

**Financial Engineering of Renminbi Revaluation Bets
and
Implications for HKD**

by

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1 Introduction

Renminbi (RMB) revaluation is considered as a plausible event by financial markets. The actual probability of such an event may be small or even insignificant, but, if the carry cost of related positions is positive and is expected to remain so, such a plausible event may still become a very attractive bet. There will be positions taken in favor, or against its occurrence, and this may create significant exposures. Balance sheets of Chinese, Hong Kong, and Western institutions may have new currency and maturity mismatches. There is some evidence in market data, that such exposures have been increasing throughout 2003. Also, these bets seem to have spread to Hong Kong Dollar (HKD) beginning September 2003.

From a policy makers' point of view, there are several issues of interest in understanding *the way* these exposures are put together. The instruments used and the way they are structured, needs to be understood clearly. A correct measurement and monitoring of associated risks can be done only then. More importantly, if the nature of the implied RMB and HKD exposures are not understood clearly, then in the event of occurrence or non-occurrence of a RMB revaluation, attempts to square such positions may have severe implications on money, currency and capital markets.

The purpose of this short note is to discuss financial engineering of such exposures in the present case, and then suggest some conclusions concerning HKD. One can ask essentially five questions of interest.

1. What are the more straightforward and hence, obvious trades that practitioners can put in place to benefit from a possible RMB revaluation?
2. Would these trades lead to creation of significant risks? What are these risks in each case?
3. What are the deeper and less transparent ways of putting these trades on?
4. What are the risks associated with such positions? Would the risks be associated with on-shore or off-shore markets?
5. How do these trades use HKD markets? What are the implications of HKD becoming a *proxy* for RMB?

The discussion below has the purpose of giving some non-technical answers to these questions. We try to use a financial engineering approach and display the implied exposures through simple cash flow analysis.

The organization of the paper follows essentially these questions. First, we discuss the straightforward exposures. We show their risks. Then, we move on less transparent, but potentially more rewarding RMB-revaluation positions. These are shown to be more risky from the point of view of local Chinese money and capital markets. Next, we discuss how HKD can be used as a proxy for RMB, and introduce the related risks. The last section concludes.

2 Straightforward RMB exposures

There are at least three straightforward and, obvious ways one can take a RMB exposure with the intend to benefit from a possible revaluation. These are (1) Opening straightforward RMB deposit accounts with a Chinese bank by shorting a “foreign” currency, (2) Buying any RMB denominated asset by shorting a foreign currency, (3) Buying RMB through a Non-Deliverable Forward (NDF) contract.

Notice the essential characteristic of these positions. These are exposures that can be taken without *any* upfront, *net* cash payment. The party does not need to “have any money” to take these positions. Any needed funds are borrowed. The purchased asset can then constitute the necessary collateral for the borrowed funds. Of course, depending on the parties involved and the perception of risks, the funding institution can demand a *haircut*. Then, some additional cash may have to be used. This will increase the cost of carry.

We discuss these straightforward positions briefly and asses their current use, considering the limited amount of available data.

2.1 RMB Deposits

Consider a decision maker that borrows a certain amount of foreign currency denoted by Z_{t_o} at time t_o and then sells these in the spot market against the RMB at the current fixed exchange rate e_{t_o} . The proceeds are deposited in a RMB deposit account with maturity T . The results of these operations are shown in Figure I. We see that, the decision maker has essentially purchased RMB-forward with maturity T .

There is some cursory evidence that several investors, from Singapore, Hong Kong, Taiwan and other parts of the world have chosen this method of taking an RMB exposure. This method is particularly easy to take for the Chinese who live outside China. These investors have reliable contacts inside China and through them can, and do, take such positions.

2.1.1 Risks

Opening such accounts in the mainland is possible for some investors. The position carries obviously, the usual credit risks associated with banking system instability and operational risks. Ignoring these, a position such as the one above taken with a view towards a RMB revaluation, will have similar risks as buying the RMB forward. The main differences would be:

1. The difficulties of opening RMB accounts by foreigners may lead to some non-transparency issues and liquidation risks.
2. These accounts will, in general, be relatively small, and this is not an efficient way of taking such positions. They will also be difficult to monitor.

