Trading style analysis of leveraged currency funds

Received: 27th March, 2001

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Abstract This paper demonstrates how a dynamic currency index can be used in analysing the trading styles of currency fund managers. We first recall the composition, market timing and asset allocation of the dynamic index. We then introduce our universe of leveraged currency funds and show how to gain a better understanding of the strategies used by specific managers. In particular, we illustrate the trend-following nature of certain programmes and indicate how to monitor changes of leverage and trading style.

Keywords: *CTA; trend-following strategies; leverage; volatility; maximum drawdown; trading style*

Despite accepting that in the long run the return on passive currency investment is nil, there is some statistical evidence that active management of currencies can significantly add value over time. The efficient market hypothesis relies upon rational, profit-motivated investors (Arnott and Pham, 1993), whereas the two largest participants in the foreign exchange market have no direct profit motive. International corporations try to hedge their currency risk while central banks try to dampen fluctuations in their currency rate to control inflation. Trends in currency markets have been linked to central bank activity (Kritzman, 1989; Silber, 1994). This partly explains why a majority of trading managers rely on technical analysis and trend-following strategies to manage their currency exposure. The appeal of the foreign exchange market resides in the high liquidity and the 24-hour access it offers. It is by far the largest financial market in the world, with an estimated daily turnover of $1,500bn.[1] Nowadays, actively managed currencies are accepted as investment vehicles by investors who recognise how their different characteristics can improve the risk/return profile of their portfolio. The success of currencies as an asset class is shown through the increasing number of currency funds available to the investor. Indices are indispensable within the context of asset allocation, to control and quantify risk and to evaluate performance. Most of the financial markets have indices to explain their

performance, but there is a general lack of a standardised benchmark for the foreign exchange market. Existing currency indices are either proprietary, not fully transparent or are passive indices and therefore not relevant for dynamic portfolio management purposes. The first section defines our currency index. The second section introduces our universe of leveraged currency funds. The third section assesses the relationships between performance statistics. The final section discusses how the dynamic index can be used to monitor the trading style of currency funds.

Dynamic currency index

Passive indices do not reflect any of the money management skills necessary to generate profit out of the markets (Schwager, 1996). For example, it is quite obvious, looking at Figure 1, that there is no real value in holding a long (or short) position in the US$ trade weighted index compiled by the Bank of England over a long time horizon. The reason why a passive benchmark fails adequately to describe the performance of currency funds is that it does not take into account short positions. The low transaction costs combined with the ability to go short permit the use of active strategies to obtain positive returns in markets that may be overvalued for short time periods. Systematic traders primarily rely on trading programs or models that generate buy and sell signals. Trades are selected, entered into and exited according to such models. Discretionary traders rely on their experience and judgement, although they may use some unformalised system or model to back their trading decisions. Our dynamic currency index, called AFX, is intended to replicate the risk/return profile of the average currency manager by using technical trading rules, namely trend-following rules.

The AFX index builds on previous works by Lequeux and Acar (1998),[2] and its exact composition, market timing and asset allocation are now detailed. The timing relies on three moving averages of respective order 32, 61 and 117 days. The moving average method has been chosen among a large array of technical indicators because it is the most popular trading rule among futures traders. The goal of this basket of technical trading rules is to represent adequately the time horizons followed by investors, while being simple and practical in its design. All investors do not work their strategies over the same time horizons. A day trader can trade anonymously and simultaneously with a pension fund: each diversifies the other. To represent adequately all time horizons, the statistical properties of technical indicators have to be used. It was decided to build the benchmark around *ex ante* measurable criteria of risk reduction and transaction costs. Each day, moving averages are calculated for each currency pair involved in the benchmark. These averages are then compared to the current price of the currency pairs. Should the currency price be greater than the moving average, the benchmark assumes that a long position is to be initiated or held for the next 24 hours, otherwise the reverse applies. The value of the benchmark is the weighted average of the returns earned by the set of three moving averages on each currency pair included in the benchmark. To reflect in a meaningful way the currencies that are dealt in the market, the index has a weighted scheme. The allocation between currency pairs has been determined by the average volume traded in the FX market as reported by the Bank for International Settlements (Table 1).

The average currency manager tends to

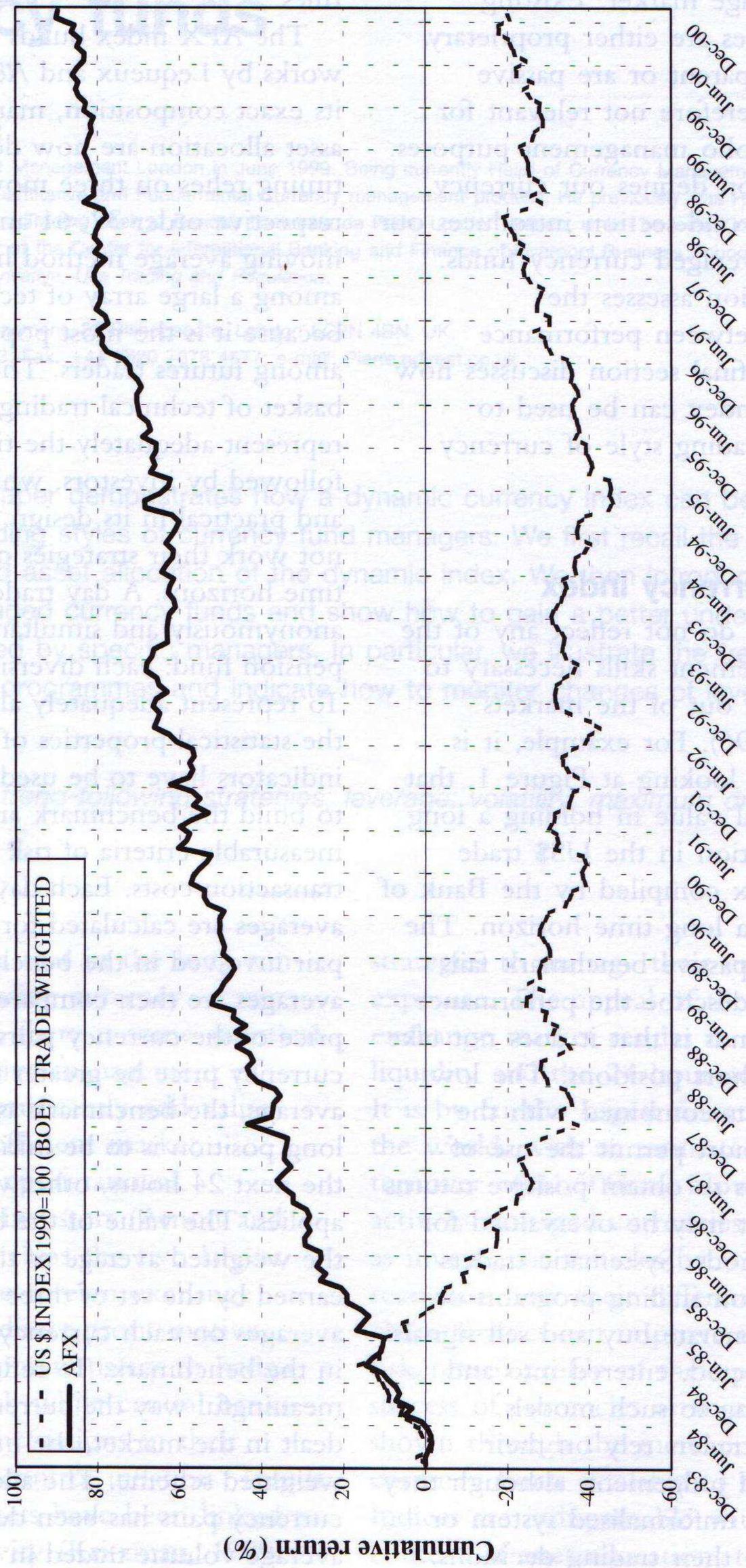

Figure 1 Cumulative performance of the Trade Weighted USD index and the AFX

Table 1 AFX currency weightings (%)

	USDDEM	USDJPY	USDCHF	GBPUSD	DEMJPY	GBPDEM	DEMCHF
6th January, 1984 to 31st December, 1998	35.62	31.65	9.02	13.12	3.45	4.54	2.60
	EURUSD	**USDJPY**	**USDCHF**	**GBPUSD**	**EURJPY**	**EURGBP**	**EURCHF**
4th January, 1999 onwards	35.62	31.65	9.02	13.12	3.45	4.54	2.60

