

New Adaptive Method of Following the Tendency and Market Cycles

Present article is the first of the set of articles dedicated to description of the new mechanical trading system worked out by the author. The system is based on usage for exchange quotation analysis such mathematical instruments as digital filtration and spectral estimate of the intermittent (discontinuous) historical series. The system is realized in the computer software able to generate trading signals. At testing the system demonstrated excellent results – with yield 692.1% and profit-factor 17.88.

FOREWORD

The chart describing the dynamics (time history) of changes in exchange quotations or real deals prices can have arbitrary form, namely: even, uneven, broken or discontinuous (with gaps). In mathematics such functions are named nonanalytic. But even such nonanalytic function can be represented on the finite time horizon by infinite sum of sine functions.

Above given statement is the subject (content) of the famous theorem by Fourier, that engineer Jean Batiste Josef Fourier proved at the meeting of the French Academy in December 21, 1807.

It follows that any timing functions (signals) can be unambiguously represented by the functions of frequency that are named their frequency content. These functions describe the signal frequency composition. For determined (nonrandom) signals the transition from signal time description to the frequency description that is computation of the frequency content is made through direct Fourier transform.

However random noise cannot be described already through frequency content, as the Fourier transform from noise is also a random process. Usually stochastic processes are presented with the process spectral density of the power (SDP). SDP is the Fourier transformation of not the random process itself but its autocorrelation function.

Filtration is a process of changing the signal frequency spectrum in some desirable direction. This process can lead to intensification or weakening the frequent components in some range of frequency,

to suppression or separation some specific frequency component.

Digital filter is a digital system that can be used for filtration the digital (discrete) signals defined only in discrete moments of time. It can be realized with the software method on computer.

With computers and modern information systems appearance methods of technical analysis using filtration and mathematical approximation began to develop rapidly. Relative simplicity of their calculation and integrability into information systems has made their effect. Hundreds of indicators have been contrived. And all of them beginning with Moving Averages, RSI, MACD, Momentum, Stochastic, are digital filters because they change signal frequency spectrum in some direction. In other words they have their transfer function with the gain factor depending on frequency. For example, for Moving Averages this factor is proportionate to function $\sin(f)/f$, where f – is a normalized frequency. However during the technical indicators development the transfer function is neither calculated by their founders at all nor is advised to the product users. Therefore change in direction the signal frequency spectrum is remained unknown for the most of the users and that fact drives them in obviously disadvantage. The main issue roots here.

The second problem is in the following. Time history of changing the currency rates and stock price for goods (commodity stock prices) or equities is always represented as a digital signal.

Digital signals possess a number of properties known to only a narrow circle of specialists that should be considered in developing technical indicators. The most important property of the digital signals is the fact that spectrum of the digital signals is a periodic function! Ignoring the properties of the discrete signals leads to unavoidable distortions digital entering time series such as aliasing – frequency superposition (overlay), ambiguity and spectrum leakage.

The third problem is connected with the fact that spectral density of the prices deviations, strongly differ with each other at different markets. Therefore even if the developers of the technical instruments have resolved the two of the problems, the user as a rule is not presented with the distinct algorithm for their parameters setup. Instead of that the user is offered the next scheme: to change at his own choosing the indicator parameter and then test.

Unfortunately, besides the complexities as above mentioned there is one more a very serious problem leading to the fact that optimized technical instruments, that worked well in the past, can work bad or cannot work at all in the future. This is non-stationary state (time-dependence) of the historical series that the technical analyzers have to deal with.

Non – stationary state of the stock exchange processes leads to the fact that price fluctuations spectrum on the same market will depend on the time of its computation (valuation). If to compare two prices of SDP computed at different time periods, one can notice that spectral peaks slowly “float” or split.

The concept of the right and left displacement (offsetting) for trend markets known to us from the technical analysis is explained with this fact. This concept is sequent featured for any waves (light, sound and etc.) effect known in physics as the “Doppler effect”: change of wavelength of harmonic (periodic) fluctuation (oscillation) watched at the movement of the wave source with regard to the receiver. In other words non-stationary state of the analyzed processes is not the hindrance in specification the trend direction but is even a direct evidence of the trend movement availability at the financial and commodity stock exchange, which is prejudiced by orthodox sticklers or apologists of the fundamental analysis.

