

The Exchange Rate Dimension in International Asset Allocation – Lessons Learned from the Current Financial Crisis

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1. Motivation and introduction

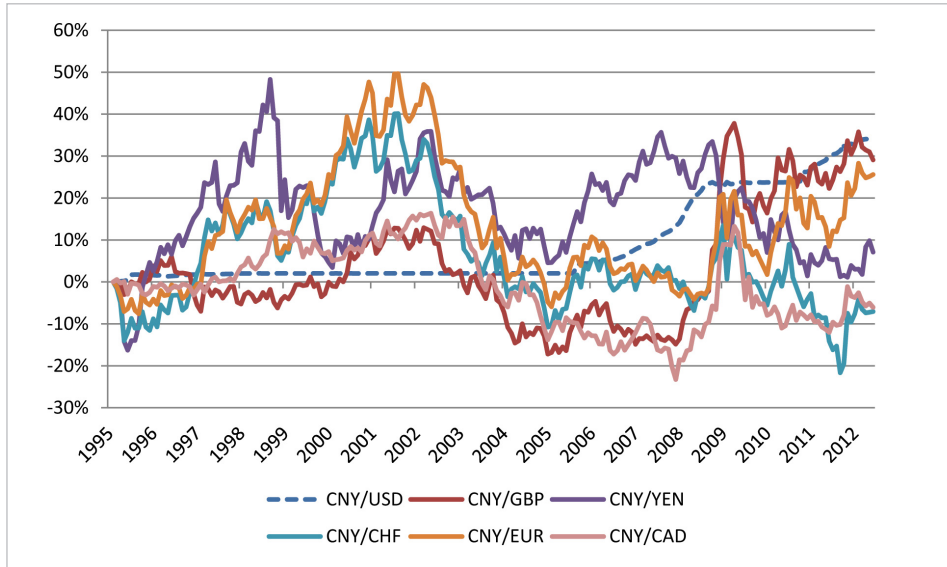
High government debt levels in several European countries and significant trade imbalances in some of them, combined with the fact, that the European Monetary Union enforced an inflexible monetary policy, led to the emergence of a euro financial crisis starting in 2009. As a consequence, lost confidence in the repayment ability of some European Sovereigns led to sharply increasing interest rates for battered EU member states (like Greece, Ireland, Portugal, Spain, Italy), followed by the devaluation of the Euro towards major currencies and also to increasing volatilities of exchange rates (Weisbrot, Montecino, 2012). As of October 2012, the situation is still unsolved, although the European Central Bank and the European Union send positive signals in order to help Greece to regain the power to act as a sovereign and to reschedule the debt such that the markets regain trust in the government decisions. Although the situation seems to be tranquilized, the development of the last 3–4 years alongside the so-called “second tier (or subprime) mortgage crisis” underline, that regional crises in our globalized world become very quickly a global crisis with significant implications not only for local, but for international asset management as well.

This paper is motivated by the increased volatility on foreign exchange markets, caused by the recent crisis, and its implications on international asset management. The questions posed in this paper are:

- Is international diversification favourable even if facing high exchange rate risks?
- Should investors hedge internationally diversified stock portfolios against exchange rate risk?
- Is it important for international asset management decisions to know the reference/numeraire currency?
- Does the answer to the last question change if the decision maker follows an active asset management strategy?

In order to offer recent and robust empirical implications of these questions they are answered from the perspective of a variety of different investors. As an example we have chosen the view of Chinese and Russian investors next to Swiss and European ones. For the following computations, figures and tables we used monthly data on exchange rates, stock indices and interest rates from Datastream and from the IMF’s International Financial Statistics Database.

Figure 1: Nominal Re- and Devaluation of the CNY, 1995–2012



Source: Calculated according to the data provided by Datastream

A general impression of nominal exchange rate changes is given by Figure 1, which depicts the development of the Chinese currency towards nine other currencies. The Chinese currency perceived a nominal appreciation towards most of the currencies with exceptions of the Swiss Franc and Canadian Dollar. Curves above the 0%-level express a nominal appreciation of the CNY. High volatility across most currency pairs for the observation period is noticeable with only exception of the US currency, which is caused by the peg of the CNY to the USD. The same figure for the Russian currency would show a significant devaluation of the Rubel.

