Currency Management Indexes: What Do They Tell Us?*

Emmanuel Acar Momtchil Pojarliev

Final draft: 26th January 2009

Abstract

The volatility of currency manager's indexes is exhibiting a downward trend. This decline can not be explained by the volatility of the foreign exchange market. We make use of a new database on currency managers over eighteen year period to highlight some of the challenges surrounding the construction of currency indexes. We show that not correcting for the numbers of managers included in the index and for the correlation between their returns substantially bias the volatility of the index. While some of the issues are methodological, attempt to resolve them only reinforce the complexity of the challenges ahead of us. Yet, we hope that our findings will constitute some preliminary work and encourage further research on the construction of hedge fund indexes.

Contact details:

Emmanuel Acar, Directional Trading Limited
Email: emmanuel.acar@directionaltrading.com .

Momtchil Pojarliev, Hermes Fund Managers Limited
Email: m.pojarliev@hermes.co.uk .

* Forthcoming in Middleton, A (2009), "Foreign Exchange: A Practitioner's Approach to the Market", Risk Books

Currency Management Indexes: What Do They Tell Us?

1. Introduction

Over the last decade investors have been increasing their allocation to alternative investments. This has put currencies on the radar screen as an alternative asset class. Nevertheless, allocation to currencies is still relatively small compared to allocations to other alternative investments (like hedge funds, real estate and private equities). One reason for that may be the lack of well-defined benchmark for currency managers. Institutional investors are challenged to find an appropriate benchmark to evaluate the performance of their currency managers. The traditional benchmark for currency managers has been zero for unfunded mandates and the return on the risk free rate for funded mandates. Such benchmarks mean that all the returns generated by currency managers are alpha returns and beta returns are assumed to be zero. Recently, Pojarliev and Levich (2008) have proposed a 4-factor model as a new way to gauge and rank the performance of currency managers. They redefined the alpha generated from currency managers from all the excess return over the risk-free rate to only that part of excess return over the risk-free rate that is not explained by the 4 factors. Naturally, institutional investors might be interested not only in the individual performance of their currency managers, but also in their performance relative to a peer group[1]. Thus, indexes which track the performance of currency managers are also important for the currency management industry.

There exist a number of indexes, which aim to track the performance of the currency management industry and might serve as useful indicator for the performance of the peer group. What are these indexes telling us? Over the recent 3-4 years, the main focus in the market has been on the diminishing returns on these indexes (see for instance Johnson, 2007 and Euromoney, 2008). We argue that looking at the volatility of the returns might be important as well as it could highlight some of the biases incorporated in these indexes and partly explain the close to zero performance. In Figure 1 we plot the volatility[2] of several currency indexes. It is striking that the volatility of the currency indexes exhibit downward trend since their inception. For example, the volatility of the Barclay Currency Trader Index (BCTI) has dropped from a high of 23.09% in the 1990's to an all time low of 2.15% as of April 2008. The volatility of other currency indexes exhibits a similar pattern. This trend could not be explained by a decline in the market volatility. Figure 2 highlights that the volatility of the foreign exchange market[3] has been moving in a broad 4.31% - 22.18% range and in the most recent months has been towards the middle of this range. Our main proxy for the volatility of the foreign exchange market is the volatility of the returns on the USD Broad index. The broad index is a weighted-average of the foreign exchange values of the U.S. dollar against the currencies of a large group of major U.S. trading partners and is computed by the Federal Reserve. Using the implied volatility (see Figure 2) as an alternative proxy shows a similar pattern: a broad 5.18%-17.6% range and again the values of the most recent months are towards the middle and not the bottom of this range.

In this study we focus on the following research question: What factors explain the decline of the volatility of currency managers' indexes? We suspect that the rapid

increase in the number of currency managers over the recent years might be one of the reasons[4].

To test our hypotheses, we make use of a new database of currency managers from SEB. We apply different weighting schemes to construct indexes designed to track the performance of these managers. Our experiment highlights that if one does not correct for the number of managers included in the index and for the correlation between their returns then this will substantially bias the volatility of the index. We argue that some of the existing weighting schemes are inappropriate. Indeed, hedge fund indexing is known to be challenging (Brewster, 2007). However we hope here that our proposed methodology, whilst it may not solve the issue of data accuracy, will indeed help remove some of these fundamental construction biases.

2 Data Description

In this study, we make use of a new database of currency managers collected by the Skandinaviska Enskilda Banken. We obtained[5] monthly return data for 141 currency managers on an anonymous basis from January 1990 until March 2008. Strictly speaking, the term "manager" stands in this study for "program"[6]. Furthermore, for statistical analysis purposes, we focus only on managers with at least four years track record as of the end of March 2008. This resulted in 73 managers.

In Figure 3 we plot the number of managers in the SEB database and the Altvest Currency Index[7] through time. It illustrates that, similar to other databases, the starting year contains very few managers (in our case only 2) while there are 73[8] managers as of the end of 2007. This highlights one of the greatest challenges for

hedge funds index providers. Stock market indexes like the Dow Jones index and the S&P 500 index are tracking a constant number of stocks. This ensures stability in the sense that looking at S&P 500 index as of the end of March 2008 is similar as looking at the index as of the beginning of 1990. While some stocks drop out of the index and new stocks come into the index, the number of stocks is held constant. In the case of the hedge fund indexes, the rapid increase in the number of available managers might mean that the same index is measuring one thing as of the end of March 2008 (as it looks at 73 managers) and possibly not quite the same thing as of January 1990 (as it would consist of only 2 managers). Schultes (2005) discusses the biases incorporated in some of the existing currency indexes such as lack of stability (massive inflows and outflows of manages), survivorship bias and self-selection bias (ie, whether the data vendor approach the managers or vice versa).

Table 1 summarizes the descriptive statistics for the managers. We have omitted the returns as our study is focussed on the higher moments. The volatility ranges from 0.76% to 29.40%. This broad range highlights the lack of a standardised currency management mandate. Risk/return profiles vary substantially across different clients and this is an additional challenge for index providers. While the stocks in the S&P 500 index also exhibit different volatility profiles, the range is much smaller as stocks are not leveraged. In the case of hedge fund managers, the leverage could vary from a fraction to a double digit number.

