative fluctuations of bilateral Yuan/Dollar exchange rate for the sub-period after. So, it seems that the American Subprime Crisis never changed the situation.

In deed, American Subprime Crisis does influence Chinese security markets by bilateral exchange rate as an intermediary. Re-examining table II, in Shanghai security market, the three industries with significant exposure coefficients in subperiod after the crisis are Machinery, Transportation, Banking and Insurance, and the same three

Table II

Proportion of Significant Beta Coefficients to Industry Portfolios

The table reports the proportion of significant Beta coefficients for economic factors.

Proportion of Significant Exposure Coefficients to Industries						
Sample Period (year.month)	Beta_FX		Beta_INT		Beta_MKT	
	SSE	SSZE	SSE	SSZE	SSE	SSZE
2005.07-2008.12	12/20	14/20	10/20	13/20	20/20	20/20
2005.07-2007.03	1/20	9/20	2/20	6/20	12/20	19/20
2007.04-2008.12	3/20	9/20	4/20	10/20	20/20	20/20

industries are exposed nonsignificantly in subperiod before the crisis. The accelerative fluctuations generated by the exacerbation of American Subprime Crisis reflect more significance on the sensitivity to variability of industry portfolios' returns. The similar effect occurs in Shenzhen security market. The exchange rate exposure to industries containing Construction, Transportation, Wholesale and Retail, Social Services, have been significant in the subperiod after the subprime crisis. Besides, the results for the subperiod after the crisis are similar with those for the entire period of July 2005 to December 2008. Although the alternation is not very violent, the Subprime Crisis does change the situation.

Table II may present explanation of limited influence from appreciation of yuan. Interestingly, in our sample period, yuan appreciates continuously, macroeconomic environment deteriorates step by step, and the security markets face alternation of bull and bear market (see Fig.4). Recalling orthogonalizations adopted in this paper, three explanatory variables are unattached for each other. Like fluctuations of yuan' value priced by US dollar, tight monetary policies and Chinese security markets' trend both

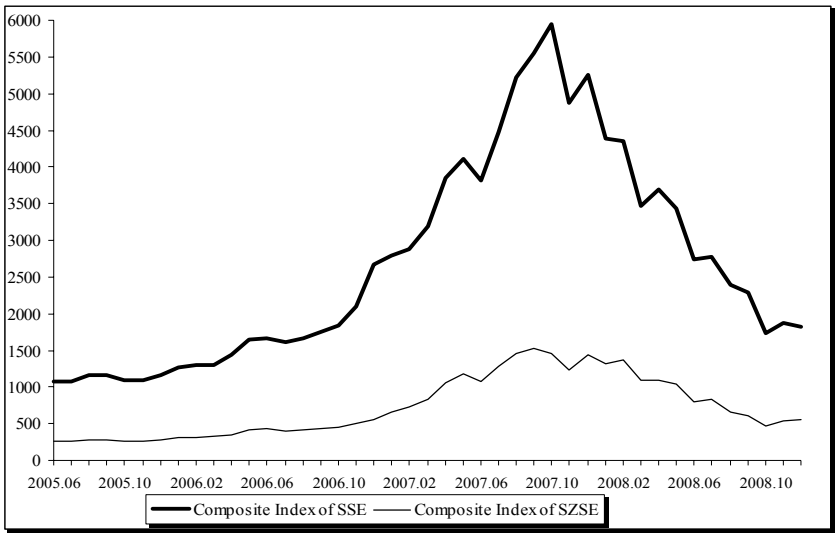

Fig.4. Trend of the two Chinese security markets, 2005.6-2008.12

affect yield of industry portfolios independently, especially the latter. Orthogonalizing operations to the risk factors' proxies may be crucial to strengthen our explanation by cutting off the relationship of the three economic phenomena. Similarly, from table II,