Present publication is devoted to the new method of the technical analysis based on filtration and spectral estimator of the discontinuous historical series. Later on we will name it “Adaptive Trend & Cycles Following Method”, or AT&CF method. The new method effectiveness significantly surpasses all trading systems efficacy known to the author.

The first article of the whole set of articles is dedicated to description of general principles of the system construction, its separate features and indicators. In the next articles such interesting results got during the working process as spectral estimators of the currency pair EUR/USD rate volatility and specific algorithm of the trading signals generating will be given a thorough consideration.

The main purpose of the present publication is to draw the attention of the trading systems developers and technical analysts to the new possibilities of the digital methods of the financial and commodity stock exchanges analysis.

PURPOSES AND TASKS OF THE METHOD

Main purpose of the AT&CF method is forming a minimal set of technical instruments with set properties sufficient for algorithm development that would provide maximal possible for the specific market yield with minimal risk level.

For this purpose achievement the following tasks are being solved:

- Frequency content (spectral distribution) of the price oscillations is studied;

- Adaptive procedure of setting or guiding non recursive digital filters is implemented with result of creation a set of pulse transition features (PTF) optimized with earlier received spectral estimators consideration;
- The procedure of the PTF and input (entering) discrete time series is realized (usually consisting of close prices of the week, day, hour and so on and so forth), that is digital filtration resulted in defining a set of indicators as given below; the filtration procedure is repeated with entry (appearance) of the new value of the digital (discrete) input series;
- Trading algorithm is worked out with main principles of construction stated below.

Area of AT&CF-method application includes any financial and commodity stock exchanges. However market capitalization and market liquidity undoubtedly influence the maximal dimension of open position without its distorting the results given below. For FOREX market this threshold (barrier) is no less than 100 mio* USD for main currency pairs. That is why AT&CF-method is of interest for any category (kind) of investors.

NEW INSTRUMENTS OF THE TECHNICAL ANALYSIS AND THEIR INTERPRETATION

Main innovation of the AT&CF-method is an adaptive trend line with arbitrary form, the movement direction of which is the direction of the prevailing trend on the market. The adaptive trend line is a low frequency component of the entry time series marked with the help of the digital filter of low frequency (FLF), letting low frequencies through and cutting high frequencies of the price instability (fluctuations). The lower frequency cutting f_c of FLF, the smoother the trend line becomes. Such approach is in compliance with the trend notion adopted in all technical and radio physical applications and

cannot shock both technical analysts and investors. The points lying on the adaptive trend line possess a very strong inner relation (connection). Independent are only values of the points being from each other in the distance equal to or more than so called Nyquist interval $T_N = 1/2 f_c$. The lower frequency of the filter cutting, the stronger is this inner relation and hence, the more time is required for the predominant tendency reversal.

The readers not experienced in theory and practices of the digital filtration I recommend to spare more attention not to the ways of computation the indicators used by the method, but to the issues of their interpretation and received results. Actually it is more important for investors that this or another method should work and give profit, and to investigate and be experienced in the details of the method is a matter of the specialists of another category. For the new instruments examination let's refer to the illustration in Fig.1.

FATL (Fast Adaptive Trend Line)– is formed with the digital filter of the low frequency FLF - 1. Filter FLF – 1 serves to suppress noises of high frequency and market cycles with very short periods of oscillation that can be considered as noise.

SATL (Slow Adaptive Trend Line)– is formed with the digital filter of the low frequency FLF - 2. Filter FLF – 2 serves to suppress noises and market cycles with longer periods of oscillation.

These filters parameters (frequency of cutting f_c and fading A in the stop band) were calculated with spectral estimate of the currency rate EUR/USD. Filters of low frequency FLW –1 and FLF – 2 provide attenuation in the stop band with no less than 40 dB and absolutely don't distort the amplitude and phase of entry discontinuous price series in the pass band (bandwidth). These properties of the digital filters provide significantly improved (in comparison with simple moving average) noise suppression that in its turn allows reducing sharply the probability of appearance “false” signals for purchase and sell.

There are no analogues to FATL и SATL among widely known technical instruments. These are not moving “average”, but just the adaptive lines estimates of the short term and long-term trends. Unlike moving “average”, FATL and SATL have no any phase delay with regard to current prices. FATL (k) value is a mathematical close price expectation close (k), where k – is a number of trading days. The value of N-punctual moving “average” MA (k), is strictly speaking, mathematical expectation not close (k), but close (k-N/2), where k – is the number of the trading day. The value of SATL (k) is mathematical expectation of FATL (k) for any k on preset time domain (slice) T.