The average skewness is positive (0.43) which could be interpreted as if the average manager included in the database is a trend-follower. Indeed, previous research (see among others Middleton, 2005; Binny, 2005; Lequeux and Menon, 2008) has shown

that the trend-following style is the most popular among currency managers. However, the minimum skewness of -1.43 suggests the presence of carry or short volatility strategies.

The literature on hedge fund indexes, investable or not, is abundant. Recent papers include Lhabitant (2007) and Amenc and Goltz (2008). Like any other hedge fund databases, our currency manager universe suffers from the biases reported by these authors. In particular, backfill and survivorship bias might be severe. Unfortunately, we are not able to quantify these biases with the information at our disposal. However, by focusing on the higher moments of the return distribution such as volatility, skewness and kurtosis, our findings are presumably less impacted by these biases.

3 Methodologies for Index Constructions

The modern portfolio theory tells us that the portfolio (index) volatility (σ_p) depends on the volatility of the individual assets (managers), their correlation and their weights, since

$$\sigma_p^2 = \sum_{i=1}^{n}\sum_{j=1}^{n} x_i x_j \rho_{ij} \sigma_i \sigma_j \qquad (1)$$

where x is the proportion of total investment in security (manager) i

$\rho_{i,j}$ is the correlation coefficient between security (manager) i and security (manager) j

n is the total number of assets (managers)

In the case of an equally-weighted portfolio, equation (1) becomes

$$\sigma_p^2 = \sum_{i=1}^{n}\sum_{j=1}^{n}\frac{1}{n^2}\rho_{ij}\sigma_i\sigma_j \qquad (2)$$

Thus, it is clear that increasing the number of assets (managers) will reduce the volatility of the portfolio (index) as long as the correlation between the different managers is less than one. It is unreasonable to assume that all managers are perfectly correlated, so increasing the number of managers included in the index clearly creates a downward volatility bias. Nevertheless, according to Lhabitant (2007), most index providers equally weight the performance of their underlying hedge funds when they calculate the performance of their index, without adjusting for the number of managers or for the different volatility profiles. Whilst most index providers use the mean fund return, CISDM Research Department (2006) argues that there are a number of reasons why the median is the preferred approach for hedge fund performance indexes. Using the mean may not give the best estimate when the underlying distribution deviates considerably from the normal distribution. Furthermore, the greater that discrepancy from the normal distribution, the more likely it is that the median will provide a more precise estimate of the central tendency. Finally, asset-weighted indexes are also used but will not be considered in this study owing to the lack of available data.

Naïve-Weighting

We construct two "naïve" indexes. The first Mean portfolio (index) is compromised of equally-weighted positions in each of the managers available each month over the sample period. The return on this index can be defined as:

$$R_{Mean,t} = \frac{1}{n_t} \sum_{j=1}^{n_t} R_{j,t} \quad (3)$$

where

$R_{j,t}$ is the monthly return for manager j at time t

n_t is the number of managers available on the platform at time t

The second index uses the median return, or

$$R_{Median,t} = \underset{j=1,n_t}{Median}\{ R_{j,t} \} \quad (4)$$

The term "naïve" is used because no attempt is made to cater for either varying/increasing number of managers or the huge dispersion of risk profiles as measured by individual program's volatility.

Volatility-Weighting

To remedy these limitations, we introduce two volatility-adjusted portfolios. We calculate at the end of each calendar year the annualised standard deviation of returns over the past two years (24 months) for each of the managers for which a two years track record is available. We then leverage/deleverage future monthly returns of each manager in order to target a given volatility profile, arbitrarily fixed here at an annualized ten percent figure. To simplify the rebalancing procedure, rebalancing is only performed once per year at the end of each year. For example, at the end of December 1991, there were two managers for which 24 months of track record were available, thus allowing us to compute their volatility. As a consequence though the whole 1992 the portfolio will consists of only these two managers (ie, managers who

join during 1992 are not included in the portfolio). We call this a Volatility Adjusted Mean (VMean) portfolio.

An additional adjustment is required to take into account the number of managers in the portfolio within a given year. We first suppose that the returns of the managers are uncorrelated between each others; although we will relax this assumption later in the discussion. For now to achieve our risk target, the portfolio volatility needs to be further leveraged by a factor equal to the squared root of number of managers in the index at the time. In other words the VMean portfolio might be interpreted as a volatility-weighted version of the Mean portfolio assuming that the returns of the managers are independent on each others.

Similarly a volatility weighted version of the Median portfolio consists in calculating the median return after the volatility adjustment has been made on individual manager's returns. An additional adjustment is still required to take into account the number of managers in the portfolio within a given year. Central limit theorem (Swanson, 2002) tells us that the leverage factor in the case of the median of uncorrelated returns is equal to the squared root of number of managers at the time divided by $\sqrt{\pi/2}$. Thus, the returns of these two portfolios are defined as

$$R_{VMean,t} = \frac{1}{n_{y-1}} \sum_{j=1}^{n_{y-1}} R_{j,t} \frac{\sigma}{\sigma_{j,y-1}} \sqrt{n_{y-1}} \tag{5}$$

$$R_{VMedian,t} = \underset{j=1,n_{y-1}}{Median}\{ R_{j,t} \frac{\sigma}{\sigma_{j,y-1}} \sqrt{n_{y-1}} \sqrt{\frac{2}{\pi}} \} \quad (6)$$

where

$R_{j,t}$ is the monthly return for manager j at time t

y is the calendar year corresponding to month t

n_{y-1} is the numbers of managers at year $y-1$

$\sigma_{j,y-1}$ is the annualized standard deviation on the returns of manager j calculated as the end of calendar year $y-1$ using the returns over the past 24 months

σ is the target volatility assumed to be an annualized 10% figure

We are now able to assess the higher moments generated by our four weighting schemes (see Table 2). The period covers January 1992 to March 2008 for which all indexes are available. To further analyse the results we used Monte-Carlo simulations similarly to Acar and Middleton (2005). The difference with the actual empirical application consists in replacing the manager's monthly returns by the realisation of a normal distribution with zero mean and standard deviation equal to the manager's historical volatility. Managers are again assumed to be uncorrelated. All other things, including the date of entries of each manager and length of track records remain identical. Ten thousand Monte-Carlo simulations were performed in order to calculate percentiles for each of the statistics under study, which were: portfolio's volatility, skewness and kurtosis. Similar confidence intervals were obtained using the Bootstrap technique without replacement in order to assess the effects of retaining the original distribution of returns.