Finally, the rates on these deposits are significantly lower than RMB rates one can obtain elsewhere. This means that the carry cost of these positions is high. Their usage is likely to be quite limited.

2.2 NDF's and NDS's

One can bet on a RMB revaluation using non-deliverable forward(NDF) and swap(NDS) contracts as well. From a conceptual point of view, a NDF is essentially the same position as the one outlined above and Figure I proves this. When the positions in Figure I are netted out, the outcome will be forward purchase of RMB. Initiating this contract outside China, in the *off-shore markets*, with a prime broker and then settling, say, in USD further simplifies the procedure.

A non-deliverable currency swap that generalizes the NDF can also be put together as an alternative. A counterparty can pay a fixed rate to another counterparty in, say, USD, in return receive a fixed rate in RMB. Such swaps are not actively traded even for major currencies, but in this case this issue is not relevant since OTC markets in RMB interest rates derivatives are not liquid. Non-Deliverable Swaps can be structured in many different ways and do not have to be fixed-to-fixed.

The main differences of using NDFs and NDSs relative to using Deposits funded by FX-loans are as follows, assuming that the position is hedged:

1. A NDF will be contracted through a major foreign institution.
2. The foreign institution would normally hedge this position through positions taken in the local RMB market.

3. These hedges may be fundamentally different than the Deposit accounts and hence may lead indirectly to different risks. For example, the foreign institution may hedge the position by using their investment accounts in local RMB market, using RMB denominated bonds. Legal issues related to the ownership of these bonds are then handled using swap structures as will be discussed below.

The institution writing the NDF can also hedge the position through another NDF or non-deliverable currency swap written by an institution better connected to the local RMB market.¹ Or, the NDF can be kept on the books unhedged, but a haircut can be obtained from the client.

2.2.1 Risks

We consider the risks from the point of view of a Chinese policy maker.² The risks associated with NDFs depend whether they are *eventually* hedged, or not. Hedged positions would have usual FX-forward risks plus, the risks associated with the hedge in local RMB markets.

If these positions are eventually hedged, they may become of concern to Chinese regulators. Essentially, every *hedged* NDF position is equivalent to a *short position* on the USD in the *local* currency market. These may result in a massive aggregate FX-short position. This implies that, in the event of a revaluation, there will be an attempt to cover these short positions. The effects of these repositioning should be managed by the Central Bank.

To the extent they are unhedged, NDF positions would constitute risks that are outside the local RMB market (i.e. on on-shore markets) and would be more relevant from the point of view of regulators in markets such as, Taiwan, Hong Kong or Singapore.

From the client's perspective, an NDF is much more transparent instrument than the RMB deposit alternative shown in Figure I. It will also be put in place in more efficient market environments. In this sense, NDF positions will be much easier to monitor and risk manage. Because of this relative transparency, they will also cause fewer surprises in case the RMB exchange rate is really modified. Yet, to the extent the NDF selling institution is hedging the position indirectly through on-shore Chinese markets, Chinese regulators will not benefit from this transparency.

¹For example, some Taiwanese bank.

²For western policy makers, these exposures will present negligible risks. They are very small given the aggregate Balance Sheet of major banks.

2.2.2 A Disadvantage

The same transparency and the associated non-liquidity has two major disadvantages. Whenever a position of reasonable size is taken, this may risk moving the prices. Secondly, the parties would know who, and which institutions have taken positions. From the point of view of market practitioners, both of these are major disadvantages, which means that a sophisticated player needs to take the position in less conspicuous ways.

3 Asset swaps

Arguably, the optimal position to benefit from a possible RMB revaluation is an asset swap organized by a foreign bank active in Chinese markets. The structure of this position can be seen in Figures II and III. Essentially we are dealing with a position that exchanges the payments from two bonds in two different currencies. The position is equivalent to borrowing, say, 3-month funds, selling the currency against RMB and then buying a RMB bond. Except, all these operations are collected in a single contract. One party receives RMB coupons and pays the USD-floating rates. The counterparty does the opposite.