Table 1 discloses an increasing annual volatility of CNY-exchange rates during the last years. The average volatility p.a. (bottom row) is in general lower than volatilities in the recent 3–4 years. On the one hand highest volatility values per currency pair (dark shaded) are to be observed in recent years for the majority of currencies (USD, GBP, CHF, EUR, AUD, CAD, INR)

Table 1: Volatility of CNY-Exchange Rates, 1995–2012

	CNY/USD	CNY/GBP	CNY/RUB	CNY/YEN	CNY/CHF	CNY/EUR	CNY/AUD	CNY/CAD	CNY/BRL	CNY/INR	CNY/HKD
1995	1.26%	6.23%	21.38%	18.00%	13.88%	8.34%	7.85%	5.15%	5.78%	5.73%	29.48%
1996	0.27%	7.16%	1.97%	6.57%	9.83%	6.01%	6.18%	3.27%	0.49%	8.09%	9.88%
1997	0.08%	8.46%	1.18%	12.52%	10.43%	11.02%	7.05%	4.17%	0.35%	7.81%	10.54%
1998	0.04%	6.19%	62.42%	22.48%	10.38%	8.65%	11.99%	4.90%	0.59%	5.17%	10.44%
1999	0.04%	6.02%	15.42%	11.51%	8.34%	7.91%	10.15%	5.65%	52.97%	1.44%	8.30%
2000	0.06%	6.12%	6.23%	10.07%	8.80%	8.82%	11.98%	4.15%	10.12%	2.46%	8.77%
2001	0.01%	7.08%	1.30%	11.69%	11.57%	12.28%	15.26%	6.07%	16.02%	2.02%	11.56%
2002	0.02%	6.57%	1.59%	10.19%	7.97%	7.59%	9.47%	6.78%	33.35%	1.28%	7.98%
2003	0.01%	9.81%	2.75%	7.80%	12.33%	11.18%	10.24%	7.23%	17.28%	1.78%	12.87%
2004	0.01%	9.57%	4.52%	11.18%	9.48%	8.69%	9.93%	8.82%	11.39%	6.62%	9.75%
2005	2.07%	8.46%	3.98%	7.31%	9.18%	7.96%	4.99%	6.62%	9.62%	4.42%	9.17%
2006	0.66%	7.80%	3.36%	6.17%	7.89%	6.47%	9.84%	8.35%	14.65%	5.47%	8.01%
2007	0.68%	3.84%	3.62%	7.63%	6.28%	5.94%	12.05%	10.88%	11.04%	6.12%	6.34%
2008	2.50%	13.09%	7.82%	11.57%	9.51%	11.28%	18.81%	12.76%	22.20%	7.64%	9.56%
2009	1.03%	13.36%	23.48%	11.50%	16.37%	14.80%	18.43%	15.67%	14.13%	10.79%	16.42%
2010	2.01%	11.09%	8.48%	13.08%	13.32%	14.17%	15.32%	7.92%	10.78%	8.00%	13.58%
2011	1.38%	8.10%	15.17%	6.96%	19.69%	10.88%	15.97%	9.08%	19.17%	8.87%	19.73%
Average	0.71%	8.17%	10.86%	10.95%	10.90%	9.54%	11.50%	7.50%	14.70%	5.51%	11.91%

Source: Calculated according to the data provided by Datastream

On the other hand, lowest volatilities have been calculated for 2007 or the years before (non-highlighted areas). Table 2 provides the correlation matrices for 1993 and 2011. This comparison contradicts the often presumed assumption of increasing correlation coefficients between exchange rates. From 15 selected correlation coefficients 7 show a decreasing coefficient. This table also underlines that correlation coefficients are still far from being equal to 1, which leaves a lot of room for diversification.