Table 2 shows that naïve indexes exhibit abnormally low volatility levels. The increasing number of managers over the period has a massive dampening effect on the portfolio's standard deviation of returns. This is true for both the mean and median schemes. Figure 4 compares the year-end volatility over the past 24 months of the naïve indexes with the market volatility and it shows that they exhibit much lower volatility levels. This is particularly evident after 1998/99. Note that their volatilities are much similar to the market volatility prior to 1998 when the numbers of managers in the database is less than 20 (see Figure 3).

Trying to adjust for the number of managers within the index as well as the various volatility profiles delivers mixed, if not disappointing, results. Our targeted volatility for the portfolio was ten percent. While this is achieved theoretically for our Monte-Carlo simulations, this is far from the case in "real life". Overall, both the naïve and volatility-weighted portfolios exhibit a much higher standard deviation of returns than expected from independent normal distributions. The non-normality of the manager's returns has only a secondary effect as can be observed from the confidence intervals obtained from the Bootstrap technique without replacement. The primary explanation lies in the fact that it is unreasonable to assume manager's returns are uncorrelated. Doing so leads a volatility-weighted portfolio to over-estimate the risk reduction caused by diversification and therefore to over-leverage. As a consequence the volatility target is exceeded. Figure 5 illustrates that both of our volatility-adjusted portfolios exhibit much higher volatility than our target rate, especially in the last ten years.

These results are understandable though. From equation (2) it is evident that not adjusting for the number of managers will create a downward volatility bias as the correlations between the managers are unlikely to be equal to 1. Therefore, the naïve indexes display decreasing volatilities as the number of managers increase. On the other hand, the volatility-adjusted indexes correct for the number of managers but assuming zero correlations. As the true correlations are likely to be higher than zero, this adjustment leads to an upward bias on the volatility.

The higher moments are also affected. Table 2 indicates that whilst skewness is not expected from any of the weighting schemes in theory, it manifests itself empirically because the individual manager's returns are themselves positively skewed, a well known observation among currency managers as this tends to indicate trend-followers. Table 2 shows that the naïve indexes are ill designed both in theory and in practice. Indeed varying/increasing the number of managers while mixing different volatility profiles generates extra kurtosis by construction even if the underlying returns of the managers follow a pure normal distribution without excess kurtosis. The volatility-weighted portfolios exhibit small positive kurtosis only because it is what we observe at the manager's level.

Incorporating Intra-Correlation

The biggest limitation of the volatility-weighted indexes described above lies in the fact that the interdependency between managers has been ignored or, more exactly, assumed to be non-existent. This is clearly not a reasonable assumption as, at least historically, BarclayHedge (1993) found the average correlation among the fifty largest Commodity Trading Advisors over three years equaled +0.197. Furthermore

Henker and Martin (1998) shows that currency managers have exhibited some of the highest intra-correlation among CTAs, at +0.232, between January 1991 and December 1993. Equation (2) makes it apparent that the correlation between the individual managers affects the volatility of the portfolio. Thus, any specification, which ignores the correlation would therefore be biasing the results. One alternative avenue would be to calculate the full correlation matrix between programmes. While this may provide useful information the drawbacks are potentially numerous. Firstly, the process can be time consuming; secondly, and more importantly, it may be prone to estimation errors and misspecifications. The relative stability of correlation coefficients will determine success or failure of any covariance-weighted indexes. Our intention is not to build the perfect in-sample index but rather to propose a methodology that can be used to develop well-behaved real-time indexes. To this effect, the seminal work of Elton and Gruber (1973) on equicorrelation has been used. The authors found that the assumption that all pairs of assets had the same correlation reduced estimation noise and provided superior portfolio allocations over a wide range of alternative assumptions. Recent work on the subject, together with further references, is provided by Engle and Kelly (2008). Here it suffices to say that the implied correlation can simply be derived from the total portfolio volatility, the individual manager's volatility and the weighting used to establish the portfolio.

As we did for our volatility-weighted schemes, we consider only those managers whom at the end of each calendar year possess a minimum two years track record. We then calculate the volatility of each manager at the end of each calendar year using the past 24 months. The corresponding track records are then backwardly volatility-adjusted such that the in-sample 24 months annualised volatility of each manager is

equal to a given volatility target (again ten percent). The standardised track records are then equally-weighted and the volatility of that particular portfolio calculated in-sample over the past two years. Using formula (7) provided below, we derive the in-sample equicorrelation between managers that are to be included in the allocation.

$$\rho_{y-1} = \frac{1}{n_{y-1} - 1}\left(n_{y-1}\left(\frac{\sigma_{p,y-1}}{\sigma}\right)^2 - 1\right) \tag{7}$$

ρ_{y-1} is the equicorrelation coefficient between the n_{y-1} managers calculated at the end of calendar year *y-1* over the past 24 months.

$\sigma_{p,y-1}$ is the annualised standard deviation of a portfolio equally weighted between the managers after volatility equalization calculated at the end of calendar year y-1 over the past 24 months[9]

σ is the target volatility assumed to be an annualised ten percent

Figure 5 illustrates the in-sample rolling value of ρ_y from end of December 1991 to end of December 2007 as well as the number of managers used to calculate its value. It reiterates the fact equicorrelation coefficient cannot be considered to be nil especially in the early years. Furthermore, even a seemingly low value will have a profound implication when the number of managers is large. This is reflected by the Covariance-Weighted (CW) portfolio as defined by its return:

$$R_{CW,t} = \frac{1}{n_{y-1}} \sum_{i=1}^{n_{y-1}} R_{j,t} \frac{\sigma}{\sigma_{j,y-1}} \sqrt{n_{y-1}} \frac{1}{\sqrt{1 + (n_{y-1} - 1)\rho_{y-1}}} \tag{8}$$

with $R_{j,t}$ the monthly return for manager *j* at time *t*

We rebalanced the CW portfolio at the end of every calendar year using the in-sample manager's volatilities and the single equicorrelation coefficients calculated over the

previous two years[10]. Indeed, the only difference with the volatility-weighted VMean index is that the final adjustment made to the CW portfolio includes a rescaling factor derived from the backward-looking equicorrelation. The term "covariance weighted" is used to reinforce the fact that it is a function of both volatility and correlation between managers.