Alternatively, one can use some sort of a Total Return Swap (TRS). In a TRS, the investor (1) Receives coupon payments and any capital gains associated with a long term RMB denominated bond, (2) Pays any capital losses associated with the same bond, (3) At the same time the investor pays the coupon and capital gains associated with a foreign bond denominated in a desirable foreign currency and (4) Receives the capital losses associated with the foreign currency bond.

A spread s_t , to be determined by the two parties, will make sure that the deal is acceptable to both sides. In this particular case, a local or foreign bank operating in China will, in all likelihood, take the other side of the deal, put the TRS on its books and then hedge it using the involved fixed income instruments.

A typical TRS is structured as exchanging cash flows based on an asset against cash flows based on Libor. But, by getting into *two* TRSs the common Libor payments will be eliminated and the two TRSs will be equivalent to exchanging capital gains and losses and the coupons generated by two different bonds denominated in two different currencies. One would be a RMB bond, the other, say a USD bond. This would clearly make the underlying Libor rates be denominated in two different currencies. But, this is a minor

complication, and can be resolved by getting into a basis swap.³

Accordingly, the Asset Swap, or an Total Return Swap will be structured using the following engineering:

$$\text{Asset Swap} = \text{TRS in RMB} + \text{Currency Swap RMB to USD} + \text{TRS in USD}$$

In this structure, one of the parties will receive RMB denominated cash flows and pay USD denominated cash flows that are generated by the underlying bonds. Hence, if RMB is revalued, the value of the structure will increase for this party.

3.1 Advantages

The Total Return Swap or Asset Swap positions are equivalent to shorting a foreign bond using the borrowed funds, and then buying the RMB bond. It has several advantages over a standard NDF or NDS.

1. The TRS will involve the use of bonds, which, in all likelihood *may* give the position holder additional arbitrage gains, since the RMB bond market is not open to foreign investors and since taking such TRS positions require more sophistication from the part of the investor.
2. TRS swaps will be more *discrete* and can be put together without moving the prices in the associated bond markets.
3. Similarly, liquidation of these positions may be easier after the event.
4. If the RMB and HKD are seen as uncorrelated, the TRS may involve two bonds, say, from RMB and HKD markets respectively. Such a selection may minimize the risks, since these bond markets have a natural link.
5. TRS or Asset swaps will have much smaller credit risks associated with client defaults in case RMB peg holds.

Given that there is ample supply of RMB denominated bonds, it is relatively easy to put together such Asset Swaps.

³Although, such basis swaps are not liquid for RMB.

3.2 Other Structures

There are many other equivalent structures. Getting into a Non-Deliverable *Currency Swap* of RMB against a foreign currency is one other example. The party expecting a revaluation will exchange dollars against RMB at the initiation, and then will reexchange these currencies at contract expiration. If, at the initial point, RMB funds are paid and USD funds are received, then the reverse will occur at expiration, at the *same* exchange rate. As a result, during a revaluation the position will benefit.

4 The Critical Role of HKD

The positions described above, dealing with a possible Renminbi revaluation, have two properties. (1) They can be taken in off-shore markets, (2) But, they are costly to hedge. These positions require finding several counterparties that have ways and means of taking RMB-based positions in on-shore instruments. Several bid-ask spreads may be involved. More importantly, legal foundations of associated contracts leading to NDF hedges, or asset swaps may not be as solid or transparent as those involved in equivalents found in Western markets.

As a result of these characteristics, especially the NDF bid-ask spreads will be very wide. The USD/RMB NDF quotes for January 6, 2004 are shown in Table I. We see that the spreads on 1-year USD/RMB NDF contracts were -4900/-4750. The spot rate was 8.2771. According to this, the markets were expecting the 1-year ahead USD/RMB rate to be 7.7871/7.8021. If these expectations turns out to be correct, this would amount, approximately, to a 6% revaluation of the Chinese Yuan.