RFTL (Reference Fast Trend Line)– support “fast” trend line and **RSTL (Reference Slow Trend Line)** – support “slow” trend line are digital filters response of FLF 1 and FLF 2 to the entry discontinuous series taken with delays equal to corresponding Nyquist intervals T_{Ni} . Support lines of RFTL and RSTL are analogues to simple moving “average” in the sense of their delay in relation to the current prices. If instead of the pulse FLF features with complicated forms to use pulse feature with 1/N balance corresponding to the procedure of N – point wise moving average, the analogue would be complete.

Indicators of FTLM (Fast Trend Line Momentum) and STLM (Slow Trend Line Momentum)

show the tempo of change (fall or growth) of FATL and SATL and are calculated similarly to indicator Momentum by formulas:

$$FTLM(k) = FATL(k) - RFTL(k), \\ STLM(k) = SATL(k) - RSTL(k).$$

Main difference of FTLM and STLM from classical technical instrument Momentum is that for its calculation not the close prices but smoothed (leveled) in the result of filtration values of the trend line are used. In the result FTLM and STLM turn out more leveled (smoothed) and regular functions than the classical instrument Momentum, and therefore have more forecasting value. FTLM and STLM lines were calculated with observance of all the rules of discrete mathematics as the first differences between the two nearest independent points of range bound channel processes.