Table 2 Yearly statistics for the 32 CTAs, October 1991 to September 1996

	Return (%)	Volatility (%)	Sharpe	Maximum drawdown[a] (%)	Correlation to AFX	Maximum monthly return (%)	Minimum monthly return (%)
Average	11.55	19.63	0.53	−30.05	0.42	19.16	−10.75
Standard deviation	11.12	11.17	0.51	22.30	0.30	12.52	7.33
Minimum	−4.62	1.13	−1.23	−102.08	−0.13	0.98	−37.76
Maximum	46.44	45.91	1.49	−3.35	0.88	48.57	−1.07

[a]Compound worse cumulative losses over a year

be a trend follower, as illustrated in Figure 2, which represents the 12 months rolling correlation of the AFX with the Parker index, compiled by an agency reporting the composite performance of currency funds.[3]

Leveraged currency funds

There are now a few databases tracking the performance of managed currencies programmes. They provide the potential investor in managed currencies with a wealth of detail regarding the risk, return, assets under management, trading style, fee structure and trading frequency of the programme among other relevant information. The data used in this research originate from a database compiled by Refco Capital Advisor Inc., reporting the performance of Commodity Trading Advisers (CTAs). We analyse data for the period October 1991 to September 1996. Out of 594 CTAs listed in the database, we concentrate on a sub-sample of 32 CTAs managing roughly US$4bn only through currencies with at least 60 months of non-simulated track record. For each of the 32 series of monthly returns, we deducted the T-Bill return that would have been earned by the manager, leaving us with the real trading performance minus the management and performance fees. Although the names of these fund managers have been removed to maintain anonymity, summary information including the trading style as declared by Refco can be found in the Appendix.

We generated five non-overlapping 12-month series of yearly return, volatility, maximum drawdown, maximum and minimum monthly return, Sharpe ratio[4] and correlation to the AFX index. This generated 160 observations, possibly interdependent, for each of the performance criteria investigated (Table 2). The performance of currency managers tends to have a high standard

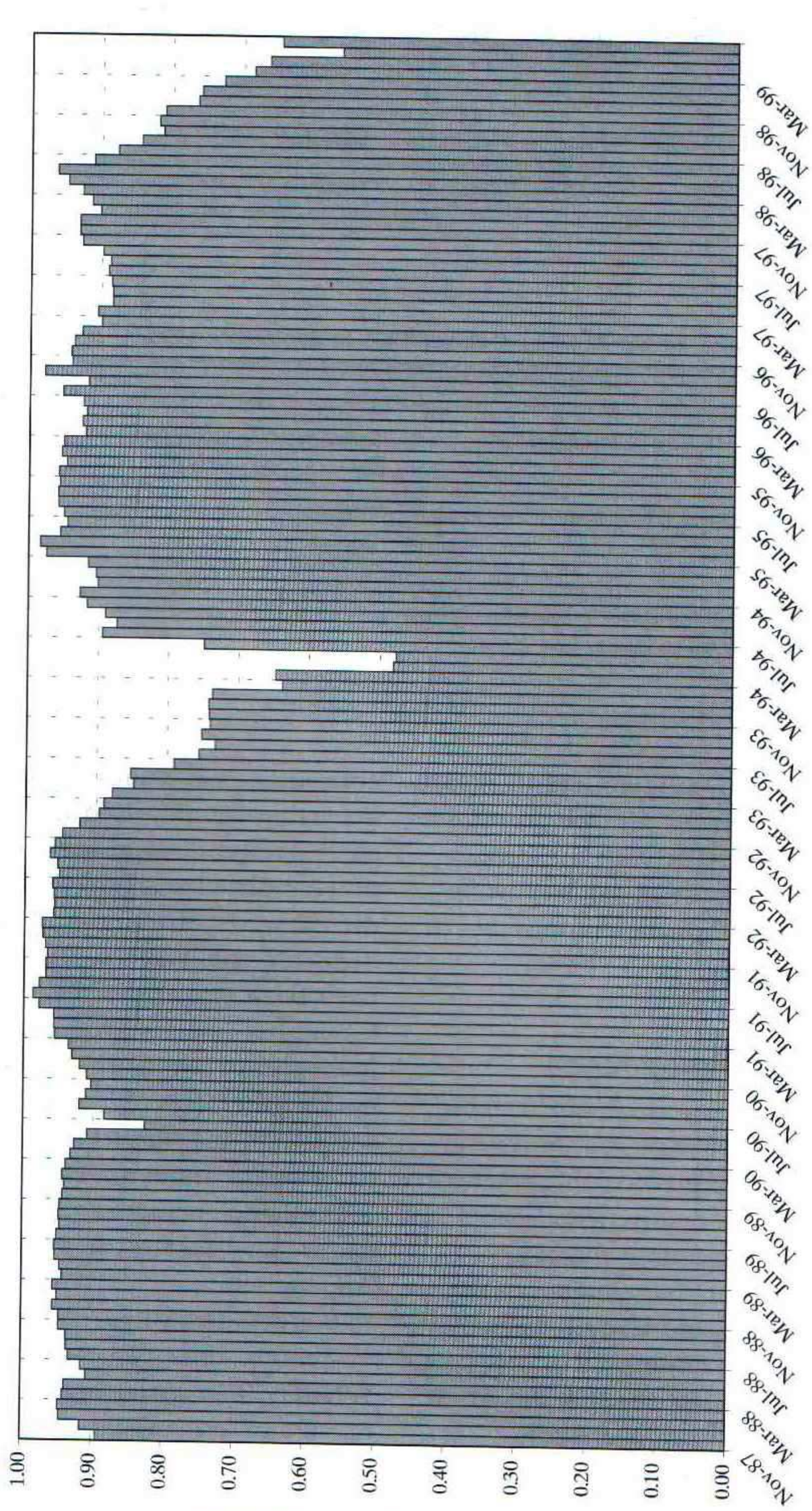

Figure 2 AFX correlation with the average currency trader as represented by the Parker Index

Table 3 Yearly statistics for the AFX index, January 1984 to December 2000

	Return (%)	Volatility (%)	Sharpe	Maximum drawdown (%)	Maximum monthly return (%)	Minimum monthly return (%)
Average	5.30	7.21	0.75	−3.99	4.53	−2.55
Standard deviation	4.69	2.30	0.69	2.08	1.50	1.34
Minimum	−3.33	3.17	−0.58	−7.92	2.39	−5.82
Maximum	14.33	12.57	1.80	−1.31	7.90	−0.79

deviation of yearly returns. The average Sharpe ratio is comparable with other traditional asset classes such as stocks and bonds when adjusted for risk-free income and fees. The wide range of correlation to the AFX benchmark reflects the diversity of trading styles and the standard deviation the changing nature of the trading approaches.

In order to compare with the performance of CTAs, we calculated the same statistics for the AFX index. The full 17 years of history, January 1984 to December 2000, were used to generate a sufficient number of non-overlapping observations (Table 3). The AFX index generates an unleveraged yearly return of 5.30 per cent exclusive of the risk-free returns and fees with a volatility of 7.21 per cent, which translates into a Sharpe ratio of 0.75. If we were to deduct the fees that a manager charges,[5] we would obtain the same level of Sharpe ratio as the average currency CTA, as indicated in Table 2.

Relationships between performance statistics

Selecting and monitoring trading programmes is paramount to the success of a multi-adviser fund or within the context of alternative investments in the institutional portfolio. The choice will be made following a strict methodology of performance evaluation primarily centred on criteria of risk analysis. The use of risk analysis is threefold. First, to forecast risks relevant to their current exposure, secondly, to measure investment past performance and, thirdly, to design new optimal portfolios (Kahn, 1995). In this section, we investigate how performance statistics relate to each other before addressing the issues of statistical significance and predictability.

Investors are well aware that CTAs tend to generate their yearly profits over a very short period of time, when market inefficiencies appear. This can be seen from the strong relationship between the maximum observed monthly return and the associated yearly return (Figure 3). The two statistics have a positive coefficient of correlation of +0.66, whereas the random walk assumption of independent and normally distributed returns would only suggest a correlation coefficient of 0.50.