TABLE I

Term	Bid	Ask
Spot	8.2771	
1 month	-320	-220
3 months	-1000	-900
6 months	-2500	-2350
1 year	-4900	-4750

The equivalent data for the HKD is shown in Table II. We see that 1-year HKD forwards are quoted at a discount of -745/-725. The discount and the

bid-ask spread are significantly smaller compared to RMB data. This has important consequences for the two countries' policy makers.

TABLE II

Term	Bid	Ask
Spot	7.7628	7.7638
1 month	-70	-66
3 months	-208	-201
6 months	-395	-385
1 year	-745	-725

We would like to analyze these policy effects next. There are two cases of interest. The first is a market perception of no correlation between the RMB and HKD. The second is the case of high perceived correlation.

4.1 No HKD-RMB Correlation

We consider a *foreign* decision maker willing to take a position that would benefit in case RMB is revaluated. We analyze the costs and benefits of such a position under no HKD-RMB correlation.

If this decision maker expects an RMB revaluation, *and* if it is believed that during such an event, HKD dollar will remain pegged, then this decision maker has no choice but to take the RMB positions through some type of derivative written by an *offshore* investment bank.

This is the case, since HKD cannot be a good proxy for RMB and Hong Kong markets cannot be used to take these positions. Then, the client uses off-shore markets. The investment bank writing these NDF contracts will use parties in local RMB markets to hedge its positions. As mentioned above, the cheapest position is likely to be an asset swap. However, given that we don't have reliable data on such a swap, consider the cost of the NDF positions using the 1-year NDF contracts.

According to Table I, the party betting on a RMB revaluation would, essentially, sell dollars against Renminbi within 1-year at a price of 7.7871. In a position of \$10 million, the party would then receive RMB77.81 million, 360 days later. If, at that time the RMB has been revaluated, and the exchange rate is significantly below 7.7871, these RMB can be re-exchanged into USD at a profit.

On the other hand, if there has been no Renminbi revaluation, this party would suffer *significant* losses. In fact, under the conditions of Table I, if

no revaluation occurs, the RMB 77.81 million received in 360 days will be reconverted into USD at the “old” exchange rate of 8.2800. This would equal \$9.4 millions. The party will face a 6% loss. This is the *risk* of taking a \$10 million RMB position towards a possible RMB revaluation.

4.2 Strong HKD-RMB Correlation

Now, suppose markets think that a RMB revaluation will be accompanied, in high probability, by a HKD revaluation. These revaluations may not be identical, but suppose markets believe that the correlation is *high*.

Then, the costs of taking positions change dramatically. The party under consideration, would instead sell USD against HKD in 1 year’s time at a price of 7.6883. If, in one year’s time the RMB has been revaluated, *and* being highly correlated with RMB, the HKD also appreciated relative to USD, then these HKDs will be sold against USD at a profit.

To see the dramatic difference between taking these position in RMB and HKD markets respectively, consider what happens if there is no RMB revaluation. In fact, if there has been no Renminbi revaluation, the HKD exchange rate would not change. It would remain around 7.7628. Then, this party would suffer losses. However, and this is the important point, these loses will be *less* than 1%.

We see that the HKD markets offer significantly more advantageous conditions for taking the RMB-revaluation positions. This advantage comes from the fact that HKD forwards are priced off the money market interest rate differentials, whereas RMB NDF’s reflect the effects of supply and demand of speculative positions. The capital account being closed in China, large NDF differentials cannot be arbitrated away.

One implication of this is the potential switch of RMB “plays” from the offshore RMB NDF market, to Hong Kong money markets. The likely effects of this could be significant. To the extent HKMA intervenes in the market to preserve the peg, this would mainly increase the HKD liquidity, lower HKD interest rates, and drive the HKD into a lower discount. However, unlike the RMB NDF market, HKD forwards are priced off the interest rate differentials. True, interest rate differentials may get bigger if HKD interest rates go down, but currently, 1-year short USD rates are also very low. Thus, the actions by HKMA can never drive the HKD discount to anywhere near the RMB NDF discounts, which, we can say, are priced off *supply and demand*.

5 Conclusions

There are several conclusions from the observations discussed in this paper.