Table 2 shows that the CW portfolio achieves its goal both empirically and theoretically. Indeed, the realised volatility is close to its target level of ten percent while skewness and excess kurtosis are kept small. The skewness coefficient is statistically different at the five percent level of what would have been obtained if the manager's returns had followed normal distributions. The lack of significance when using the bootstrap technique indicates that the reason lies in the individual manager returns being positively skewed not in the portfolio construction itself. Figure 6 also validates that the year-end volatility of this portfolio over the past 24 months oscillates around its ten percent target on a yearly basis. These variations are probably caused by the market volatility, and therefore the volatility of the individual managers not being constant, rather than the weighting scheme itself. Indeed the construction bias seems to have been removed completely.

4 Conclusions

This paper highlights the challenges faced by hedge fund index providers and we focused specifically on the case of currency indexes. Looking at a new database of currency managers we demonstrate that the rapid increase in the number of managers over the last decade has created a downward bias in many existing currency fund indexes, which do not take correlations between managers into account.

What are the implications for the currency management industry? Given the trade-off between risk and return then a severe downward volatility bias suggests that future returns of these indexes are expected to be close to zero. This could mislead investors in terms of what could be expected from currency managers. To attempt to mitigate this we have proposed an alternative weighting scheme, which not only takes account of the number of managers but also of their correlations. A balance has to be struck between theoretical soundness and practical implementation. We believe it is currently achieved by the CW portfolio we propose here.

References

Acar, E and A. Middleton (2005), "Maximum Drawdown of Active Currency Indices", Hedgequest, Summer, 19-21

Amenc, N. and F. Goltz (2008), "Revisiting the Limits of Hedge Fund Indices: A Comparative Approach", The Journal of Alternative Investments, Vol 10(4), pp 50-63

BarclayHedge (1993), "The Importance of Indices or Benchmarks", BMFR 2nd Qtr 1993

Binny, J. (2005), "Currency Management Style through the Ages", The Journal of Alternative Investments, Winter 2005, Vol 8 (3), pp 52-59

Brewster, D. (2007), "The inexact art of hedge fund indexing", Financial Times, Jan 15, 2007

CISDM Research Department (2006), "The Benefits of Hedge Funds: 2006 Update", Isenberg School of Management, University of Massachusetts, pp. 1-26.

Elton, E.J., and M.J. Gruber, (1973), "Estimating the Dependence Structure of Share Prices–Implications for Portfolio Selection", Journal of Finance, 28, pp. 1203–1232.

Engle, R.F., and B.T. Kelly (2008), "Dynamic Equicorrelation", Working Paper, Stern Business School,. NYU

Euromoney (2008), "FX debate: Testing times in the search for alpha", May 2008, Volume 39, Number 469, pp. 204-211.

Henker, T. and G.A. Martin (1998), "Naive and Optimal Diversification for Managed Futures", The Journal of Alternative Investments, Fall 1998, pp 25-39

Johnson, S (2007), "Dollar slide 'hit currency managers'", Financial Times, Dec 17, 2007.

Lequeux, P. and M. Menon (2008), "Fingerprinting Currency Managers", Presentation at the 15th Forecasting Financial Markets Conference, Aix-en-Provence, 21, 22 and 23 May 2008

Lhabitant, F-S. (2007), "Hedge fund indices for retail investors: UCITS eligible or not eligible?", Derivatives, Use, Trading & Regulation, 12, pp 275–289

McGuire, P.M. and K. Tsatsaronis (2008), "Estimating hedge fund leverage", BIS Working Paper Sep 2008, No 260

Middleton, A. (2005), "Trading Style Analysis: A Quantitative Assessment of the Currency Industry", The Journal of Alternative Investments, Summer 2005, Vol 8(1), pp 14-28

Pojarliev, M. and R.M. Levich. (2008). “Do Professional Currency Managers Beat the Benchmark?” *Financial Analysts Journal,* Vol.64, No. 5, pp 18-32

Schultes, R. (2005). „Measuring FX performance“ Global Pensions, September 2005, page 25.