Returns are also positively correlated with volatility (Figure 4). At first, this result is surprising, since the two statistics should be theoretically unrelated. This would be ignoring a key feature of CTA programmes: leverage. Therefore, volatility here tends to express the level of risk taken among CTAs or the gearing of their positions. This is just a rule of thumb, however, since some managers trade options and, as a consequence, standard deviation of returns may not accurately reflect the level of risk embedded in the programmes.

Over recent years, owing to the

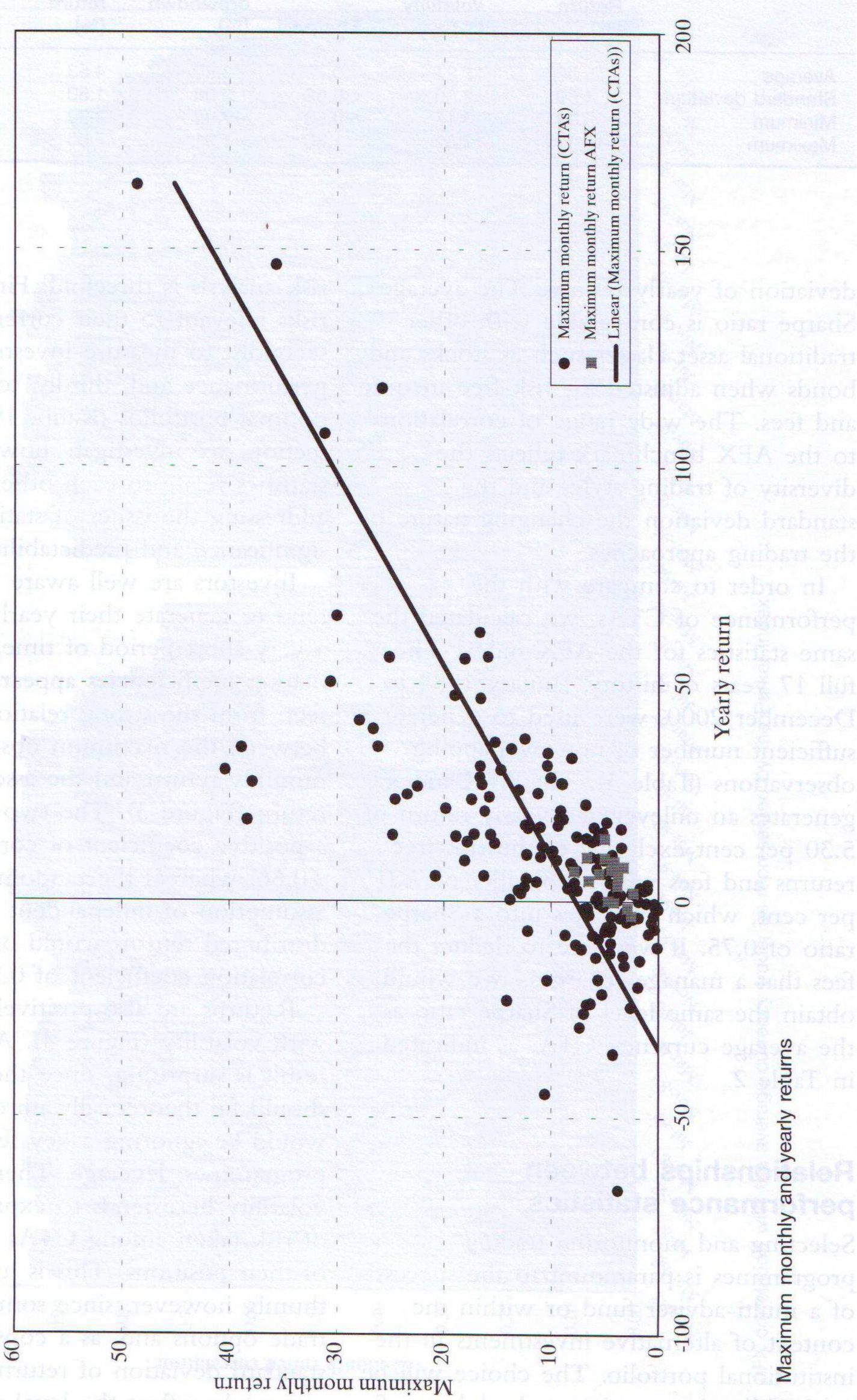

Figure 3 Maximum monthly and yearly returns

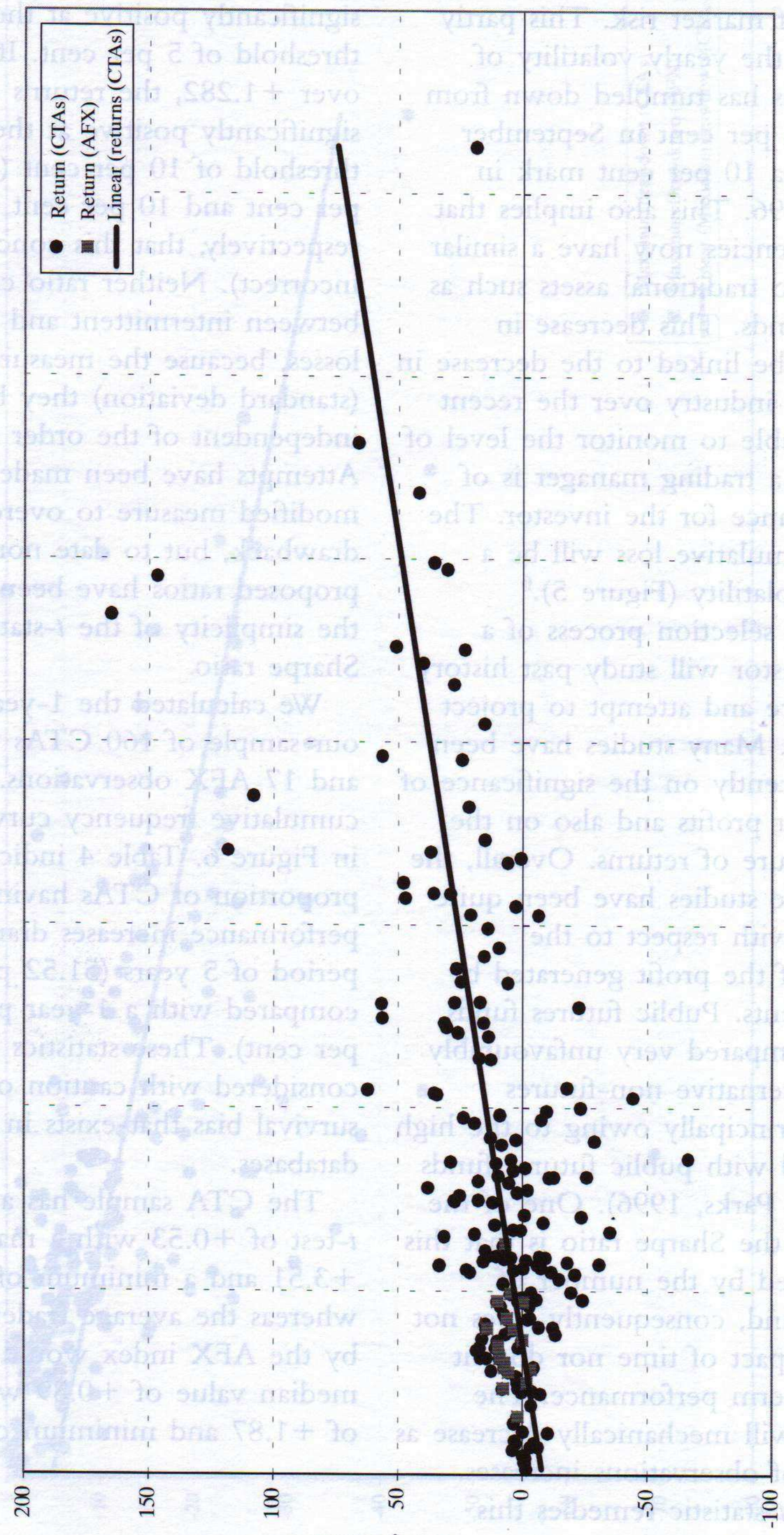

Figure 4 Yearly return and volatility

reported cases of gross mismanagement of risk in the financial markets, emphasis has been placed on a better understanding and control of market risk. This partly explains why the yearly volatility of currency funds has tumbled down from an average 26 per cent in September 1992 to near a 10 per cent mark in September 1996. This also implies that managed currencies now have a similar level of risk to traditional assets such as stocks and bonds. This decrease in volatility can be linked to the decrease in returns of the industry over the recent years. Being able to monitor the level of risk taken by a trading manager is of prime importance for the investor. The maximum cumulative loss will be a function of volatility (Figure 5).[6]