First, most outside observers of the Renminbi-USD markets follow the events by looking at the state of the NDF market. This is quite misleading from a risk management point of view. Given the very high cost in case these anticipations are *not* borne out, sophisticated players are likely to put these positions using asset swaps or TRSs.

The high discounts that exist in the NDF market can support many unhedged positions put in place by selling the USD short against the RMB. As long as NDFs remain unhedged, the effects of these positions on local Chinese markets are likely to be relatively small. However, if the sophisticated players have taken these positions through bond swaps, then this may imply significant fixed income positions in the local Chinese bond market. These positions are likely to be non-transparent as well. Unwinding of these positions may cause volatility at a later stage. Central Bank may have to manage a sell-off in the local bonds and Renminbi simultaneously.

Second, the paper suggested that as soon as HKD is perceived to be a good proxy for betting towards an RMB revaluation, the lower costs of taking the same positions in the HKD market would make them much more advantageous. Hence, both the demand for HKD bonds, and HKD itself would increase through positions taken with derivatives.

Third, the HKMA intervention in the market is likely to have no effect on players' calculations, since USD and HKD short term interest rates are already very low. Even if the bet on a RMB and hence, HKD revaluation loses, the loss is likely to be less than 1% of the *notional* amount invested.

Thus, it appears that at the currently low interest level environment, the *only* way one can prevent such proxy RMB positions is to lower the perceived correlation between RMB and HKD. Yet, this is difficult to do as long as USD depreciates, the peg is maintained and the Hong Kong economy does better. Under these circumstances, the markets would expect that a "small" revaluation of HKD would not hurt the Hong Kong economy and, hence, expect the HKD be revaluated along with RMB. In other words, the existence of the peg itself strengthens the correlation between RMB and HKD as long as USD keeps depreciating. Hong Kong policy makers should be braced for more *RMB proxy trades* put in place.

References

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Figure 1: Bond equivalence of a standard FX-Forward