more industries presenting the significant exposure coefficients in subperiod after the crisis, is consistent with sustaining adjustment of the deposit reserve ratio from June 2006. The industries realize the recession of economic growth in faith under the veer of macroeconomic circumstance. Further, the "real" market risk, without intersection to variation of currency value and monetary policies, exhibits more significant effects than other factors during the full period and two subperiod across both Shanghai and Shenzhen security markets. The dramatic and violent turning from bull market to bear market, only taken place in one year. During the subperiod before the crisis, Chinese security markets were experiencing an unprecedented bull market. More speculative participants, who ignored the fluctations of exchange rate and interest rate, only paid attention to the soaring composite indexes. The bigger bubble of speculations, the greater risk of security markets. During the subperiod after the crisis, bear market replaced bull market, resulting in accelerative fall in almost every stock' price. The lower confidence of investors, the greater risk of security markets. So, during the full sample period, the fluctuations of security markets always gain more attention from investors, and present more significant exposure to industry portfolios' yield than the movements of yuan's value priced by US dollar. The substitution of bull and bear in Chinese security markets, which counteracts attention to change of currency value and monetary policies, limits the influence from yuan's appreciation.

In conclusion, our investigation in this section shows that: (1) industry portfolios' exposure to bilateral Yuan/Dollar exchange rate is approximately negative. (2) the Subprime Crisis does influence Chinese security markets by bilateral exchange rate as an intermediary. (3) the substitution of bull and bear in both Chinese security markets limits the significant exposure to appreciation of yuan.

And then, we will turn to study B-shares in Shanghai security market, which are mainly opened to qualified foreign investors and dealt by US dollar.

III. Exposures of Exchange Rate Fluctuations to B-shares Returns

In section II, we discuss the exposure of exchange rate fluctuations to industries' yield in Chinese security market, and analyse the reason why difference of exposure is insignificant as expected before and after subprime crisis. Our conclusion supports such a point of view that Chinese security markets are speculative and inefficient as a new emerging market. We can not directly validate the optimal hedging theories in the security market.

So, in this section, we examine some special stocks to confirm optimal hedging theories that active hedging strategies can affect firms' cost of capital and induce no premium paid to investors. The B-shares listed in Shanghai security market may be appropriate for us. B-share, namely "Renminbi special stock", is marked a price by yuan and dealt by foreign currencies such as US dollar. In China, B-shares are mainly issued to the qualified foreign institutional investors and individual investors. With participantion of mature investors abroad who pay more attention to corporations' hedging policies, B-shares market may be more rational and efficient. Specially, B-shares in Shanghai security market must be dealt with by US dollar. Besides the

exposure to stocks' returns, movements in value of yuan also impact the transaction cost of foreign investors. Our data are still obtained from CSMAR database.

Viewing 53 B-shares in Shanghai security market as a portfolio, we can price the portfolio's yield using regressive model (2). The result is shown in table III.

Table III

Exchange Rate Exposures Coefficients of B-shares Portfolio

The table reports estimated β_{iFX} of entire B-shares Portfolio, with P-values in parentheses.

Exposure Coefficients to Composite Index of Entire B-Stocks In SSE						
Sample Period	Beta_FX		Beta_INT		Beta_MKT	
(year.month)	Coef	P-value	Coef	P-value	Coef	P-value
2005.07-2008.12	-2.5239	(0.351)	0.7389	(0.084)	1.0233*	(0.000)
2005.07-2007.03	0.4016	(0.946)	0.6689	(0.465)	0.5202	(0.108)
2007.04-2008.12	-0.1357	(0.974)	0.5272	(0.276)	1.2469*	(0.000)

*Significant at the 5 percent level.

Table III presents that the exposure of exchange rate fluctuations to returns of the portfolio is insignificant. In spite of using relatively sensitive B-shares, there seems little evidence that foreign investors require compensation for bearing risk of yuan's appreciation. The same nonsignificance also to changes of deposite reserve ratio. But, market risk still exhibits more significant exposure during full period and subperiod after the crisis. It is so interesting that foreign investors never required the premium during subperiod before the crisis, when Chinese security markets were experiencing an unprecedented bull market. In other words, the market risk is not significant before the crisis, and Chinese security markets should achieve the high level of bull market. In sight of foreign investors, the transitory achievement of Chinese security markets is the return of economic development for years. It refers to another interesting problem: what is the reasonable price range in Chinese security markets?