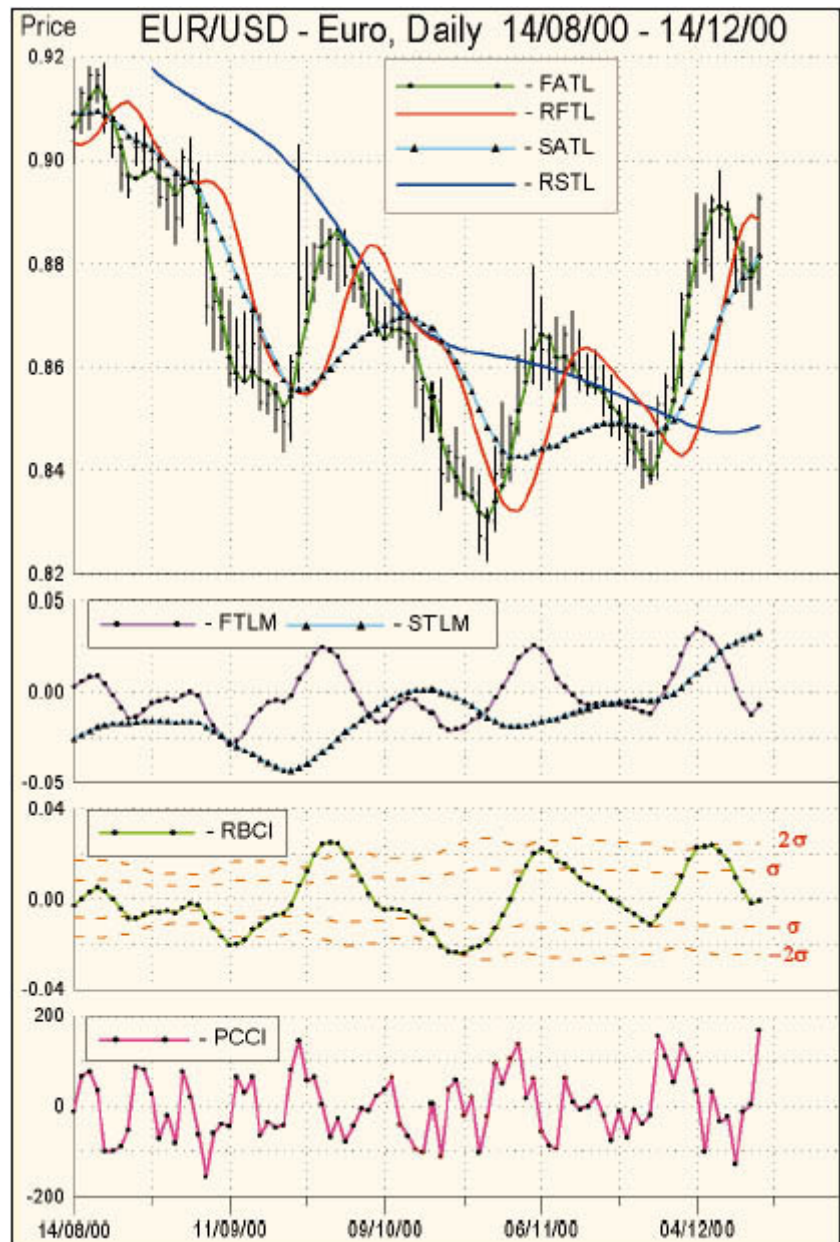


Fig. 1. Adaptive trend lines.

During computation the classical indicators Momentum requirement is often not fulfilled and it leads to unavoidable distortions in the spectrum of the entering signal. Specialists in the digital processing of the signals name these distortions aliasing that is frequencies overlay or ambiguity. This ambiguity leads to strong irregularity and chaos in the classical technical indicator Momentum.

A set of the technical instruments of the method contains two more new oscillators. They are indexes of RBCI and PCCI, also shown in Fig. 1.

RBCI (Range Bound Channel Index) – is calculated by means of the channel (bandwidth) filter (CF). Channel filter simultaneously fulfills two functions:

- Removes low frequent trend formed by low frequent components of the spectrum with periods, more $T_2 = 1/f_{c2}$;
- Removes high frequency noise formed by the high frequent components of the spectrum with periods, less $T_1 = 1/f_{c1}$.

The periods T_1 and T_2 are chosen to comply with condition $T_2 > T_1$

Cutting frequencies f_{c1} and f_{c2} are chosen so that all prevailing market cycles should enter the frequencies range bound by f_{c1} и f_{c2} .

Summarily $RBCI(k) = FATL(k) - SATL(k)$.

Indeed, RBCI approaches its local maximum the prices approach upper border of the trading channel and when RBCI approach its local minimum the prices approach the lower border of the trading corridor.

Let's mark main property of RBCI index. This is quasistationary (that is almost stationary) process bound by the frequency range both from above and below.

PCCI Index (Perfect Commodity Channel Index) – is a perfect commodity channel index is calculated by the formula:

$PCCI(k) = close(k) - FATL(k)$.

It has some outer similarity in the calculating method with commodity channel index CCI by D. Lambert. Indeed, CCI index is calculated as normalized difference between current price and its moving average and PCCI – as the difference between closing price and its mathematical expectation represented by the FATL value. Here lies more than in comparison with CCI the perfection of PCCI. PCCI index– is a normalized for its standard deviation high frequency component of the currency rate volatility.

Main Principles for the Trading Algorithm Development and Interpretation Rules for New Technical Instruments

Main principles to be observed at the concrete trading algorithm development are the following:

- Trade only in the direction of the prevailing tendency the direction of which is specified by “slow” adaptive trend line SATL;
- To consider dynamic characteristic-s of the “fast” and “slow” trend represented by the FTLM and STLM indicators;
- To use information on what area of the values (neutral, overbought, oversold, local maximum and local minimum) is the sum of prevailing market cycles (index of RBCI) in chosen by means of frequency range spectral analysis;

TABLE 1. OVERALL PERFORMANCE OF THE TRADING SYSTEM WORK BASED ON ADAPTIVE METHOD OF FOLLOWING THE TENDENCY AND MARKET CYCLES