Table 2: Correlation Coefficients over Time, 1993 (lower left corner) and 2011 (upper right corner, highlighted)

	EUR/USD	EUR/GBP	EUR/CHF	EUR/YEN	EUR/RUB	EUR/CNY
EUR/USD	1.00	0.59	-0.08	0.86	-0.17	0.99
EUR/GBP	0.41	1.00	0.07	0.59	0.13	0.57
EUR/CHF	-0.09	0.24	1.00	0.23	0.61	-0.03
EUR/YEN	0.64	0.47	0.25	1.00	-0.15	0.89
EUR/RUB	0.54	0.50	0.20	0.29	1.00	-0.17
EUR/CNY	0.99	0.47	-0.07	0.69	0.55	1.00

Source: Calculated according to the data provided by Datastream

As a result we can summarize that exchange rates are in general quite volatile, in nominal and real terms. We could reconfirm that, beginning with the financial crisis, volatility of exchange rates increased. Furthermore, we have shown that correlation coefficients between exchange rates are not close to 1. In the following chapters we discuss the implications of these findings for international asset allocation.

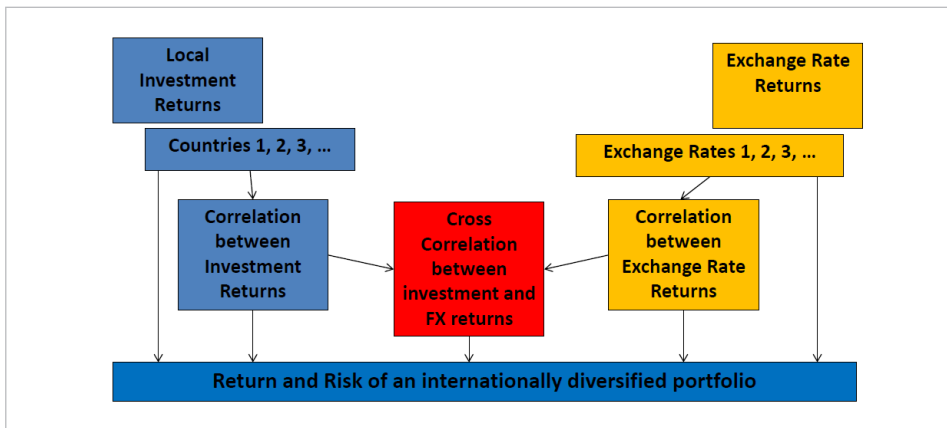
2. International asset allocation

2.1 Risk and return drivers in international asset allocation

Asset allocation defines the structure of a portfolio based upon asset categories shall be included, i.e. investments into cash, bonds, stocks, real estate, commodities, exchange rates, countries, alternative investments etc. (Bodie, Kane, Marcus, 2009, p. 957). This decision is the result of an optimization approach. The capital asset pricing theory (CAPM) gives us an understandable relationship between risk and expected return, but this model describes an economy with only one currency. The framework was later extended to the international context (Grauer, Litzenberger, Stehle, 1976). In an international setting the investor faces the risk that purchasing power parity does not hold and thus real exchange rate changes positively or negatively influence the performance of an international portfolio (Solnik, McLeavey, 2009, p. 126).

Risk and return drivers in an internationally diversified portfolio are influenced by two sources (Solnik, McLeavey, 2009, pp. 388, 878). On one hand we have to consider investment returns in local markets, calculated in local returns. On the other hand we have to respect the exchange rate between the local currency and the reference currency of the investor. In fact the calculation of the return risk will become quite complicated, as the investor has to consider the correlation coefficients between local investment markets, correlation coefficients between the relevant exchange rates and finally also the cross-correlations between investment markets and exchange rates. Figure 2 visualizes these drivers.