In section II, one important conclusion is that changes in value of yuan have the significant negative impact on returns of industry portfolios. We therefore examine whether such an effect can be generalized to B-shares' yield. Considering keeping the independence and validity, risk of entire market is replaced by risk of B-shares market. And the similar trend supports the substitute (see Fig.5). We investigate exposures to 53 corporations by running the following regressive model:

$$R^B_{it} = \beta_{i0} + \beta_{iFX} R_{FXt} + \beta_{iINT} R_{INTt} + \beta_{iMKT} R^B_{MKTt} + \varepsilon_{it} \qquad (3)$$

where R^B_{it} is the rate of return on the ith B-share, R^B_{MKTt} is the rate of return on market portfolio just including B-shares. And, the full sample period is also divided into two subperiods before and after subprime crisis. Analyzing subperiod helps to unveil any structural change of exposures coefficients which represent firms' hedging actions and foreign investors' requirements to premium. Finally, orthogonalization is still applied.

Table IV shows cross-sectional distribution of the 53 B-shares' estimated β_{iFX} for the full sample period and two subsample periods. It reports minimum, middle and maximum values of estimated β_{iFX} together with proportion of significant coefficients

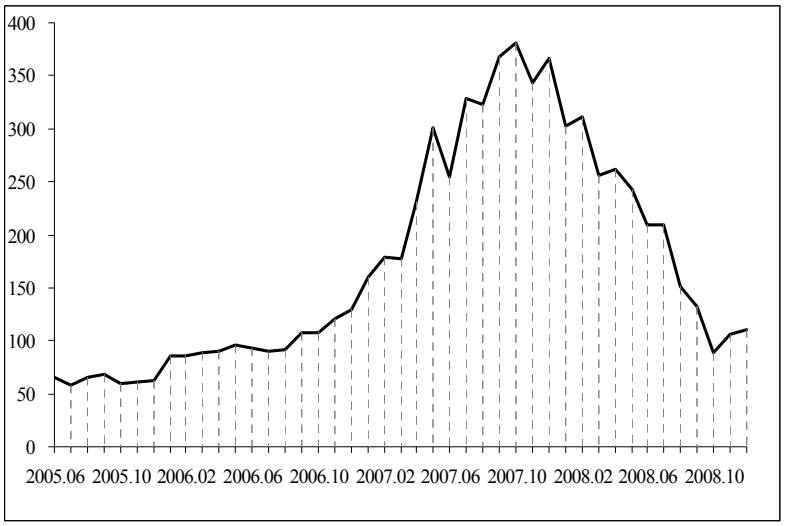

Fig.5. Trend of the B-shares market in SSE, 2005.6-2008.12

obtained. The P-values are indicated in parentheses.

Table IV

Distribution and Proportion of Exposure Coefficients to B-shares

The table reports distribution and proportion for estimated β_{iFX}, with P-values in the parentheses. N- reports the proportion of B-shares with negative exposure significant at the level of 5 percent, and N+ reports the proportion of B-shares with positive exposure significant at the 5 percent level.

Distribution and Proportion of Significant Exposure Coefficients								
Sample Period	Min		Median		Max		N-	N+
(year.month)	Coef	P-value	Coef	P-value	Coef	P-value		
2005.07-2008.12	-10.7438*	(0.042)	-1.5736	(0.486)	4.4044	(0.384)	6	0
2005.07-2007.03	-29.9999*	(0.006)	-3.3473	(0.150)	13.2844*	(0.018)	10	3
2007.04-2008.12	-11.3019	(0.321)	-1.4838	(0.735)	7.2340	(0.076)	3	1

*Significant at the 5 percent level.