During the selection process of a CTA, an investor will study past history of performance and attempt to project future returns. Many studies have been conducted recently on the significance of trading adviser profits and also on the predictive nature of returns. Overall, the results of these studies have been quite inconclusive with respect to the significance of the profit generated by such investments. Public futures funds have been compared very unfavourably with other alternative non-futures investment, principally owing to the high fees associated with public futures funds (Edwards and Parks, 1996). One of the drawbacks of the Sharpe ratio is that this is not weighted by the number of observations and, consequently, does not reflect the impact of time nor does it reward long-term performance. The Sharpe ratio will mechanically decrease as the number of observations increases. The Student *t*-statistic remedies this limitation by multiplying the Sharpe ratio by the square root of the number of years. The *t*-statistic is also widely used by academics and practitioners to test the hypothesis that returns generated by active fund managers or technical analysis are zero. If the calculated *t* value is over +1.645, the returns are said to be significantly positive at the critical threshold of 5 per cent. If the *t* value is over +1.282, the returns are said to be significantly positive at the critical threshold of 10 per cent (i.e. there is a 5 per cent and 10 per cent probability, respectively, that this conclusion is incorrect). Neither ratio can distinguish between intermittent and consecutive losses, because the measure of risk (standard deviation) they both use is independent of the order of the data. Attempts have been made to design a modified measure to overcome this drawback, but to date none of the proposed ratios have been able to retain the simplicity of the *t*-statistic or the Sharpe ratio.

We calculated the 1-year *t*-statistics for our sample of 160 CTAs yearly returns and 17 AFX observations. The cumulative frequency curve is illustrated in Figure 6. Table 4 indicates that the proportion of CTAs having a significant performance increases dramatically over a period of 5 years (51.52 per cent) compared with a 1-year period (22.42 per cent). These statistics have to be considered with caution owing to the survival bias that exists in current databases.

The CTA sample has a median 1-year *t*-test of +0.53 with a maximum of +3.51 and a minimum of −4.92, whereas the average trader represented by the AFX index would have had a median value of +0.89 with a maximum of +1.87 and minimum of −0.70. If we