Figure 2: Return and Risk Drivers in an International Portfolio



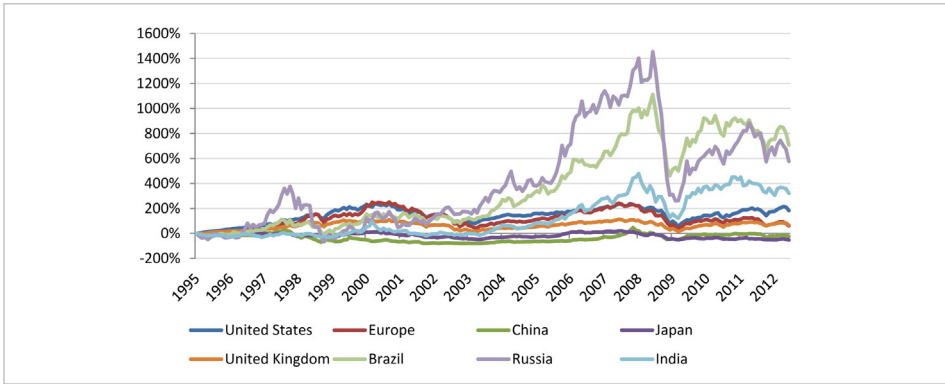
Source: authors' illustration

In case of an internationally diversified portfolio, cross-correlations have an important impact on the overall portfolio risk. Nevertheless, because of the broader asset universe, diversification over multiple countries and currencies leads in general to lower portfolio risk compared to an investment in only one single currency market.

2.2 Passive and active investment approaches

Asset allocation can be classified into a passive and an active approach (Bodie, Kane, Marcus, 2009, pp. 512 ff.). The passive investment approach assumes given security prices to be fair. Consequently, investors try to structure their portfolios in order to receive an appropriate risk-return relationship. Generally, this leads to an investment into the market portfolio.

Figure 3: Equity Investments in Domestic Currencies, 1995–2012

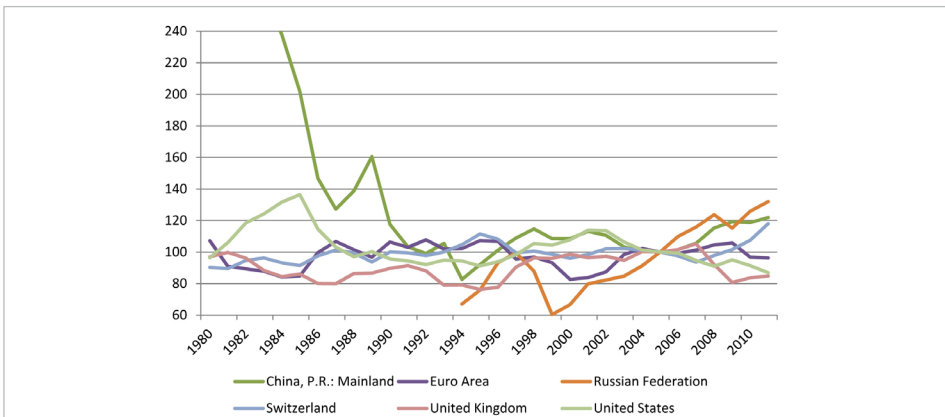


Source: Calculated according to the data provided by Datastream

An active approach in asset allocation corresponds to a short-term oriented deviation from strategic asset allocation weights in order to profit from the current over- or undervaluation of assets compared to the equilibrium price. Active management leads to the under- or overweighting of specific asset classes. Investors have to understand that a deviation from passive asset allocation means an active management of portfolios. Investors should also fully understand that active asset allocation only makes sense, if the decision maker is convinced about his ability to beat the market portfolio. For this approach the investor is in need of research and information that is qualitatively better than that of other market participants.

The higher the volatility of an asset the larger is the potential gain that can be earned through active management. Figure 3 depicts the progress of equity markets, expressed in local currencies. These risks are stressed on the left side in Figure 2. Uncertainty related to exchange rate changes (right side of Figure 2) is demonstrated in Figure 4.