AT&CF method – EUR/USD, daily from 29.07.1998 until 08.12.2000			
OVERALL PERFORMANCE OF THE METHOD			
Total net profit	\$692100.00	P/L of open position	\$0.00
Gross profit	\$733100.00	Total loss	\$-41000.00
Total number of trades	36	Percentage of Profitable deals	83.33%
Number of successful trades	30	Number of unsuccessful trades	6
Maximal profit	\$48300.00	Maximal loss	\$-16400.00
Average index in profit dealership	\$24436.67	Average index in loss dealership	\$-6833.33
Ratio: average profit/average loss	3.58	Average index in total operations (profit and loss)	\$19255.00
Max. sequence of gains	10	Max. sequence of losses	2
Average position duration		Average position duration	
In profitable deals, days	11.63	in unprofitable deals, days	4.83
Max. intra-day drop	\$-18800.00		
Profit – factor	17.88	Position lot	1 mio EUR
Margin	\$100000.00	Yield	692.10%
System Work Characteristic: Long positions			
Total net profit	\$230800.00	P/L open position	\$0.00
Gross profit	\$254400.00	Total loss	\$-23600.00
Total number of trades	12	% of profitable deals	83.33%
Number of prof. trades	10	Number of unprof. trades	2
Maximal profit	\$45000.00	Maximal loss	\$-16400.00
Average index in profit dealership	\$25440.00	Average index in loss dealership	\$-11800.00
Ratio: average profit/average loss	2.16	Average index in total operations (profit and loss)	\$19233.33
Max. sequence of gains	9	Max. sequence of losses	1
Average position duration		Average position duration	
In profitable deals, days	8.70	in unprofitable deals, days	5.00
Max. intra-day drop	\$-18800.00		
Profit – factor	10.78	Position lot	1 mio EUR
Margin	\$100000.00	Yield	230.80%
System Work Characteristic: Short positions			
Total net profit	\$461300.00	P/L open position	\$0.00
Gross profit	\$478700.00	Total loss	\$-17400.00
Total number of trades	24	% of profitable deals	83.33%
Number of prof. trades	20	Number of unprof. trades	4
Maximal profit	\$48300.00	Maximal loss	\$-13400.00
Average index in profit dealership	\$23935.00	Average index in loss dealership	\$-4350.00
Ratio: average profit/average loss	5.50	Average index in total operations (profit and loss)	\$19220.83
Max. sequence of gains	7	Max. sequence of losses	2
Average position duration		Average position duration	
In profitable deals, days	13.10	in unprofitable deals, days	4.75
Max. intra-day drop	\$-18800.00		
Profit – factor	27.51	Position lot	1 mio EUR
Margin	\$100000.00	Yield	461.30%

- To take oscillator signals as secondary ones in cases when trend indicators are evidence of the very marked bearish or bullish tendency availability;
- To take oscillator signals as main ones in cases when trend indicators give signals about absence of the very marked tendency;
- To use flexible system of protective stop orders based on the values of RBCI, PCCI indexes and volatility values of the “fast” market oscillations.

Main rules for the above mentioned instruments interpretation are the following:

- Growing SATL line is evidence of the bullish trend on the market. The point of the reversal beginning of the bearish trend is considered the point of the local minimum of SATL. The point of finishing the reversal of the bearish trend is the point where the sign of STLM changed from minus into plus.
- Falling SATL line is evidence of the bearish trend on the market. The point of the bullish trend reversal beginning is considered the point of the local SATL maximum. The point of finishing the bullish trend reversal is the point where STLM sign changed from plus into minus.
- Close to horizontal the form of SATL is evidence of the neutral tendency.
- STLM interpretation requires special attention. Positive value of STLM is evidence of the bullish trend and the negative one testifies the bearish trend. STLM is an advance indicator. Local minimum of STLM always precedes the local minimum of SATL. Local maximum of STLM always precedes the local maximum of SATL. Achievement by STLM its points of extremum is necessary but insufficient condition for the achievement by the curve of SATL the top or the bottom. Growing STLM at growing SATL is evidence of the bullish trend acceleration. Horizontal and positive STLM at growing SATL is evidence of the set bullish trend. The more absolute the value of STLM, the more potential the bullish trend has. Falling STLM at falling SATL testifies the bearish trend acceleration.