Table 4 Percentage of track records significant at the 10% critical threshold

	1 year	5 year
t-test > 1.282	22.42	51.52

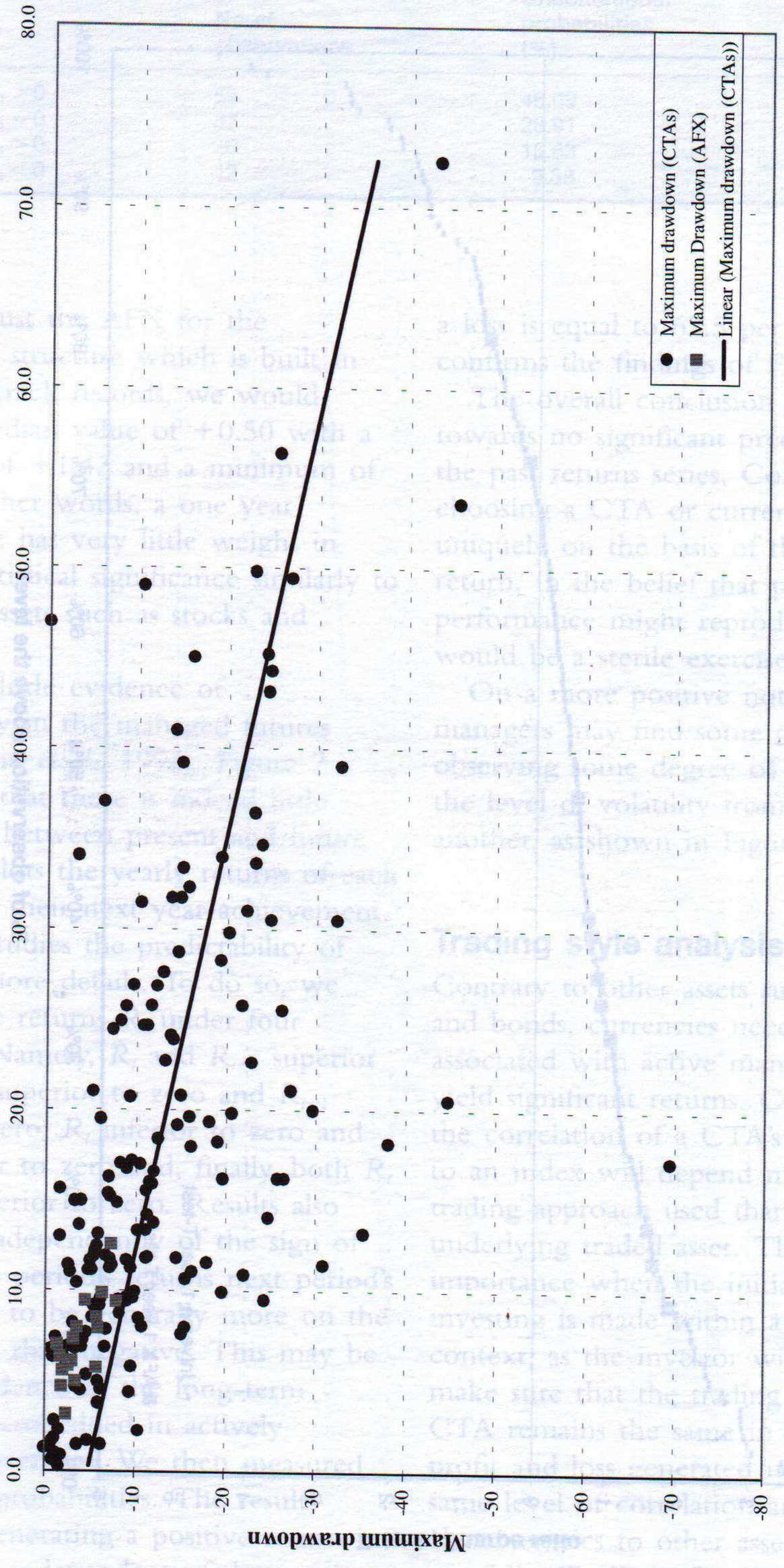

Figure 5 Maximum drawdown and volatility

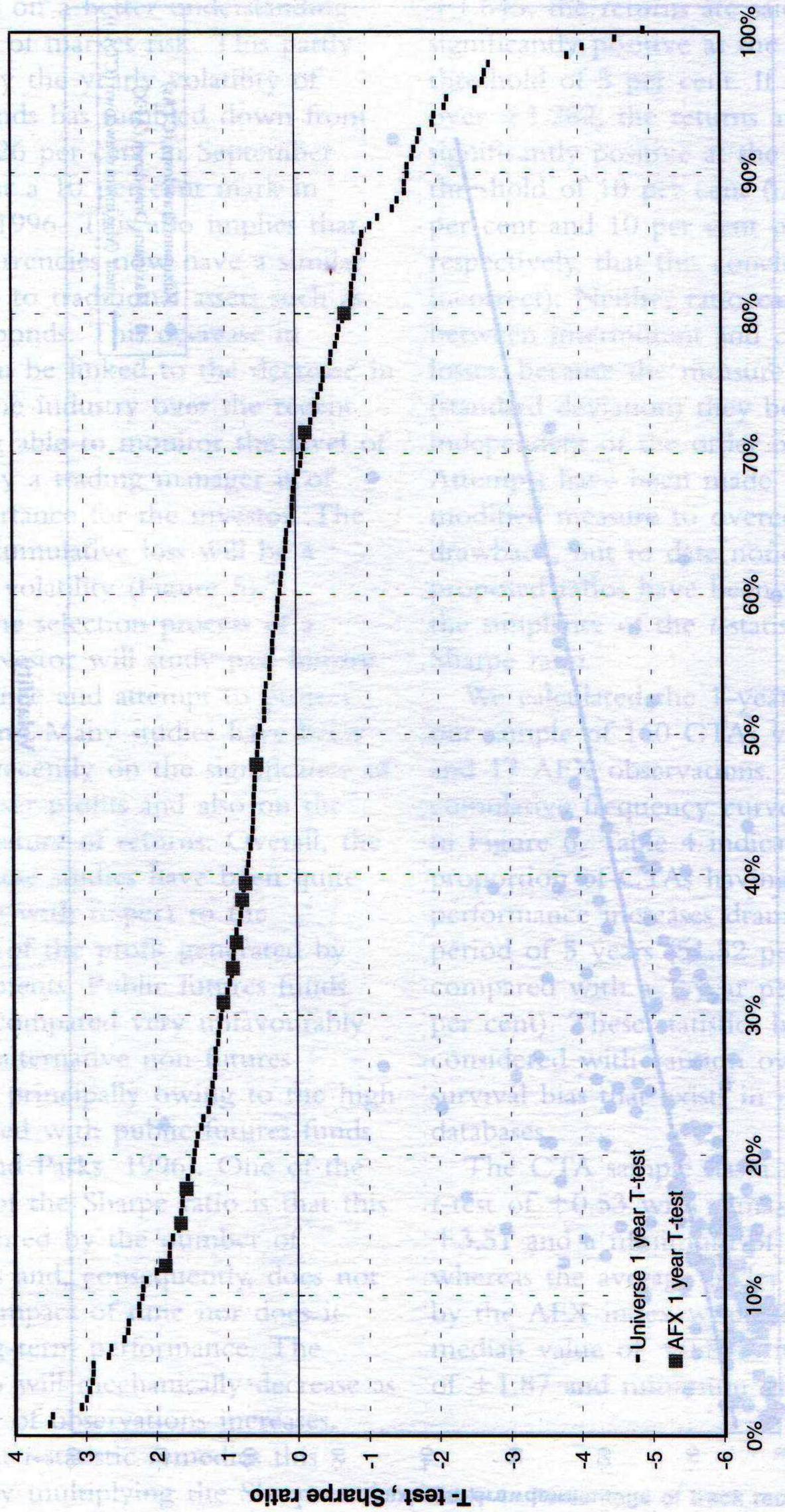

Figure 6 One-year Sharpe rat

Table 5 Classification of next period's returns as a function of previous period's returns

Condition	No of observations	Unconditional probabilities (%)	Conditional probabilities (%)
$R_t >$ and $R_{t+1} > 0$	59	46.09	61.46
$R_t >$ and $R_{t+1} < 0$	37	28.91	38.54
$R_t <$ and $R_{t+1} > 0$	20	15.63	62.50
$R_t <$ and $R_{t+1} < 0$	12	9.38	37.50

were to adjust the AFX for the commission structure which is built in the CTAs' track records, we would obtain a median value of +0.50 with a maximum of +1.43 and a minimum of −1.1. In other words, a one year performance has very little weight in terms of statistical significance similarly to traditional assets such as stocks and bonds.

There is little evidence of predictability in the managed futures returns (Irwin *et al.*, 1994). Figure 7 shows well that there is indeed little relationship between present and future returns. It plots the yearly returns of each CTA versus their next year achievement.

Table 5 studies the predictability of returns in more details. To do so, we classified the returns R_t under four categories. Namely, R_t and R_{t+1} superior to zero, R_t superior to zero and R_{t+1} inferior to zero, R_t inferior to zero and R_{t+1} superior to zero and, finally, both R_t and R_{t+1} inferior to zero. Results also show that independently of the sign of the previous period's returns next period's returns tend to be generally more on the positive side than negative. This may be taken as evidence of the long-term profitability embedded in actively managed currencies. We then measured conditional probabilities. The results show that generating a positive return in the future is independent of the previous year's return, be it positive or negative. For instance, the probability of observing a positive return having just experienced a loss is equal to 62.5 per cent. This also confirms the findings of Figure 7.

The overall conclusion tends to point towards no significant predictability in the past returns series. Consequently, choosing a CTA or currency trader uniquely on the basis of their absolute return, in the belief that past performance might reproduce itself, would be a sterile exercise.

On a more positive note, risk managers may find some comfort in observing some degree of persistence in the level of volatility from one period to another, as shown in Figure 8.

Trading style analysis

Contrary to other assets such as stock and bonds, currencies need to be associated with active management to yield significant returns. Consequently, the correlation of a CTA's performance to an index will depend more on the trading approach used than on the underlying traded asset. This is of great importance when the initial decision of investing is made within a portfolio context, as the investor will have to make sure that the trading style of the CTA remains the same in order that the profit and loss generated maintains the same level of correlation and risk characteristics to other assets in his portfolio. Trading often involves the use of fundamental analysis, technical analysis or, in the case of a discretionary trader, a loose mixture of the two. Consequently,