Swanson, J. (2002), URL: http://www.swansonsite.com/W/instructional/limits.pdf

Table 1: Descriptive Statistics of Individual Currency Managers

	M1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
Volatility in %	17.10	5.16	11.45	5.56	8.29	0.76	14.09	18.89	21.99	4.43	8.13
Skewness	0.36	0.62	1.83	0.73	3.15	-1.21	-0.11	3.28	-0.17	0.75	1.46
Excess Kurtosis	0.58	0.80	5.80	1.94	12.69	4.53	0.80	16.05	-0.11	3.79	3.17
Number of Months	219	219	200	196	195	193	181	164	159	155	155
	M12	**M13**	**M14**	**M15**	**M16**	**M17**	**M18**	**M19**	**M20**	**M21**	**M22**
Volatility in %	7.04	18.65	10.18	1.91	9.05	7.94	12.63	9.47	13.61	7.35	4.84
Skewness	0.15	0.37	0.45	1.21	1.69	1.56	0.12	0.16	-0.06	0.18	0.40
Excess Kurtosis	1.25	0.82	1.31	-0.11	5.62	9.90	-0.13	0.82	0.22	0.99	-0.12
Number of Months	147	147	144	143	138	135	126	126	123	120	118
	M23	**M24**	**M25**	**M26**	**M27**	**M28**	**M29**	**M30**	**M31**	**M32**	**M33**
Volatility in %	15.69	16.09	11.16	4.63	6.59	3.87	0.94	9.41	6.01	21.11	9.23
Skewness	-0.21	0.43	0.05	0.83	0.59	-0.13	0.49	-0.40	1.39	-0.41	0.30
Excess Kurtosis	1.20	0.61	0.15	11.17	1.44	0.50	1.10	0.98	1.92	-0.20	1.98
Number of Months	112	111	107	102	100	99	90	90	90	88	87
	M34	**M35**	**M36**	**M37**	**M38**	**M39**	**M40**	**M41**	**M42**	**M43**	**M44**
Volatility in %	3.46	10.35	17.99	10.30	8.01	1.50	15.21	11.53	13.07	3.92	8.20
Skewness	-0.63	0.83	-0.01	-0.28	0.28	0.00	0.18	0.54	0.10	1.25	-0.03
Excess Kurtosis	1.29	2.08	-0.04	1.18	1.00	0.42	-0.17	0.84	0.92	5.03	0.40
Number of Months	87	87	86	85	84	81	77	77	75	75	75
	M45	**M46**	**M47**	**M48**	**M49**	**M50**	**M51**	**M52**	**M53**	**M54**	**M55**
Volatility in %	14.37	11.55	1.65	4.74	4.86	16.57	5.29	15.44	7.76	3.01	7.65
Skewness	0.70	-0.15	0.61	1.38	1.13	0.73	-0.02	1.30	0.86	-0.28	0.34
Excess Kurtosis	1.04	-0.05	0.74	4.46	1.44	1.20	0.71	4.18	2.44	0.76	0.73
Number of Months	75	75	75	71	70	64	63	63	63	63	62
	M56	**M57**	**M58**	**M59**	**M60**	**M61**	**M62**	**M63**	**M64**	**M65**	**M66**
Volatility in %	2.83	12.28	4.01	2.75	3.97	1.76	1.21	8.82	11.71	9.63	5.19
Skewness	-0.12	0.55	-0.42	-0.26	1.53	0.00	0.63	-1.33	-0.32	0.29	0.80
Excess Kurtosis	-0.38	1.06	0.01	0.10	3.92	-0.28	0.38	6.22	-0.26	0.69	0.65
Number of Months	62	61	60	60	59	59	57	57	54	54	53
	M67	**M68**	**M69**	**M70**	**M71**	**M72**	**M73**	**Mean**	**Med.**	**Min**	**Max**
Volatility in %	11.71	3.86	7.47	7.79	29.40	6.92	6.81	**9.01**	**8.01**	**0.76**	**29.40**
Skewness	-0.24	-0.62	0.67	0.07	0.84	2.26	-1.43	**0.43**	**0.34**	**-1.43**	**3.28**
Excess Kurtosis	-0.83	0.73	2.71	-0.11	0.45	4.82	3.32	**1.99**	**0.92**	**-0.83**	**16.05**
Number of Months	53	52	51	51	51	48	48				

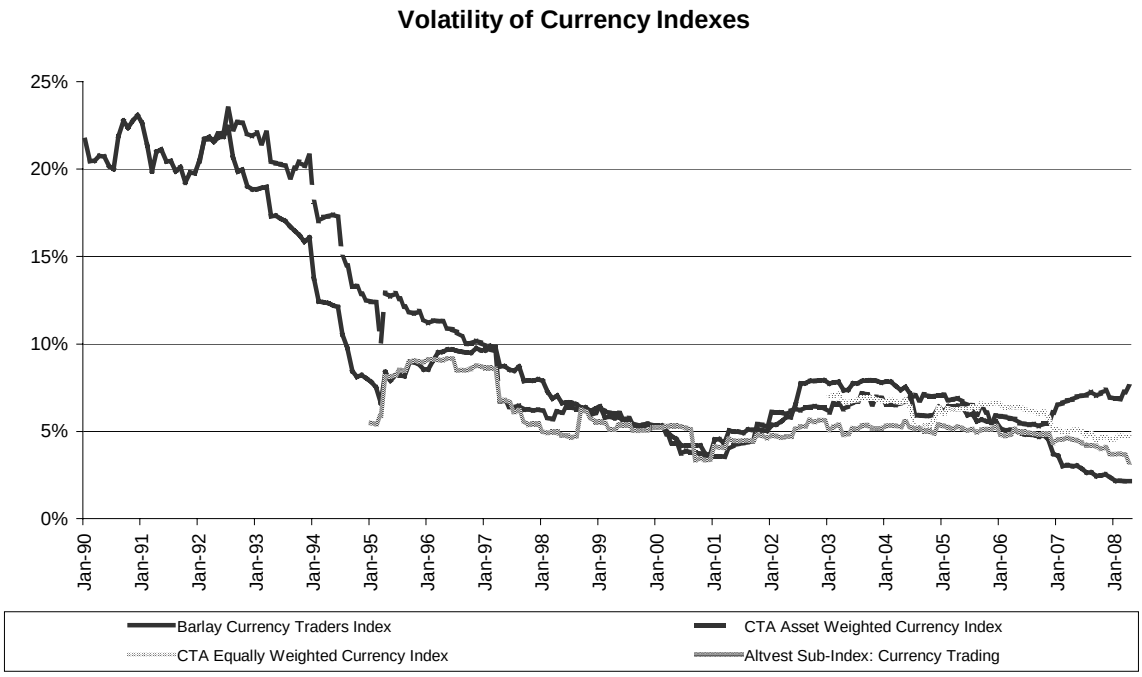
Table 2: Descriptive Statistics of Currency Managers Indexes

Empirical observations & Percentiles of 10,000 Simulations using Monte-Carlo and Bootstrap without replacement