We find that for the full period, only 6 shares yield significant negative exposure coefficients and no share yields significant negative exposure coefficient. The number of significant negative coefficients decreases from 10 in the first subsample period to 3 in the second subsample period. Correspondingly, the number of significant positive coefficients decreases from 3 to 1. For the corporations issuing B-shares, the negative exposure coefficient suggests that the appreciation of yuan against US dollar can hurt themselves. But the few positive exposure coefficients obtained suggest that there are exceptions. However, this evidence still strengthens our investigation in section II: the relationship between securities' returns and movements of yuan' value is significantly negative. On the other hand, Chinese corporations, which listed in B-shares market, are influenced insignificantly by the fluctuations of yuan's value priced by US dollar. This conclusion may be unexpected that according to optimal hedging theories, most firms listed in this market apply active hedging strategies to avoide exchange rate risk and rational foreign investors also recognize firms' hedging actions without request of

premium. One plausible reason why these corporations are not significantly exposed to exchange rate fluctuations is that they might apply foreign currency derivatives or other similar financial hedging instruments extensively to protect themselves from the volatility of yuan' value priced by US dollar.

Following Jorion (1990), He and Ng (1998), Bartram (2004), we set export ratio at least 10 percent during full sample period to partition corporates listed in B-shares market. There are16 firms exceeding this level, which means most corporates are not exporting enterprises directly impacted by currency fluctuation. More specially, from our statistics, 29 firms never have sales income out of Chinese mainland, more than half of entire 53 firms. But, Bartram (2007) indicates that existing empirical studies on exchange rate exposure to multinationals have met with only limited success in statistical significance. So, non-exportor is not the exclusive reason for nonsignificant exposure. Besides, it is so puzzling that less firms experienced significant exposure to more drastic movements of yuan's value after onset of US financial crisis. The reason why relation between fluctuation and significance is abnormally reverse across the two subsmple periods, may be refer to the unique characteristic of Chinese enterprises, namely nationalization which will be discussed in section IV.

In this section, we find the nonsignificant exposure of exchange rate fluctuations to stock returns in B-shares market. To explain the phenomenon more reasonablely, we should turn to investigate the relationship between nationalization and significance of exposure in Shanghai B-shares market.

IV. Nationalization and Significance of Exposure

Optimal hedging theories postulate that the firm's hedging activities affect the extent to which the firm is exposed to currency fluctuations. In section III, evidence is shown that the firms listed in Shanghai B-shares market are impacted insignificantly by the fluctuations of bilateral Yuan/Dollar exchange rate. Under the assumption that B-shares market is imperfect but rational, firms have incentives to employ derivative instruments to hedge against currency risk for diminishing significant exposure. In this section, we examine whether nationalization, which means important proporation of property rights or shareholdings belongs to government which is the main body of investment, have any impact on the significance of exposure coefficients obtained in the preceding section.

Nance, Smith, and Smithson (1993) indicate that hedging costs affect the firm's hedging strategies. If the hedging benefits are greater thatn costs, the firms will have a motive to design hedging policies. He and Ng (1998) argue that firm size as a proxy of hedging costs is related to hedging incentives. Although larger firms with scale in hedging costs are more likely to hedge than smaller firms, there are circumstances where smaller firms will hedge more for facing greater bankruptcy costs. Thus, effect of firm size on exchange rate exposure should be empirically determined. The first variable that explains a firm's heding policy is determined there, namely *SIZE*.

Existing studies demonstrate that a firm's exchange rate exposure is significantly related to the level of its foreign activities. Follow Jorion (1990), He and Ng (1998),

Bartram (2004), we therefore select the ratio of a firm's foreign sales to total sales as a proxy of operations abroad. The second variable that explains a firm's heding policy is determined there, namely *EXPR*.