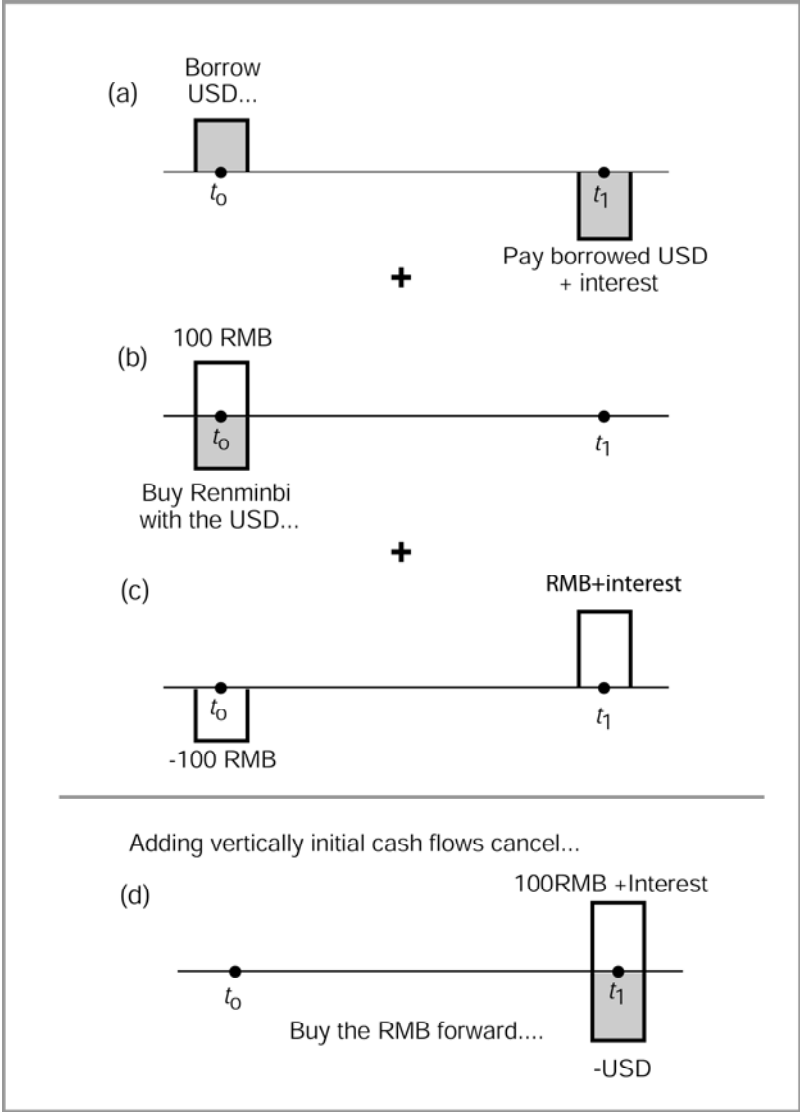


Figure 2: A Swap

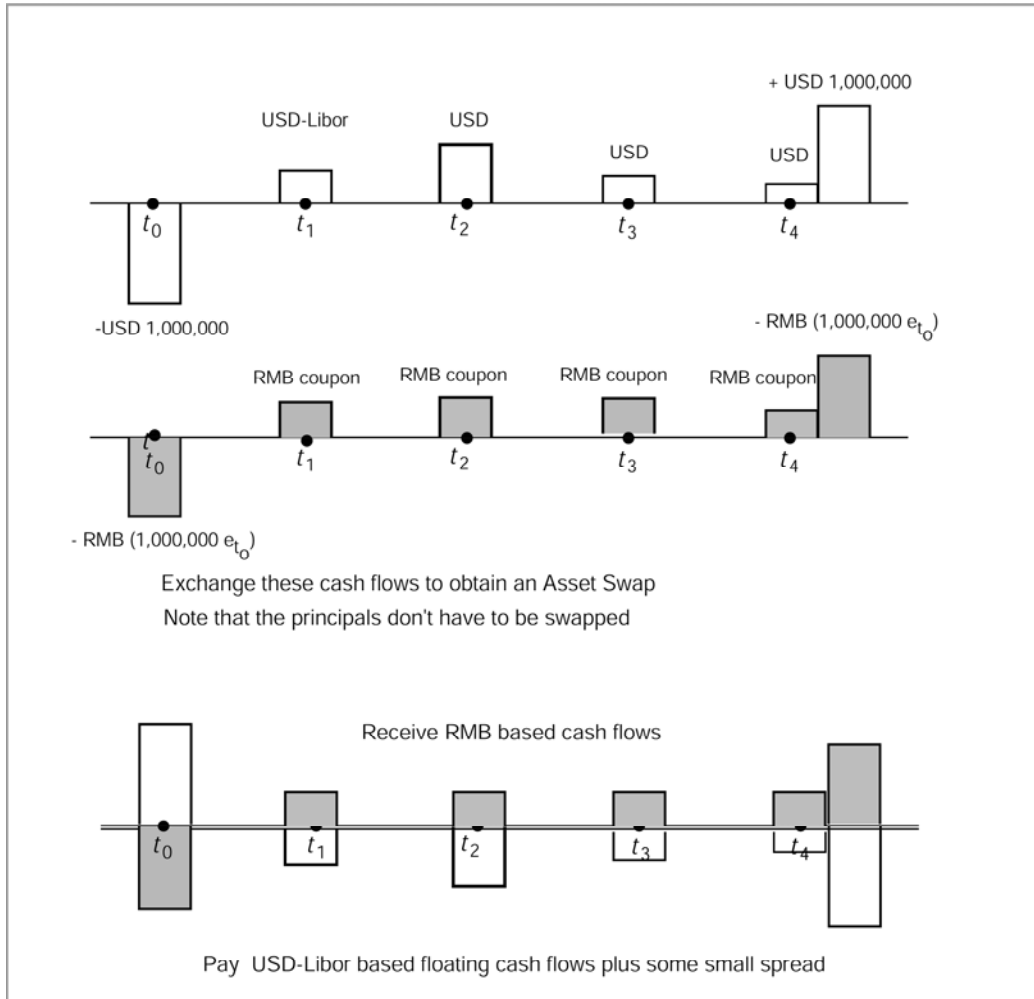


Figure 3: A bond swap