Figure 4: Effective Exchange Rate Index 1980–2011 (2005 = 100)



Source: Data from International Monetary Fund, International Financial Statistics Database, 2012

Finally the investor has to decide whether he wants to be invested passively or he rather follows an active approach according to his forecast of local stock markets and foreign exchange rates. Any volatile price movement of local stock markets and/or efficient exchange rates (refer to Figure 3, 4) could be used to invest (go short) in increasing (decreasing) stock markets and to invest (go short) in appreciating (depreciating) currencies. This is a trivial but “golden rule” in active international asset allocation.

2.3 Is international diversification advantageous?

In the preceding subchapters we discussed the risk and return drivers of international investments and we mentioned the possibilities of active asset allocation strategies to take advantage from different forms of existing risks. In this closing subchapter we deliver a preliminary judgment on the profitability of international diversification based on the respective literature. As we discussed active management issues in the preceding subchapter, it is necessary to underline, that the following findings have been mostly obtained on the basis of passive investment management strategies. Moreover, prior delivering an overview about the research results, it is important to emphasize, that research approaches in this study not only use return, but also risk as a criterion for measuring the advantage or disadvantage of international diversification. The return figure alone in this context remains an incomplete measure.

Among many studies we only refer to early works from Solnik (1974) and Odier and Solnik (1993) to confirm the improvement of portfolio performance caused by international diversification. One recent research study by Vermeulen (2011) states that international stock market diversification provided large gains during the financial crisis, compared to a pure domestic investment. According to Vermeulen, international diversification has an important positive effect on stabilizing a country’s equity wealth. However what counts is not diversification as such, but effective diversification in assets with low correlation to each other.

Fernandes and Ornelas (2010) also point out that benefits of international diversification exist and that they are higher for less risk-averse investors. They underline the importance of the numeraire, having a strong effect on portfolio optimization. Chiou (2008) could prove that local investors in less developed countries like East Asia and Latin America benefit more from both, regional and global diversification. Driessen and Laeven (2003) come to a similar result. According to their study, investors in developing countries – or more broadly formulated – in economic areas characterized by high country risk benefit most from international diversification.

Apart from the mentioned studies, an equally important research field deals with the question, whether investors are experienced enough to invest abroad. Bailey, Kumar and Ng (2007) tried to shed light on that question. According to their study, wealthier and experienced investors enjoy an informational advantage and experience good portfolio performance. The remaining group of market participants, often behaviorally biased investors, misuse foreign equity securities and experience poor portfolio per-

formance. Some investors only use foreign securities for speculation or try to improve their poor domestic portfolio performance. In this study, although existing, we do not refer to the last two groups of investors.

To summarize, not only early works by Solnik (1974) or Odier and Solnik (1993) proved significant positive effects of international diversification, even the most recent studies confirm this result. A number of the studies stress that policymakers will benefit, if they reduce barriers for foreign stock investments.

3. Case

In the following we describe a simple internationally diversified portfolio. We assume an investor who allocated his funds into MSCI stock market indices of 12 countries (investment locations) on the timeframe from 1992 to June 2012. Table 3 provides the weights of the allocation. World portfolio weights to be found in the literature are slightly different, as we either took averages, or rounded them to 5% in order to obtain a simple model.

Table 3: Structure of Case Portfolio

United States	20 %
Europe	15 %
China	10 %
Japan	10 %
Australia	10 %
United Kingdom	5 %
Canada	5 %
Switzerland	5 %
Brazil	5 %
Russia	5 %
India	5 %
HongKong	5 %
Sum	100 %

Source: authors' illustration

The weights given in Table 3 have been taken for the calculation of portfolio risk and return starting in 1992. Portfolio risk and return have been determined from the perspective of investors with different domiciles. Accordingly, their reference currencies are different: notation for Swiss investors in CHF, for euro area investors in EUR, for Chinese in CNY and for Russians in RUB. We calculated annual performance with monthly rebalancing and did not include wealth effects for consecutive years.