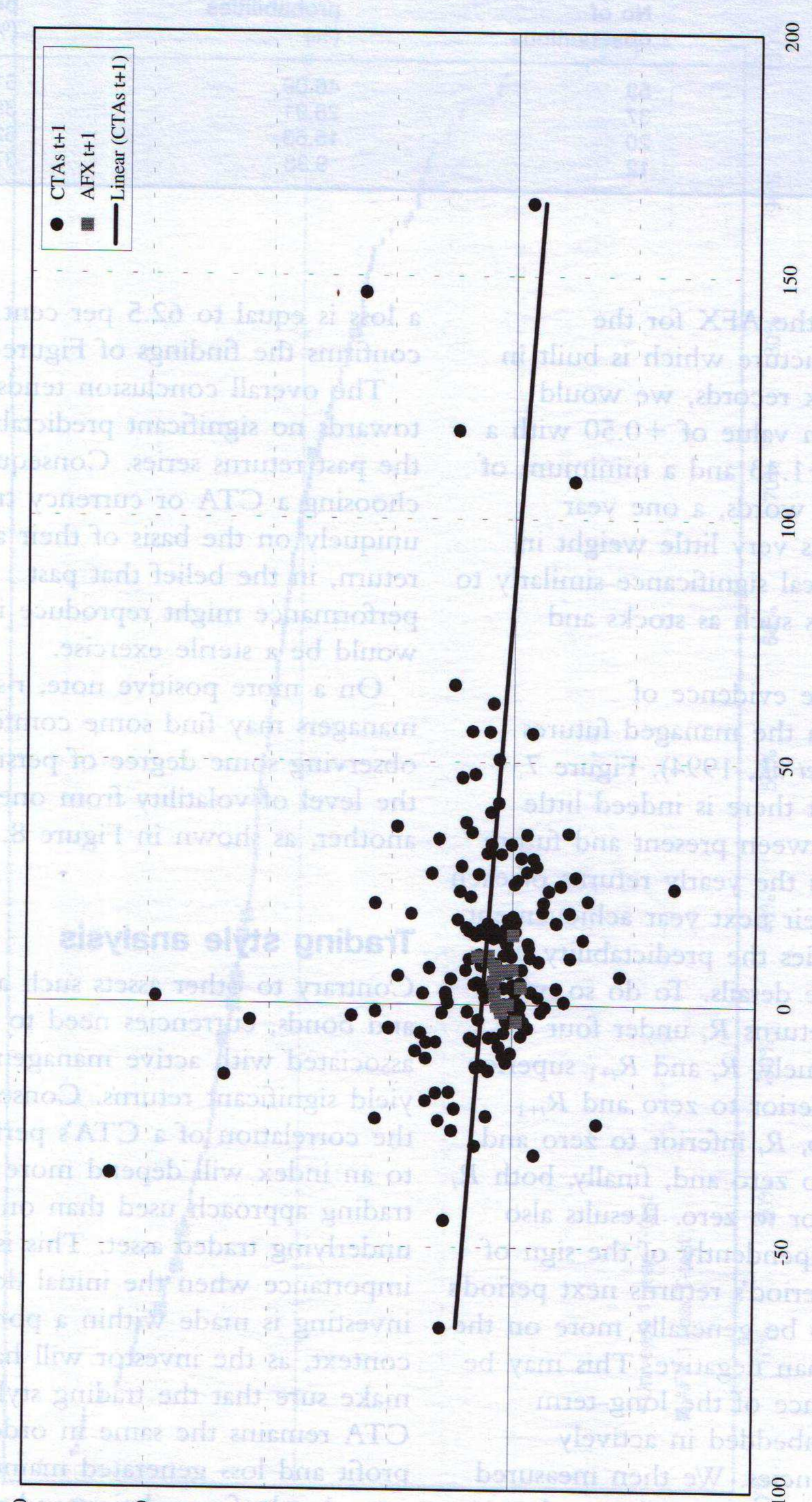

Figure 7 *xy* plot of yearly returns versus next period yearly returns

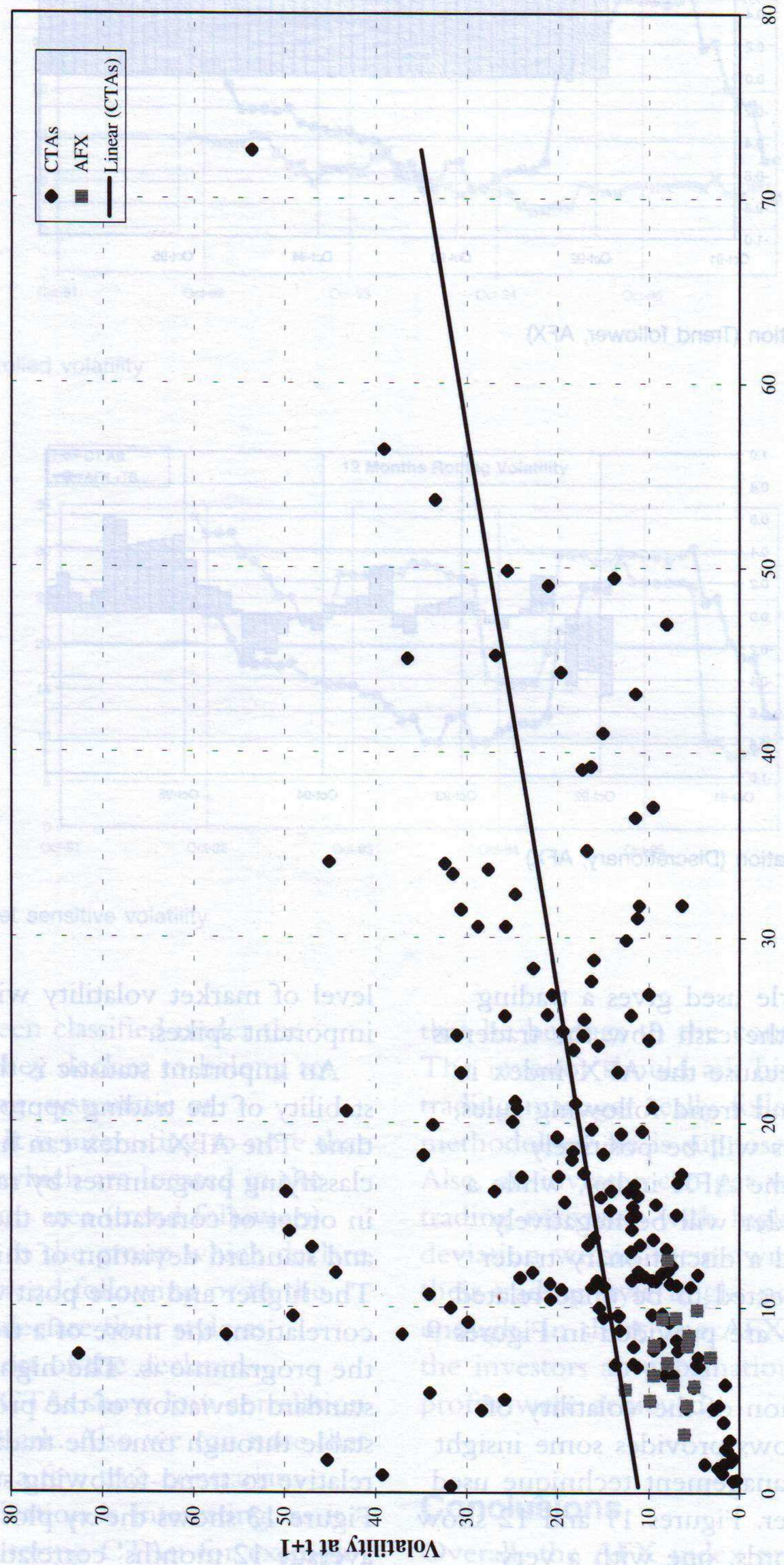

Figure 8 Predictability of next period volatility

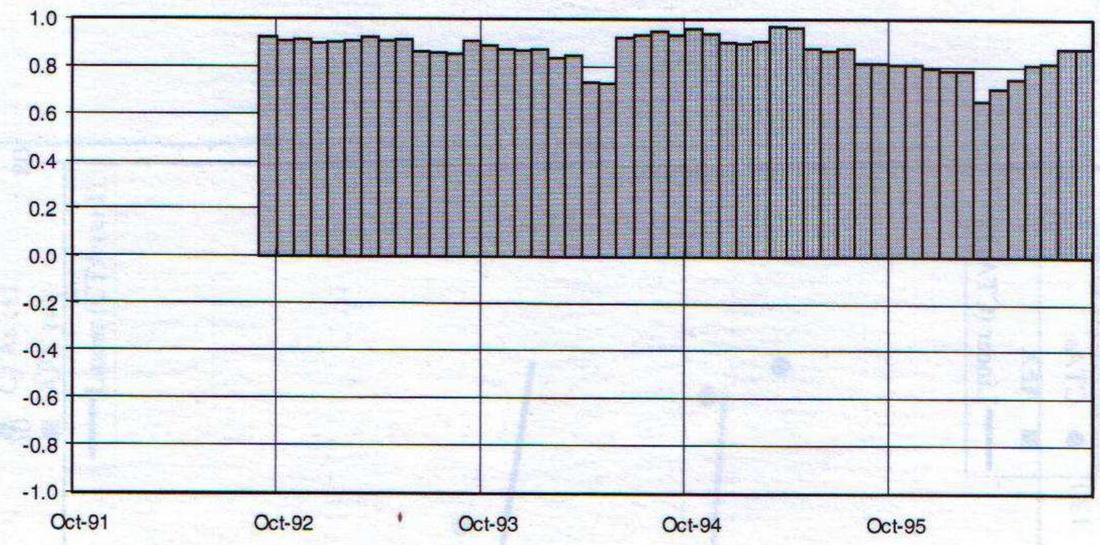

Figure 9 Correlation (Trend follower, AFX)

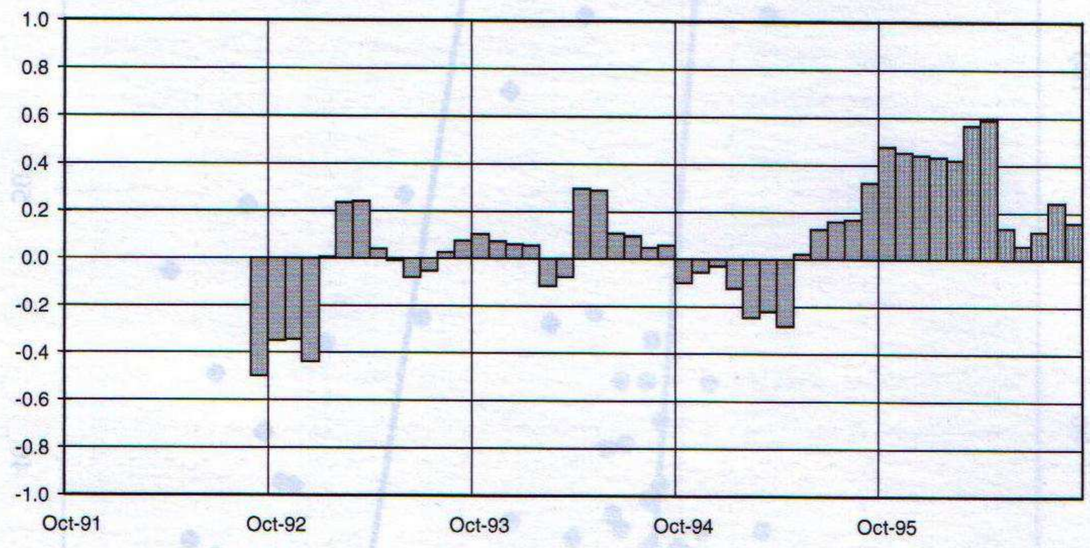

Figure 10 Correlation (Discretionary, AFX)

the trading style used gives a trading 'signature' to the cash flow the trader is generating. Because the AFX index is designed around trend following rules, trend followers will be positively correlated to the AFX index, while a contrarian[7] trader will be negatively correlated, and a discretionary trader would be expected to be uncorrelated. Two examples are provided in Figures 9 and 10.