		Mean	Median	VMean	VMedian	CW
Volatility	**Empirical**	4.87%	3.46%	19.64%	14.67%	10.25%
Monte-Carlo	95%	2.91%	2.20%	11.34%	10.52%	11.74%
	50%	2.61%	1.90%	10.43%	9.70%	10.87%
	5%	2.34%	1.63%	9.59%	8.92%	10.09%
Bootstrap	95%	2.94%	1.80%	13.33%	8.91%	14.10%
	50%	2.61%	1.47%	12.18%	8.15%	12.73%
	5%	2.32%	1.25%	11.16%	7.47%	11.63%
Skewness	**Empirical**	1.30	1.47	0.22	0.85	0.57
Monte-Carlo	95%	0.63	1.15	0.29	0.30	0.35
	50%	-0.01	0.00	0.00	0.00	0.00
	5%	-0.63	-1.16	-0.30	-0.30	-0.35
Bootstrap	95%	1.34	2.72	0.74	0.70	0.91
	50%	0.43	0.95	0.30	0.32	0.40
	5%	-0.23	-0.23	-0.02	-0.03	0.03
Excess Kurtosis	**Empirical**	2.61	2.21	0.59	1.15	0.61
Monte-Carlo	95%	3.93	9.66	0.70	0.77	1.27
	50%	1.82	4.17	-0.01	0.03	0.21
	5%	0.68	2.02	-0.46	-0.43	-0.35
Bootstrap	95%	7.06	18.40	1.85	1.59	2.60
	50%	2.36	5.21	0.19	0.32	0.44
	5%	0.86	1.92	-0.40	-0.29	-0.28

Note: We omit the mean return on purpose as we want to focus on the higher moments on the return distribution.

Figure 1: Volatility of Currency Indexes



Source: BarclayHedge (www.barclaygrp.com), the CASM CISDM Hedge Fund Database (www.casamhedge/com), Morningstar (http://www.altvest.com/av/index/index_rets.asp) and authors calculations.

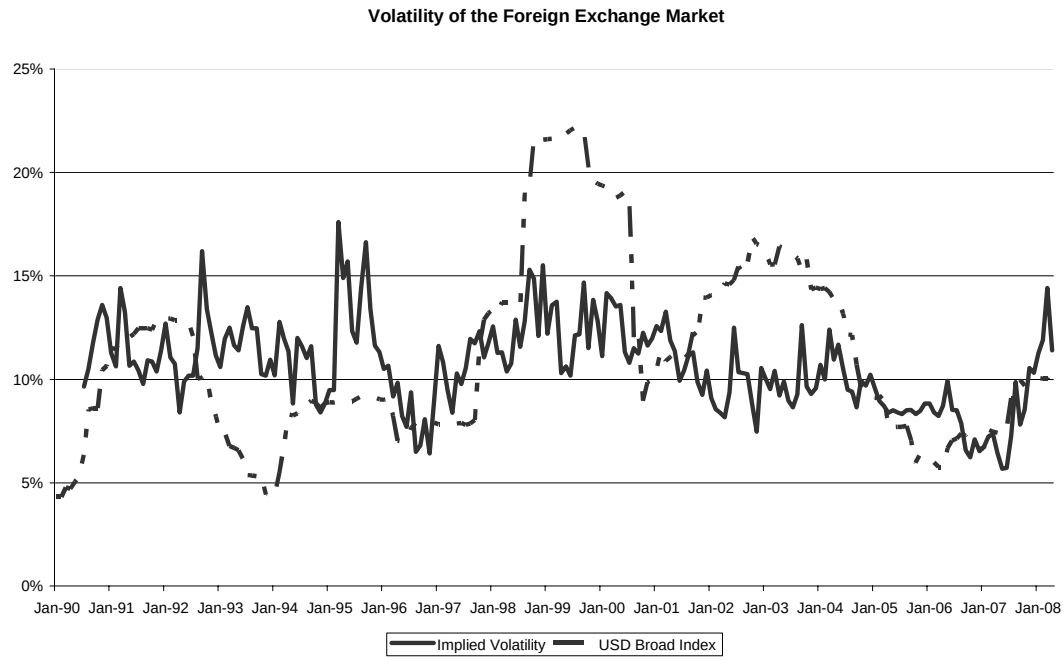
The volatility of the Barclay Currency Traders Index is computed as the 2 years rolling annualized standard deviation of the returns on the index. Monthly returns were downloaded from Bloomberg. Time horizon: January 1990 to April 2008.

The volatility of the CTA Asset Weighted Currency Index s computed as the 2 years rolling annualized standard deviation of the returns on the index. Monthly returns were downloaded from http://www.casamhedge.com/ . Time horizon: January 1992 to April 2008 (monthly returns available since January 1990, thus first volatility number as of January 1992).

The volatility of the CTA Equally Weighted Currency Index s computed as the 2 years rolling annualized standard deviation of the returns on the index. Monthly returns were downloaded from http://www.casamhedge.com/ . Time horizon: January 2003 to April 2008 (monthly returns available since January 2001, thus first volatility number as of January 2003).

The volatility of the Altvest Hedge Fund Currency Index is computed as the 2 years rolling annualized standard deviation of the returns on the index. Monthly returns were downloaded from http://www.altvest.com/av/index/index_rets.asp. Time horizon: January 1995 to April 2008 (monthly returns available since January 1993, thus first volatility number as of January 1995).