Still follow Nance, Smith, and Smithson (1993), the expected costs of financial burden can be mitigated by maintaining a larger short-term liquidity position. Similar argument that liquidity is negatively related to hedging actions is provided by He and Ng (1998). Firms with higher liquidity ratio are less likely to hedge and more exposed by exchange rate fluctuations. The third variable that explains a firm's heding policy is determined there, namely *LR*.

The hedging can reduce the probability that a firm will go bankrupt and thereby reduce the expected costs of financial distress. He and Ng (1998) use firm's long-term debt ratio to measure its probability of financial distress. Firms with higher financial burden are more likely to hedge and less exposed to currency fluctuations. The fourth variable that explains a firm's heding policy is determined there, namely *LTDR*.

According to underinvestment cost hypothesis, hedging benefits increase with a rise in potential underinvestment cost and interaction between growth opportunities and costly external financing should be negative. Although Geczy (1996), He and Ng (1998) employ the ratio of a firm's book-to-market value of equity as a proxy for the growth opportunities, we apply growth ratio of shareholders' equity to reflect foreign investors' returns on equity. The lower the growth opportunities, the greater a firm's incentive to employ hedging activities to reduce the underinvestment costs. The fifth variable that explains a firm's heding policy is determined there, namely *SEGR*.

In China, nationalization may be the offspring of regime. The difference between nationalization and privajation is the proporation of a enterprise's shares holded by governement. Comparing to the private enterprises, the national enterprises dominate in the powerful support from the government, the close-knit banking ties for financial inpouring, the stable management mechanism, the affluent accumulation of manpower, and the steady structure of staff. Obviously, other four advantages base on the support from government. Unlike private enterprises, government directly provides not only compensation, but also information, advice, protection and even policies assistance, in times of crisis or fluctuations, to most national enterprises. Impacted by the relaion between government and national enterprises, major banks will come to the rescue if national enterprises is in a financial crisis and will try best to help financing for the distressed national enterprises.

Combining characteristic of nationalization with optimal hedging theories, the national enterprises, which have a stronger liquidity positon and a lower probability of financial distress, would tend to hedge less against fluctuations of yuan' value priced by US dollar than private enterprises. Thus, currency exposure to national enterprises is more significant. We mark entire firms, which issue B-shares in Shanghai security market, into two groups to test this implication. Besides that the basic information of enterprises listed are referenced, state-holding ratio is also a valuable criterion there. We use the level of 51 percent to filter state-holding ratio of firms listed in Shanghai B-shares market. If the firm's average state-holding ratio exceeds level of 51 percent during fullsample period, the firm belongs to national enterprise, and those that do not

belong to private enterprises. Thus, we find that 8 of 53 firms are national enterprises, while the remaining are independent.

In contrast to He and Ng (1998), we never examine nationalization's effect to the exposure coefficients estimated in section III, but discuss nationalization's impact on significance of these exposure coefficients. A binary dependent variable is generated to describe significance of exposure coefficients, namely D_S. If exposure coefficient is significant, D_S euqals zero, else equals one. A dummy variable, namely D_N, is used for whether a firm belongs to the national enterprise. Then, we examine nationalization's effect by linear probability model (LPM) and Probit model respectively. The LPM is shown as follow:

$$\begin{aligned} D_{iS} = {} & \beta_0 + \beta_D D_N + \beta_{SIZE} LnSIZE_i + \beta_{EXPR} EXPR_i + \beta_{LR} LR_i + \beta_{LTDR} LTDR_i + \beta_{SEGR} SEGR_i \\ & + \beta_{SIZE\_D} D_N LnSIZE_i + \beta_{EXPR\_D} D_N EXPR_i + \beta_{LR\_D} D_N LR_i + \beta_{LTDR\_D} D_N LTDR_i \\ & + \beta_{SEGR\_D} D_N SEGR_i + \varepsilon_i \end{aligned} \tag{4}$$

where D_S is a binary dependent variable used for significant β_{iFX} estimated in section III, DN is a dummy variable that takes the value of one if the firm belongs to national enterprise and zero otherwise. *SIZE*, *EXPR*, *LR*, *LTDR* and *SEGR* have defined above. All the variables are obtained from CSMAR database and quarter communiques from the firms listed in Shanghai B-shares market.