The evolution of the volatility of CTAs' cash flows provides some insight on the risk management technique used by the manager. Figures 11 and 12 show two track records, one with a very controlled level of volatility and another programme where the level of volatility seems to be more dependent from the level of market volatility with some very important spikes.

An important statistic is the measure of stability of the trading approach through time. The AFX index can help in classifying programmes by ranking them in order of correlation to the benchmark and standard deviation of this correlation. The higher and more positive the correlation, the more of a trend follower the programme is. The higher the standard deviation of the profile, the less stable through time the trading style is relative to trend-following strategies. Figure 13 shows the *xy* plot of the average 12 months' correlation between each CTA and the AFX index versus the standard deviation of the monthly variation in the yearly correlation. All the

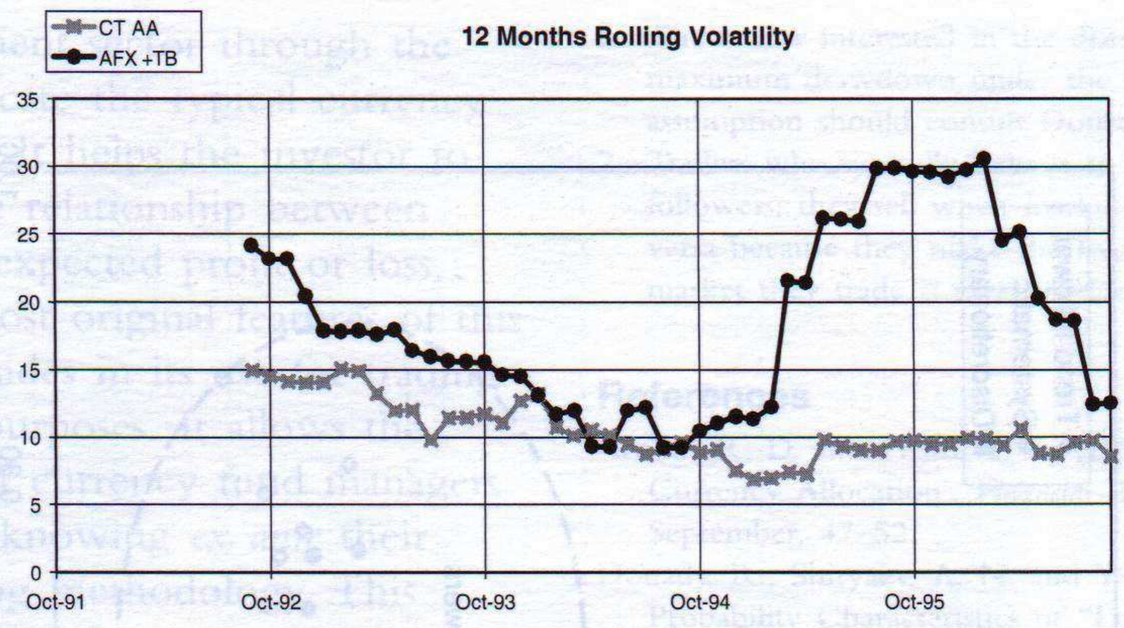

Figure 11 Controlled volatility

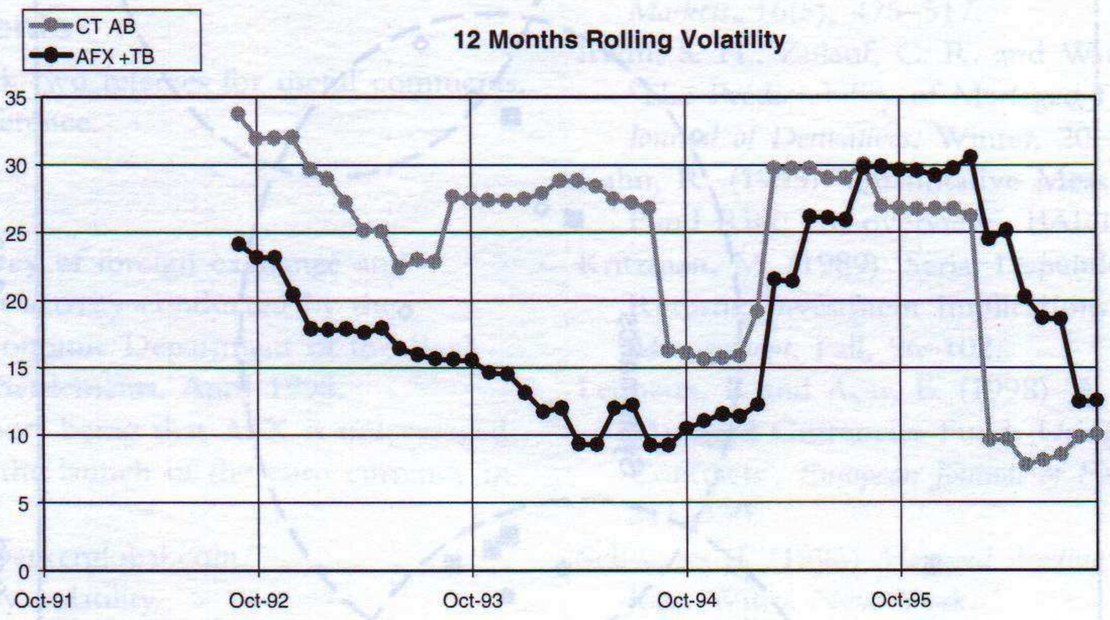

Figure 12 Market sensitive volatility

CTAs have been classified under the trading style they declare to belong to: trend following, systematic or discretionary. It is interesting to note that all the CTAs which are located in the high correlation area (trend followers) belong either to the group which declare their style as trend following or to the group which declare their style as systematic. Most of the declared discretionary CTAs show low correlation to the benchmark. Also we can note that there are only a few true contrarians.

This classification is interesting, as it helps in monitoring CTAs: for example we can see from Figure 13 that there is one CTA declaring he is a trend follower, though his signature suggests that he belongs to the contrarian's group. The investor should ask himself if this trading manager really follows the trading methodology he is supposed to be using. Also, an investor can get weary of trading managers with high standard deviation within their own class because their trading style might not be mature enough. In short, the AFX index gives the investors an explanation of how the profits were achieved.

Conclusions

Overall, the AFX index provides the investor with a new tool for performance and risk analysis which allows for a better understanding of the currency