Figure 2: Volatility of the Foreign Exchange Market

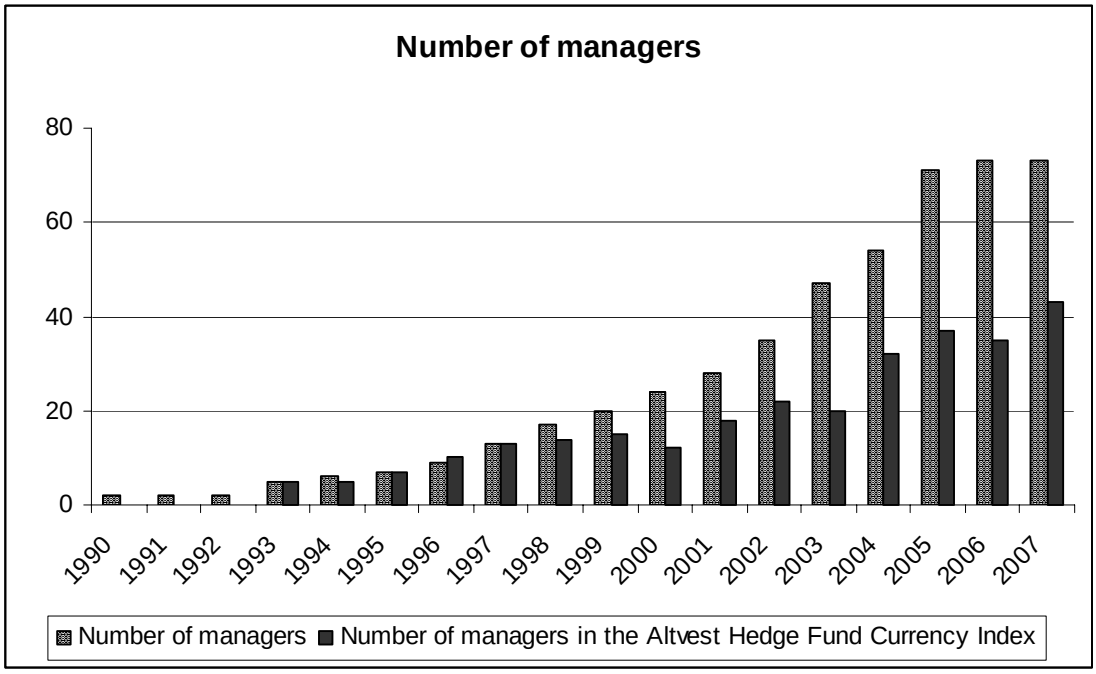


Source: Federal Reserve, Citibank and authors calculations.

The volatility of the Broad Dollar Index is computed as the 2 years rolling annualized standard deviation of the returns on the index. Monthly spot prices were downloaded from http://www.federalreserve.gov/releases/H10/summary/indexb_m.txt
Time horizon: January 1990 to April 2008 (data available since 1973).

The implied volatility of the currency market is computed as the average of the 1-month implied volatility for the EUR-USD exchange rate (DEM-USD before the introduction of the Euro) and for the USD-JPY exchange rate. Monthly data were provided by Citibank. Time horizon: July 1990 to April 2008 (data available since July 1990).

Figure 3: Number of Currency Managers



Source: SEB, Morningstar (http://www.altvest.com/av/index/index_rets.asp) and authors calculations.