Estrella and Mishkin's (1996) probit methodology is adapted there to reinforce LPM for reason that likelihood maximum estimation (LME) is always more efficient than ordinary least squares (OLS). The probit model is shown as follow:

$$\begin{aligned} P(D_{iS} = 1) = F(\beta_0 & + \beta_D D_N + \beta_{SIZE} LnSIZE_i + \beta_{EXPR} EXPR_i + \beta_{LR} LR_i + \beta_{LTDR} LTDR_i \\ & + \beta_{SEGR} SEGR_i + \beta_{SIZE\_D} D_N LnSIZE_i + \beta_{EXPR\_D} D_N EXPR_i + \beta_{LR\_D} D_N LR_i \\ & + \beta_{LTDR\_D} D_N LTDR_i + \beta_{SEGR\_D} D_N SEGR_i + \varepsilon_i) \end{aligned} \tag{5}$$

where P denotes probability of insignificant β_{iFX} estimated in preceding section, and F is cumulative normal probability density function. Notes that if exposure coefficient is significant, D_S euqals zero, else equals one. Thus, the positive parameters in equation (5) mean that firms are more insignificantly exposed by fluctuations of yuan' value priced by US dollar, and the negative parameters mean more significantly exposed.

Table V contains estimates of model (4) and model (5) for entire sample period. Our result shows that national enterprise is more exposed significantly by fluctuation of yuan' value priced by US dollar, no matter applying LPM or Probit model. The left of table V, estimates from LPM, reveals that the marginal effects of *EXPR* and *SEGR* on insignificant exposure coefficients are not only significant, but also are different significantly for national and private firms. Both the coefficients on *EXPR* and *SEGR* are opposite to those associated with their dummy variables, which means significant exposure coefficients of exchange rate risk are determined by firms' nationalization. If *EXPR* is the only explanatory variable, the marginal effect (*dY/dX*) suggests that a one

unit increase in *EXPR* causes the probability of nonsignificant β_{iFX} for a private firm to add by 1.7420, and for that of a national firm to increase by only 0.1322. Similarly, a one unit rise in *SEGR* leads to a drop of 1.2260 in the probability of nonsignificant β_{iFX} for a private firm and to a add of 0.1859 for a national firm. Then we could pay more attention to result from Probit model, which is more efficient, on the right of the table V. The marginal effects (*dF/dX*) estimated by Probit model suggest that one unit change of explanatory variable brings some variation on probability of D_{iS} equalling one, which indicates nonsignificant β_{iFX}. Except dummy variable D_N, the coefficients on *EXPR*, *LR* and *SEGR* are significant and opposite to those associated with their dummy variables. For a example of *EXPR*, a one unit increase in *EXPR* causes the probability of nonsignificant β_{iFX} for a private firm to add by 0.1084, and for that of a national firm to increase by only 0.0293. Private firm is more exposed insignificantly by currency risk than national firm under the same increasement of exporting, in other words, national firm is more exposed significantly by currency risk than private firm under the same increasement of exporting. Similar differentia exists in *LR* and *SEGR*. The evidences indicate that national enterprises and private enterprises have different hedging incentives. The national enterprises are less financially constrained, they have less motive to hedge, and thus be more significantly exposed to currency risk. On the other hand, there is no evidence of *SIZE* and *LTDR*'s effect on nonsignificance of β_{iFX} across LPM and Probit model, which is consistent with He and Ng (1998).

Table V

Effects of Nationalization on Nonsignificant Exposure Coefficients

The table reports relationship between nationalization and probability of nonsignificant β_{iFX}, with P-values in the parentheses. For LPM, the marginal effects (dY/dX) also euqal the coefficients. At the bottom of table, the correctly classified ratio of Probit model presents model's goodness of fit.