Table 4: Results for Different Reference Currencies (1995–2012)

	CHF – Investor		EUR – Investor		CNY – Investor		RUB – Investor	
	Portfolio							
	Return	Std. Dev.	Return	Std. Dev.	Return	Std. Dev.	Return	Std. Dev.
1995	-8.42%	2.76%	-2.90%	2.76%	0.25%	3.00%	28.05%	5.45%
1996	29.74%	2.49%	21.42%	3.54%	17.48%	1.92%	36.32%	2.14%
1997	16.39%	5.39%	20.73%	7.10%	7.02%	4.74%	11.03%	4.81%
1998	-16.54%	7.74%	-17.97%	9.39%	-12.88%	7.74%	96.79%	13.25%
1999	33.59%	4.10%	34.43%	5.45%	19.16%	3.86%	60.04%	5.27%
2000	-2.38%	4.91%	3.43%	4.72%	-11.14%	4.52%	-6.25%	4.56%
2001	-23.87%	6.90%	-21.38%	6.65%	-19.37%	5.80%	-12.06%	5.92%
2002	-23.26%	5.82%	-23.17%	5.36%	-11.58%	4.87%	-5.81%	4.92%
2003	14.48%	5.53%	9.23%	4.99%	28.42%	3.11%	20.83%	3.13%
2004	4.88%	2.87%	6.96%	2.27%	18.21%	3.47%	12.00%	2.90%
2005	30.19%	3.82%	28.61%	3.65%	12.75%	2.76%	18.12%	2.86%
2006	14.49%	3.38%	11.31%	3.16%	21.71%	3.06%	14.50%	2.65%
2007	19.42%	4.09%	15.71%	3.39%	19.81%	3.43%	17.79%	3.36%
2008	-69.84%	7.83%	-61.63%	6.41%	-84.32%	7.22%	-64.44%	6.24%
2009	26.08%	6.60%	27.06%	6.16%	45.09%	8.31%	49.55%	6.25%
2010	3.48%	5.02%	17.51%	3.30%	0.75%	5.47%	11.41%	4.01%
2011	-17.97%	4.47%	-11.88%	4.31%	-13.04%	6.29%	-9.08%	2.82%
2012	-7.60%	4.31%	-0.71%	4.30%	-22.11%	6.36%	-3.22%	1.49%
Average	1.27%	4.89%	3.15%	4.83%	0.90%	4.77%	15.31%	4.56%

Source: Calculated according to the data provided by Datastream

The results show that investment performance is heavily dependent on the home currency of the investor. The average return for the investigated period is around 0.90 % p. a. for the Chinese and 15.31 % p. a. for the Russian investor. The average return for a Swiss investor is close to the Chinese results, while a Euro investor's return is slightly higher. Despite these huge differences in portfolio return, the portfolio volatility is with around 4.7 % p. a., nearly the same for all investors in consideration. This fact can be understood as the strong and convincing implication on stable portfolio risk in international diversification.

We also see significant differences in annual results across currencies as well as across time. Signs of the yearly returns are similar for EUR and CHF, as well as for RUB and CNY.

Although all investors have invested according to the same weights in the same stock indices, the results are very different. This is purely caused by exchange rates. Russian investors "profited" from the fact that their currency depreciated substantially over the years, thus foreign investments have been very profitable in home currency terms. Chinese investors had to face the opposite situation and thus their investment performance was quite low. We have to emphasize that this is a nominal perspective. The devaluation of the RUB came along with high inflation rates in Russia, consequently, despite highest returns, investors have been punished by a decreasing purchasing power of their RUB income.

4. Interaction levels of the exchange rate dimension

Exchange rates have a multi-dimensional influence on the asset allocation decision. Of course, one of the most important decisions is on hedging exchange rate risk. On the other side, the hedging decision depends upon the reference currency of the investor. Furthermore, the exchange rate risk is also influencing the investment currency and the investment claim decisions. All these questions have to be answered depending on the individual situation of the investor, thus we claim that no universal asset management strategy covers individual investor needs.