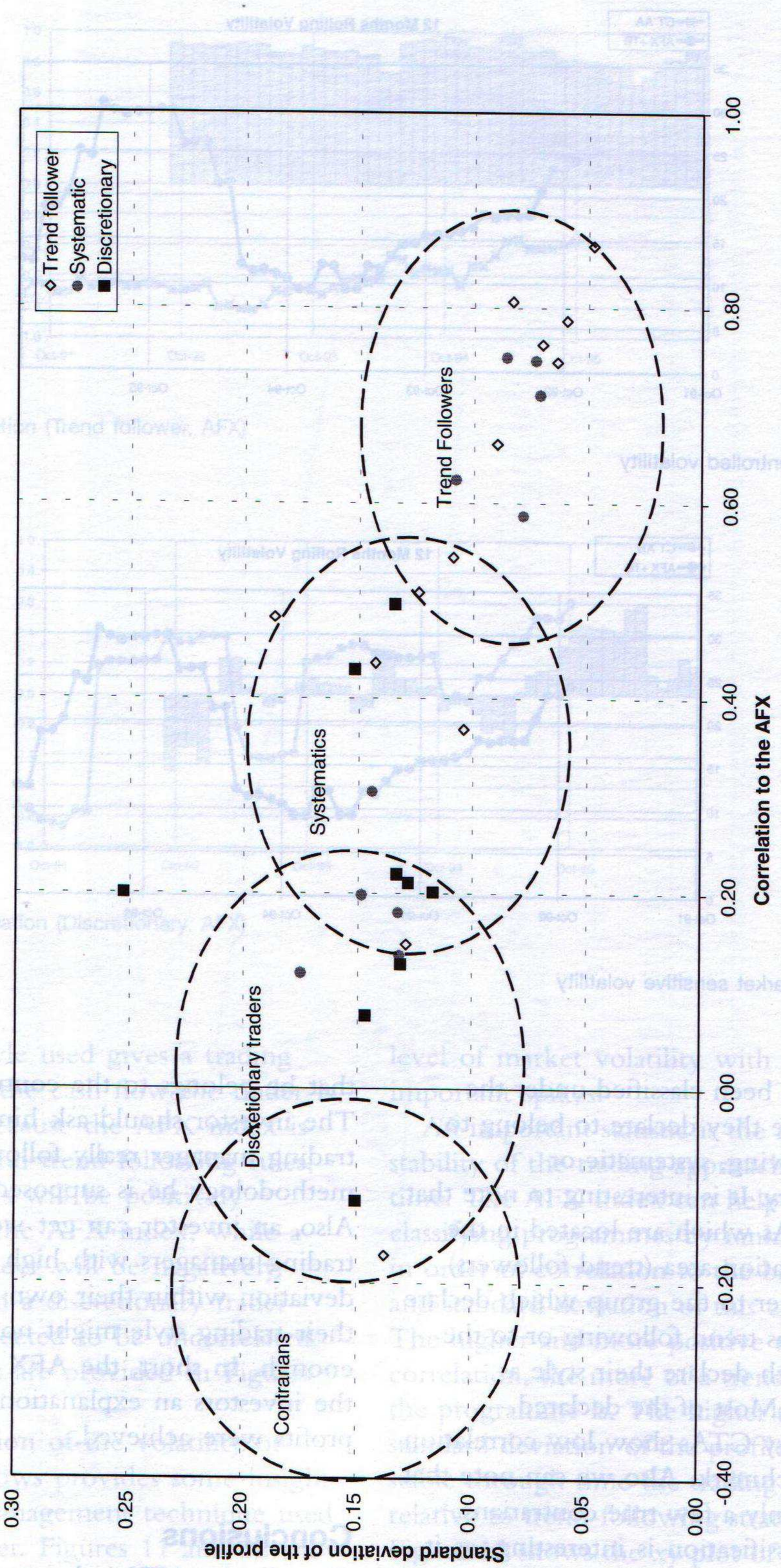

Figure 13 Trading style classification through the AFX

fund management sector through the ability to replicate the typical currency fund manager. It helps the investor to understand the relationship between volatility and expected profit or loss. One of the most original features of this benchmark resides in its use for trading style analysis purposes. It allows the classification of currency fund managers without even knowing *ex ante* their declared trading methodology. This surely should be of interest to a multi-fund adviser and institutional investors.

Acknowledgements

I should like to thank two referees for useful comments, suggestions and a reference.

Notes

1 Central bank survey of foreign exchange and derivatives market activity conducted by the Monetary and Economic Department of the Bank for International Settlements, April 1998.
2 The only differences being that AFX is unleveraged and incorporates the launch of the euro currency in 1999.
3 See http://www.parkerglobal.com/
4 Return divided by volatility.
5 Two per cent management fees and 20 per cent performance fees on a three times leveraged programme on average for the period.
6 The reader interested in the distribution of the maximum drawdown under the random walk assumption should consult Douady *et al.* (2000).
7 Traders who typically behave to the inverse of trend followers: they sell when markets move up and vice versa because they make the hypothesis that the market they trade is mean reverting.

References

Arnott, R. D. and Pham, T. K. (1993) 'Tactical Currency Allocation', *Financial Analysts Journal*, September, 47–52.

Douady, R., Shiryaev, A. N. and Yor, M. (2000) 'On Probability Characteristics of "Downfalls" in a Standard Brownian Motion', *Theory of Probability and Its Applications*, 44(1), 29–38.

Edwards, F. and Park, J. (1996), 'Do Managed Futures Make a Good Investment?', *Journal of Futures Markets*, 16(5), 475–517.

Irwin, S. H., Zulauf, C. R. and Ward, B. W. (1994) 'The Predictability of Managed Futures Returns', *Journal of Derivatives*, Winter, 20–27.

Kahn, R. (1995) 'Quantitative Measures of Mutual Fund Risk: An overview', BARRA, Working Paper.

Kritzman, M. (1989) 'Serial Dependence in Currency Returns: Investment Implications', *Journal of Portfolio Management*, Fall, 96–102.

Lequeux, P. and Acar, E. (1998) 'A Dynamic Index for Managed Currencies Funds Using CME Currency Contracts', *European Journal of Finance*, 4(4), 311–330.

Schwager, J. (1996) *Managed Trading: Myths & Truths*, John Wiley, New York.

Silber, L. W. (1994) 'Technical Trading: When it Works and When it Doesn't', *Journal of Derivatives*, Spring, 39–44.

Appendix Five years' statistics for each CTA and declared trading style

CTA code	Annualised return	Annualised volatility	Sharpe	Maximum drawdown	Correlation with AFX	Trading style
A	9.36	20.52	0.46	−14.18	0.57	Trend follower, Technical (100%), Systematic (100%)
B	46.44	31.12	1.49	−19.92	0.23	Technical (75%), Discretionary (75%)
C	15.42	11.08	1.39	−9.08	0.16	Discretionary (75%)
D	11.76	11.56	1.02	−12.32	0.21	Technical (75%), Discretionary (75%)
E	8.44	35.07	0.24	−102.08	0.60	Trend follower, Technical (100%), Systematic (100%)
F	1.22	24.44	0.05	−29.31	0.37	Discretionary (100%)
G	13.19	14.98	0.88	−14.88	0.07	Systematic (75%)
H	−0.12	1.13	−0.11	−3.35	0.18	Systematic (75%)
I	13.57	17.75	0.76	−27.41	0.51	Systematic (100%), Trend follower, Quantitative
J	26.84	45.91	0.58	−45.57	0.34	Discretionary (100%)
K	18.20	23.52	0.77	−37.41	0.78	Systematic (100%)
L	6.18	6.48	0.95	−12.79	0.10	Systematic (100%)
M	0.39	1.76	0.22	−5.27	0.14	Systematic (100%)

CTA code	Annualised return	Annualised volatility	Sharpe	Maximum drawdown	Correlation with AFX	Trading style
N	127.6	30.55	0.42	−53.65	0.80	Trend follower, Technical (75%), Systematic (75%)
O	6.11	13.30	0.46	−14.25	0.39	Trend follower, Technical (100%), Systematic (100%)
P	41.30	35.71	1.16	−65.79	0.43	Trend follower, Technical (100%), Systematic (75%)
Q	5.66	8.90	0.64	−15.74	0.00	Trend follower, Technical (50%), Discretionary (75%)
R	13.66	14.60	0.94	−11.63	0.65	Systematic (75%)
S	14.06	17.34	0.81	−15.92	0.55	Discretionary (75%), Fundamental, Technical
T	−4.62	3.76	−1.23	−23.13	0.05	Systematic (100%)
U	6.76	32.49	0.21	−73.59	0.79	Trend follower, Technical (100%), Systematic (100%)
V	16.32	21.14	0.77	−29.64	0.66	Systematic (100%)
W	9.98	12.74	0.78	−11.32	0.73	Trend follower, Technical (100%), Systematic (100%)
X	1.07	16.44	0.06	−33.75	0.85	Trend follower, Technical (100%), Systematic (100%)
Y	24.53	33.40	0.73	−47.78	−0.02	Undeclared
Z	10.08	33.54	0.30	−37.77	0.89	Trend follower, Technical (100%), Systematic (100%)
AA	1.71	22.87	0.07	−61.87	0.77	Systematic (100%), Trend follower, Technical (100%)
AB	1.33	8.17	0.16	−22.38	0.11	Trend follower, Technical (100%), Systematic (75%)
AC	9.70	25.07	0.39	−41.41	0.41	Trend follower, Technical (100%), Systematic (100%)
AD	5.74	9.97	0.58	−16.31	−0.10	Systematic (100%)
AE	18.98	27.65	0.69	−22.17	0.64	Systematic (75%)
AF	3.70	15.31	0.24	−29.95	0.66	Trend follower, Technical (100%), Systematic (100%)