Effect of Nationalization on Probability of Nonsignificant Exposure					
	Linear Probability Model		Probit Model		
Parameter	dY/dX	P-value	Coefficient	dF/dX	P-value
β_{SIZE}	0.1274	(0.344)	4.5633	0.0445	(0.986)
β_{EXPR}	1.7420*	(0.029)	11.1227*	0.1084*	(0.000)
β_{LR}	0.0491	(0.780)	1.0675*	0.0104*	(0.000)
β_{LTDR}	1.5737	(0.186)	28.2455	0.2754	(1.000)
β_{SEGR}	-1.2260*	(0.011)	-28.3964*	-0.2769*	(0.000)
β_{D}	2.6627	(0.411)	91.2268*	1.0000*	(0.000)
β_{SIZE_D}	-0.1204	(0.418)	-4.4802	-0.0437	(0.986)
β_{EXPR_D}	-1.6098*	(0.047)	-8.1152*	-0.0791*	(0.006)
β_{LR_D}	-0.0462	(0.837)	-1.2827*	-0.0125*	(0.030)
β_{LTDR_D}	-1.3850	(0.283)	-27.3724	-0.2669	(1.000)
β_{SEGR_D}	1.4119*	(0.005)	30.4357*	0.2967*	(0.000)
	R-Squared	0.1931	Pseudo R-Squared		0.3256
			Correctly classified		92.45%

*Significant at the 5 percent level.

Our conclusion above suggests that nationalization impacts on hedging incentive, leading to different significance between a national enterprise and a private enterprise to currency fluctuations. Considering 20 national enterprises during the entire sample period, we can explain the nonsignificant exposure in Shanghai B-shares market more reasonably, as supplement of the section III. Most firms listed in Shanghai B-shares market, belong to private enterprise with active hedging motive, and rational foreign investors realize this point and have little requirement of premium to bearing changes of yuan' value priced by US dollar. This explanation is also consistent with purpose, which we investgate B-shares listed in Shanghai security market, to confirm optimal hedging theories that the active hedging strategies can affect firms' cost of capital and induce no premium paid to investors.

Besides, the empirical result also explain our puzzle that less firms experienced significant exposure of drastic Yuan/Dollar movements after the onset of US financial crisis. We can describe it as follow steps: Firstly, there are 10 firms that only issue B shares, so the main participants of the Shanghai B-shares market are qualified foreign investors who tend to analyse the corporations' fundamentals. Secondly, the rational and mature foreign investors would realize adequately the lack of hedging motives for state-holding firms. Thirdly, some state-holding firms continually reduced the firms' state-owned shares under reform of non-tradable shares from September 2005, which means that the degree of nationalization is being weakened. Fourthly, the reduction of state-owned shares lead some firms to adjust hedging incentives to avoide exposure of currency risk. Finally, based on optimal hedging theories, the foreign investors expect less premium with the weaker nationalization, and less firms experienced significant exposure during the second subsample period after the American Subprime Crisis.

In this section, we discuss effect of nationalization to probability of insignificant exposure from exchange rate risk. The result is shown that national firms, with close support from the government and banks, have less hedging motives, and are exposed more significantly by currency risk. This evidence help us to explain nonsignificant exposure in Shanghai B-shares market and further confirm optimal hedging theories.

V. Conclusion

This paper examines whether Chinese industry portoflios' returns are priced by fluctuations in yuan's value priced by US dollar. We find that for the period from July 2005 to December 2008, industries in both security markets have significant negative exposure. The result is also robust across the two subperiods, indicating that drastic Yuan/Dollar movements caused by American Subprime Crisis significantly influences Chinese security markets. But, this significant exposure are limited by substitution of bull and bear in both Chinese security markets.

Then we turn to investigate the prcing of exchange rate risk in Shanghai B-shares market to confirm optimal hedging theories that active hedging strategies can affect firms' cost of capital and induce no premium paid to investors. We find nonsignificant exposure of exchange rate fluctuations to stock returns in B-shares market. It is little evidence that rational foreign investors require premium for bearing currency risk.