4.1 Role of the reference currency

Knowing the numeraire of the investor is the basis for all succeeding decisions. If the investor follows a passive approach and allocates according to a classical e.g. world-capitalization based strategy, the structure of the international portfolio is not be influenced by the reference currency. At the same time the performance will depend on the reference currency, as we have described it in the case before.

If the investor follows an active management approach, knowing the reference currency is crucial for utilizing forecasts on future exchange rate changes, which enables to change the weights of currency investments. Therefore, in case of an active investor, the reference currency will likely influence the international asset allocation decision, too.

4.2 Decision on hedging exchange rate risks

From the corporate finance literature we know the differentiation of exchange rate risk in translation, transaction and economic exposure (Eiteman, Stonehill, Moffett, 2010; Madura, 2011). The concepts of transaction and economic exposure can be transferred to international asset management.

Transaction exposure captures the company's profitability risk caused by exchange rate changes on accounts receivables and payables. In case of investments, we expect coupon payments and repayment of the face value at known maturities. Classical methods of hedging transaction exposure claim that the use of financial instruments like forwards, futures or options is appropriate.

Economic exposure – in corporate finance – focuses more on changes in the competitive position of a firm caused by exchange rate changes. In case of investments, long-term payments without fixed maturities and future settlements to be received in local currency evoke economic exposure. Conventional methods of hedging economic exposure in corporate finance reveal that in these situations the use of financial instruments like forwards and futures is not appropriate. These positions require to be fulfilled at a certain date, whereas the future settlement to be received is unsure regarding payment date and amount. As a result, by using forwards or futures for hedging, the decision maker could potentially increase his risk rather than reducing it. On the other hand, options could be used, as there is no obligation to exercise them. However, as in corporate finance firms are advised to use strategic hedging instruments, in the field of investments we similarly advise same methods. In the following two subchapters we examine these approaches and take a look at the aspects of the investment currency – meaning the market strategy –, moreover on the financial claim – meaning the product strategy. Although this categorization in transaction and economic exposure guides us to identify the best hedging instrument to be chosen, the investor still faces the difficult question if and to which extent to hedge. This decision depends on his individual risk aversion and his ability to bear risks. This will also depend on his existing asset allocation and on the degree at which exchange rate risks are already diversified. Lastly, the hedging decision also depends on the exchange rate risk sensitivity of the instruments he is invested in, which will be discussed in the last subchapter.

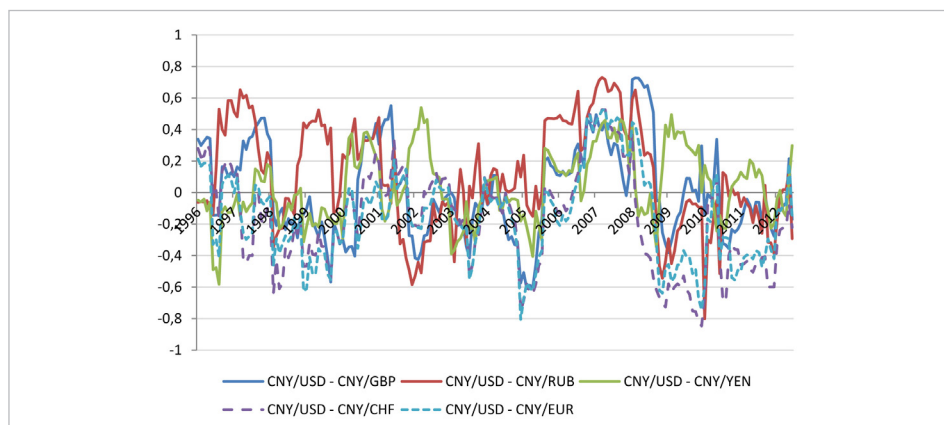
4.3 Role of the investment currency

Considering a pure passive management approach the investment currencies and their portfolio weights are given by the world market capitalization. In case of an active management approach the investor can concentrate his investments on specific currencies. Of course, an important condition for the active approach is the analysis and forecast of exchange rate changes.

