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Axioma Research Paper
No. 025

December, 2010

Yesterday's News in Today's Risk Model: A Risk Model's Perspective on the Chinese Currency Debate

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A Risk Model's Perspective on the Chinese Currency Debate

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Overview

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1. Introduction

Throughout 2010, the United States argued that China has kept its currency, the Chinese Yuan Renminbi (CNY), weaker than it would should be, thereby reducing American exports[1]. The intensity of the debate reached its peak in May; in June, China announced it would allow the value of the CNY to vary more easily, and in September, President Obama met with China's Prime Minister, Wen Jiabao[2]. Although there remain concerns over the value of the CNY from all parts of the globe[3], the heated rhetoric of the first half of 2010 has cooled noticeably.

[1] This article addresses only how well Axioma's risk models have tracked political and economic events. For a detailed discussion of the Chinese Currency debate, see, for example, http://knowledge.wharton.upenn.edu/article.cfm?articleid=2617.

[2] See, for example, http://topics.nytimes.com/top/reference/timestopics/subjects/c/currency/yuan/index.html?scp=1-spot&sq=china%20currency&st=cse.

[3] http://online.wsj.com/article/SB10001424052748703673604575549640958894072.html?mod=WSJ_World_LEFTSecondNews.

Axioma's Global Risk Models include currency risk. In addition, the Global Fundamental Factor Risk Models includes market and country factors that estimate the volatility and correlation of these factors. This article illustrates how closely and accurately Axioma's Risk Model's reacted to these currency-related events.

2. CNY vs. USD Correlation

We first examine the historical correlation of the CNY and US dollar (USD) returns as predicted by Axioma's Medium Horizon, Global Fundamental Factor Risk Model. Currency returns, of course, are measured against a base currency, termed a numeraire. We cannot use either USD or CNY as the numeraire when computing the CNY/USD correlation since the return of any currency to itself is, by definition, zero, thus making its correlation to any other currency also zero. Fortunately, Axioma's software, Axioma Portfolio™[4], allows easy conversion from one numeraire to another.

Figure 1 shows the historical CNY/USD exchange rate (top) and the CNY vs. USD correlation since July 2007 using three different numeraires: the Euro (EUR -- blue), Pounds Sterling (GBP - red), and Japanese Yen (JPY -- green). (The CNY was depegged from the USD on July 21, 2005; prior to that the CNY/USD correlation was 1.0)

Notice that the exchange rate levels off in July 2008 and exhibits essentially no variation from January 2009 through June 2010. Whenever the exchange rate is constant over a significant period of time, the correlation should rise toward 1.0.

This is exact what happened in Axioma's risk models. Prior to August 2008, correlations were flat or falling. In July 2008 China took deliberate steps to respond to the financial crisis. Once the exchange rate leveled off, the correlation rose steadily in all three numeraires. The correlation reached a near perfect correlation for the first six months of 2010. Since June 2010, the correlation has fallen steadily as the exchange rate has dropped.

Several recent dates are indicated on the graph in the top right. These correspond to key events during the crisis:

- 2/3/10: Obama criticizes China's currency policy.
- 4/8/10: Timothy Geithner visits China.
- 5/27/10: China announces greater flexibility with its currency.
- 9/24/10: Obama meets Wen Jiabao in Washington, DC.

[4] Axioma Portfolio is a trademark of Axioma, Inc.

It is interesting to see how these political events closely bracket the highest currency correlations in Axioma's risk models.