Finally, we analyse characteristic of Chinese enterprises, namly nationalization, to explain nonsignificance more reasonablely. We test whether there are significant differences in the hedging motive between national and private firms. The evidence is presented that national firms with support from the government and banks are more significantly exposed by fluctuations of yuan's value because of less hedging needs. This conclusion help us explain nonsignificant exposure in Shanghai B-shares market and further confirm optimal hedging theories.

This paper is an elementary investigation of exchange rate exposure to Chinese security markets. Some insufficiencies still exist in our empirical study. As Bartram (2007) indicated, exposure puzzle may not be a problem with methodology or theory, but mainly result of endogeneity for operative and financial hedging at the firm level, which is left for our future research.

References

Adler, M. and Dumas, B. (1984), "Exposure to currency risk: definition and measurement", *Financial Management*, Vol. 13 No. 2, pp. 41-50.

Amihud, Y. (1994), ''Exchange rates and the valuation of equity shares'', *Exchange Rates and Corporate Performance*, Irwin, New York, NY, pp. 49-59.

Bodnar, G.M. and Gentry, W.M. (1993), ''Exchange rate exposure and industry characteristics: evidence from Canada, Japan, and the USA'', *Journal of International Money and Finance*,Vol. 12 No. 1, pp. 29-45.

Bodnar, G.M. and Wong, M.H.F. (2003), ''Estimating exchange rate exposures: issues in model structure'', *Financial Management*, Vol. 32 No. 1, pp. 35-67.

Bartram, S.M. (2004), ''Linear and nonlinear foreign exchange rate exposures of German nonfinancial corporations'', *Journal of International Money and Finance*, Vol. 23 No. 4, pp. 673-699.

Bartram, S.M. and Karolyi, G.A. (2006), ''The impact of the introduction of the Euro on foreign exchange rate risk exposures'', *Journal of Empirical Finance*, Vol. 13 No. 4-5, pp. 519-549.

Bartram, S.M. (2007), "The exchange rate exposure", *Managerial Finance*, Vol. 33 No. 9, pp. 642-666

Choi, J.J. and Prasad, A.M. (1995), ''Exchange risk sensitivity and its determinants: a firm and industry analysis of US multinationals'', *Financial Management*, Vol. 24 No. 3, pp. 77-88.

Dominguez, K.M.E. and Tesar, L.L. (2001a), ''A reexamination of exchange-rate exposure'', *American Economic Review*, Vol. 91 No. 2, pp. 396-400.

Dominguez, K.M.E. and Tesar, L.L. (2001b), ''Trade and exposure'', *American Economic Review*, Vol. 91 No. 2, pp. 367-370.

Doidge, C., Griffin, J. and Williamson, R. (2006), ''Measuring the economic importance of exchange rate exposure'', *Journal of Empirical Finance*, Vol. 13, pp. 550-576.

He, J. and Ng, L.K. (1998), ''The foreign exchange exposure of Japanese multinational corporations'', *Journal of Finance*, Vol. 53 No. 2, pp. 733-53.

Jorion, P. (1990), ''The exchange-rate exposure of US multinationals'', *Journal of Business*, Vol. 63 No. 3, pp. 331-345.

Jorion, P. (1991), ''The pricing of exchange rate risk in the stock market'', *Journal of Financial*

and Quantitative Analysis, Vol. 26 No. 3, pp. 363-376.
Priestley, R. and Ødegaard, B.A. (2005), ‘‘New evidence on exchange rate exposure’’, *working paper*, Norwegian School of Management, Oslo.
Warren Bailey. and Y. Peter Chung. (1995), “Exchange Rate Fluctuations, Political Risk, and Stock Returns: Some Evidence from an Emerging Market”, *Journal of Financial and Quantitative Analysis*, Vol. 30 No. 4, pp. 541-561