On one hand the investor will try to invest in currencies appreciating in the future, as he will invest in stock markets, which he expects to increase in the future. Expected currency depreciations could be used to go short in these currencies.

On the other hand the investor will try to combine currencies that minimize portfolio risk. For this approach the investor uses his forecasts on correlations between currency pairs. Either he is mixing a low risk portfolio with the use of correlations right from the beginning, or at a later stage he tries to add risk-reducing currencies to his existing positions. In case he is able to identify the currency pairs with the lowest correlations, his choice will offer a lower portfolio risk than the volatility of a passively managing investor. Figure 5 depicts the correlation of currency pairs for CNY over time. Despite the high volatility of correlations a certain pattern arises. USD/CHF and USD/EUR exhibit mostly a lower correlation than USD/GBP, USD/YEN and USD/RUB. Let us assume a Chinese investor with an over weighted asset position in USD. If he wants to add new investments efficiently and reduce portfolio risk, he would prefer EUR- and CHF-investments, but not GBP-, YEN- or RUB-investments.

Figure 5: Correlation of Currency Pairs, 1998–2012



Source: Calculated according to the data provided by Datastream

4.4 Role of the investment claim

Depending on the investor's reference currency, his hedging decision and the chosen investment currencies he finally can decide on the investment claim. Different investment claims show different price sensitivity to exchange rate changes. This is the final exchange rate related choice of the investor.

The stock price in local currency is also reacting to exchange rate changes, as the competitive position of a company is likely to be influenced by the currency pair, consequently impacting the firm's cash inflows. Often the effect of exchange rate changes is weakened by a contrarian development of the stock price in local currency. If a Chinese investor is invested in the US where the currency depreciates, the investor is facing a decreasing value of CNY. Yet simultaneously, with the depreciation of the USD and a better competitive position of the US firm the stock price of the US firm is likely to increase, which consequently reduces or even compensates the overall negative effect for the Chinese investor. The absorbing exchange rate and stock price behavior acts as a buffer.

The bond price in local currency is reacting to changes in the local interest rate, but not directly to exchange rate changes. Even more important, the nominal value, repaid at maturity remains constant and is independent of exchange rate changes. As a result, the reference currency value of a foreign currency bond investment is very sensitive to exchange rate changes. This enables the use of foreign currency bonds as a leverage instrument for expected exchange rate changes. A Russian investor, expecting a revaluation of the EUR, could invest into a EUR bond and thus increase the value of his investment as soon as market changes meet his expectations. Compared with a stock investment, a bond investment acts more as a leverage instrument to take advantage from expected exchange rate changes.

5. Conclusion

Exchange rate risks have increased with the financial crisis. With this contribution we shed some light to the role of exchange rate risks for decision-making in international asset allocation. In order to cope with this increased risk we decompose the exchange rate dimension in four different interaction levels.

On the first level the investor's reference currency is the starting point for taking care of exchange rate risks in asset allocation. As the investment portfolio with many different currencies has to be valued from the viewpoint of one numeraire currency, two investors with a different numeraires but same international portfolio positions will likely be facing different changes of their wealth at the end of the period. Looking at investors favoring active management, their reference currency will play a role to find the optimal currency structure of the portfolio.

On a second level, the hedging decision has to be solved. Dependent on the type of future foreign currency cash flow streams either financial instruments or strategic instruments have to be utilized.

On a third level the investor has to decide on the investment currencies. Based on his numeraire the active investor will select currency positions according to the risk structure of the existing portfolio. Moreover, expected re- or devaluations of his home currency towards other currencies will be taken into account.

On a last level the investor has to decide on the asset claim to invest in. Because of the different sensitivity of home prices towards exchange rate changes, stocks and bonds cannot be judged equally. While stocks act as buffer to exchange rate risks, bonds work more as a leverage instrument for portfolio performance to exploit profit from exchange rate changes.

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