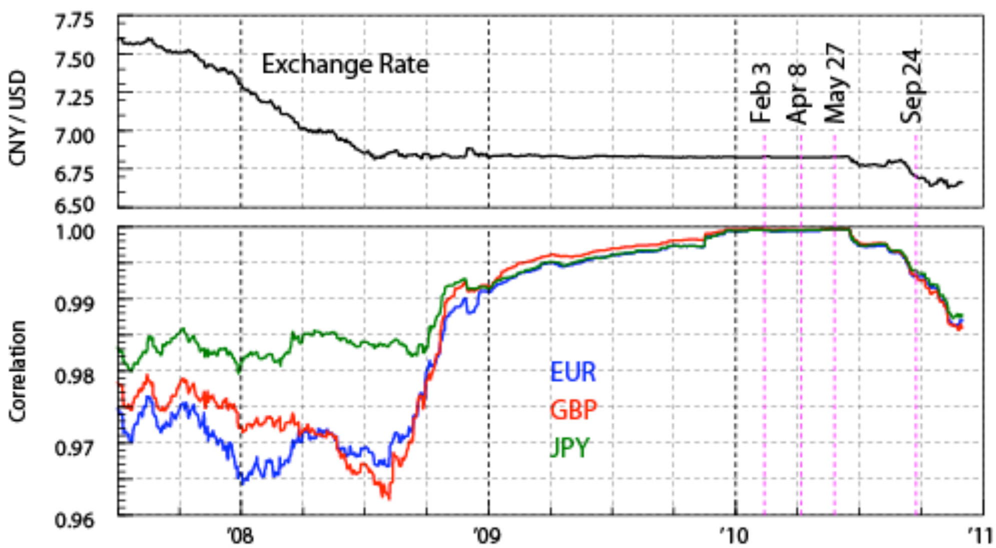

Figure 1. The correlation predicted by Axioma's Global Risk Model between the US dollar and the Chinese Yuan Renminbi (CNY) as measured in three different numeraires: the Euro (EUR -- blue), Pounds Sterling (GBP - red), and Japanese Yen (JPY -- green). The corresponding exchange rate between CNY and USD is shown in the top graph.

The data indicates that Axioma's Global Risk Model's accurately and quickly tracked events and market news related to the currency crisis. Axioma's risk models use exponentially weighted historical data to estimate volatilities and correlation. This explains why the correlations did not reach 0.999 until December 2009 even though the exchange rate was flat starting in July 2008. The correlation drops very quickly in June 2010, without any apparent lag. This occurs because the correlations are so high: when the vast majority of the returns are nearly perfectly correlated, just a few data points are needed to cause the correlation to drop from values such as 0.999.

3. Other Factors

In addition to currency factors, Axioma's Global Fundamental Factor Risk Model include Global Market and Country factors, and one might wonder how the correlations and volatilities of these factors compare with those of the currency factors. Figure 2 shows the correlation of selected market, country and currency factors; Figure 3 shows the volatilities of these factors. The data in Figs. 2 and 3 have been computed with a market-focused estimate[5]. To improve legibility, we use USD as the numeraire as it allows us to eliminate the USD factor (its volatilities and correlations are all zero).