Figure 4: Volatility of the Naïve Indexes and Market Volatility

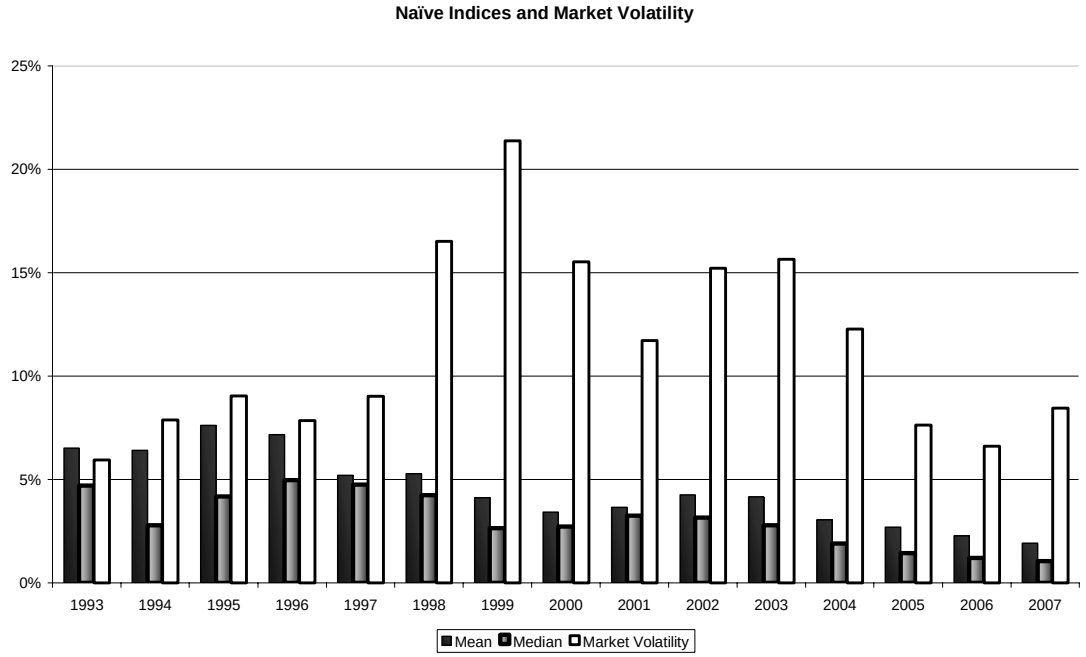


Figure 5: Equicorrelation and number of managers in the portfolio

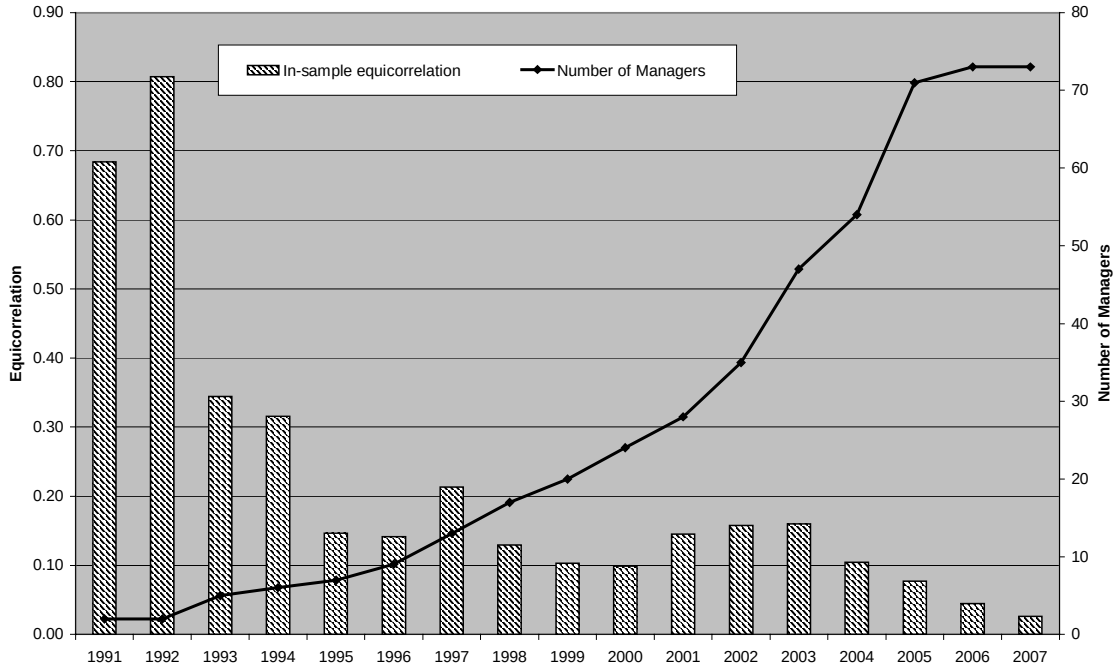
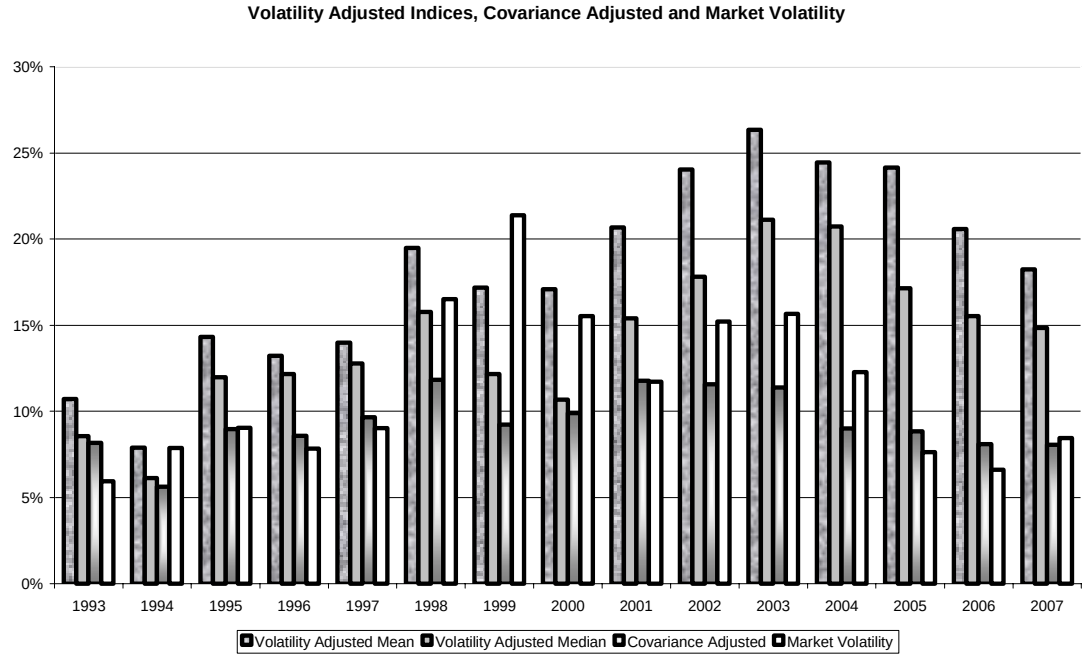


Figure 6: Volatility Adjusted Indexes, Covariance Adjusted and the Market Volatility



Source: SEB, authors' calculations.

Endnotes

[1] Indeed, it is common practice for managers to report their performance as being in the first, second, third or last quartile of the peer group.

[2] We compute the volatility as the 2 years rolling annualized standard deviation of the index. We used 2 years as the minimum period which allows us to get robust estimate on the standard deviation with monthly data (24 observations). The correlation between this measure of volatility of the S&P 500 index and the VIX index (a popular measure of the implied volatility of S&P 500 index options) has been 55% between January 1990 and May 2008.

[3] To measure the volatility of the foreign exchange market, we compute the 2 years rolling annualized standard deviation of the returns on the USD Broad Trade Index. The broad index is a weighted average of the foreign exchange values of the U.S. dollar against the currencies of a large group of major U.S. trading partners. The index weights, which change over time, are derived from U.S. export shares and from U.S. and foreign import shares. As an alternative measure for volatility we use the implied volatility, i.e. an average of the 1-month implied volatility for the EUR-USD exchange rate (DEM-USD before the introduction of the Euro) and for the USD-JPY exchange rate to measure for the volatility of the FX market. These are the most liquid FX options and account for roughly 54% of the currency option trading in the BIS surveys. The correlation between this measure of implied volatility and the CVIX index (a currency volatility benchmark prepared by Deutsche Bank based on 9 currency pairs) has been 94.5% since data are available for the CVIX index (from August 2001 until May 2008).

[4] It is worthwhile mentioning that the concomitance of increasing number of managers and decreasing volatility of hedge fund indices is not unique to the currency sector. This has been noted by McGuire and Tsatsaronis (2008) for most fund families with the possible exception of funds-of-funds and relative value arbitrage. However the treatment of these other markets is beyond the scope of our study.

[5] We are grateful to Seppo Leskinen and Andy Woolmer for providing the data without which this study would not have been possible. All errors remain ours.

[6] Indeed, the same manager could operate several programs such as “Technical” and “Fundamental” or “G7” and “Emerging”. As long as these programs are structurally different (not just by a leverage factor) they will all be included and appear as separate “managers”.
[7] To our knowledge, Altvest is the only alternative investment database to publish the number of funds in its indices on a monthly basis.
[8] Additionally to at least 4 years' track record as of end of March 2008, we consider only managers from 1991 with at least two years' track record at the end of a given year, i.e. managers reported in Figure 13.3 to be active in 1992 have track record since 1990. Prior performance history is often required for inclusion in an index. Keeping all the managers in the database, not just the managers with at least four years’ track record, would bring the number of managers to 141 as of the end of March 2008.
[9] This is not equal to the volatility of VMean portfolio over the past 24 months as the VMean portfolio is rebalanced yearly.
[10] Strictly speaking the concept of equicorrelation could be bypassed as only the past portfolio volatility matters as can be seen from the following equivalent formulation::

$$R_{CW,t} = \frac{1}{n_{y-1}} \sum_{j=1}^{n_{y-1}} R_{t,j} \frac{\sigma}{\sigma_{j,y-1}} \frac{\sigma}{\sigma_{p,y-1}} \tag{9}$$