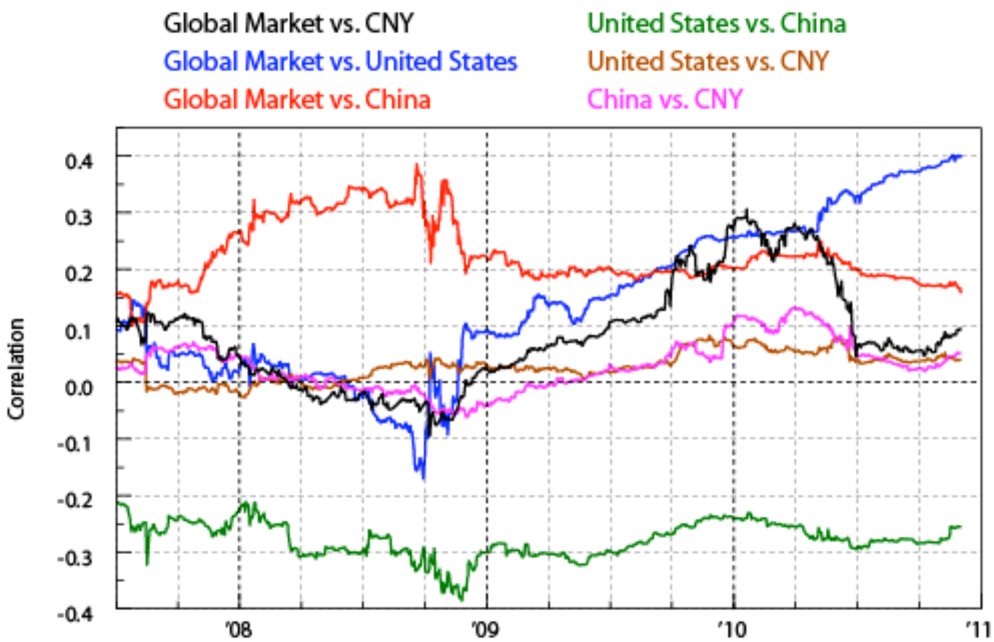

Figure 2. Selected risk model factor/factor correlations using a market-focused risk model using US dollars as the numeraire. Colors corresponding to each correlation are given above the chart. The Chinese Yuan Renminbi correlation with the Global Market (black) experienced a significant decorrelation in June 2010.

Figure 2 shows the historical values of six correlations related to China's monetary policy. The correlation between the Global Market and the CNY factors (black) drops precipitously from 0.223 on May 26 to 0.047 on June 30. None of the other correlations exhibit any obvious changes during June 2010, suggesting that the CNY was being managed differently during this month than it had been previously. The timing of this event closely matches the correlation drop in Fig. 1.

[5] In a market-focused risk model, the weighted sum of the daily country factor returns is zero.

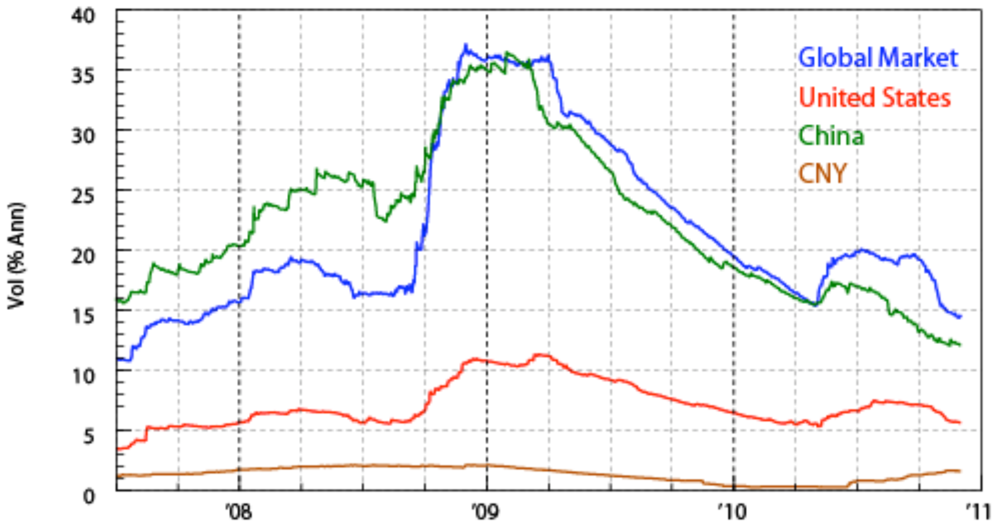

Figure 3. Selected risk model factor volatilities using a market-focused risk model using US dollars as the numeraire.

Similarly, the factor volatilities shown in Fig. 3 show an abrupt divergence of the Global Market factor volatility and the China factor volatilities starting 5/3/2010. The volatilities of the Global Market, China, and United States factors all rise starting in May 2010, but only China's volatility decreases before September 2010.

This data illustrates how quickly and accurately daily risk models can capture and model market news, even on global events. Such up-to-date and high quality risk models are, of course, essential to portfolio managers as they analyze and rebalance their portfolios. In the past, when risk models were updated on a monthly basis, many investors came to believe that risk model estimates did not respond as quickly or as accurately as has been shown here. Many investors also concluded that more responsive risk models were not necessary for investment management. The data shown indicates that daily risk models do correctly capture relevant market information. Such timely risk estimates can be invaluable for portfolio managers.