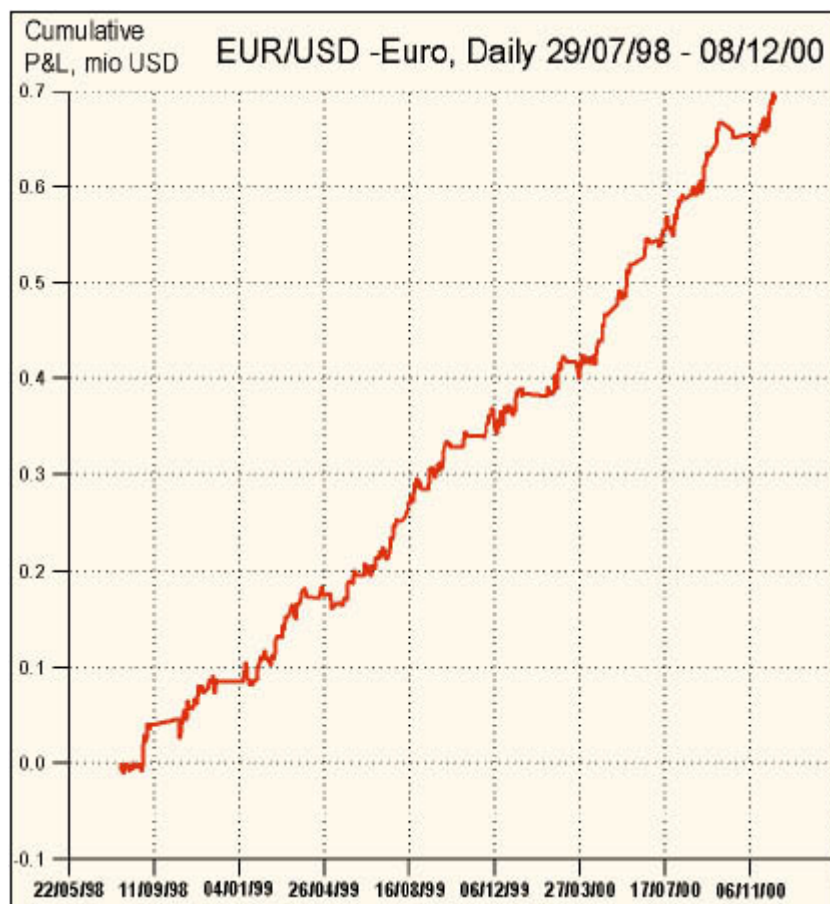


Fig. 2. Total value of the P&L trading system based on the AT & CF method

Table 2. Time behavior characteristic of the trading system work based on AT&CF-method including P&L with one entry the market and total P&L (the beginning).

Data	Type	Signal	Volume	Price	Stop	P&L entry	Total P&L
29/07/98	Buy	L2A	1 mio EUR	1.1052	1.0893		
10/08/98	LExit	S8	1 mio EUR	1.0980	1.0893	\$ -7200	\$ -7200
10/08/98	Sell	S8	1 mio EUR	1.0987	1.1132		
14/08/98	SSExit	L3	1 mio EUR	1.0966	1.0994	\$2100	\$ -5100
14/08/98	Buy	L3	1 mio EUR	1.0863	1.0715		
08/09/98	LSExit	LS1	1 mio EUR	1.1313	1.1313	\$45000	\$39900
14/10/98	Sell	S8	1 mio EUR	1.2003	1.2189		
16/11/98	SSExit	SS3	1 mio EUR	1.1664	1.1664	\$33900	\$73800
20/11/98	Sell	S2A	1 mio EUR	1.1600	1.1797		
01/12/98	SSExit	SS3	1 mio EUR	1.1605	1.1605	\$ -500	\$73300
02/12/98	Buy	L8	1 mio EUR	1.1609	1.1451		
04/12/98	LSExit	LS1	1 mio EUR	1.1721	1.1721	\$11200	\$84500
07/01/99	Sell	S1	1 mio EUR	1.1714	1.1913		
15/01/99	SSExit	SS3	1 mio EUR	1.1739	1.1739	\$ -2500	\$82000
18/01/99	Buy	L8	1 mio EUR	1.1565	1.1366		
21/01/99	LExit	S2A	1 mio EUR	1.1565	1.1366	\$0	\$82000
21/01/99	Sell	S2A	1 mio EUR	1.1616	1.1824		
08/02/99	SSExit	SS3	1 mio EUR	1.1309	1.1309	\$30700	\$112700
12/02/99	Sell	S2A	1 mio EUR	1.1217	1.1369		
08/03/99	SSExit	SS1	1 mio EUR	1.0821	1.0821	\$39600	\$152300
12/03/99	Sell	S5	1 mio EUR	1.1037	1.1221		
01/04/99	SSExit	SS3	1 mio EUR	1.0813	1.0813	\$22400	\$174700
16/04/99	Sell	S2A	1 mio EUR	1.0685	1.0843		
23/04/99	SSExit	SS3	1 mio EUR	1.0680	1.0680	\$500	\$175200
03/05/99	Sell	S2A	1 mio EUR	1.0589	1.0723		

Horizontal and negative STLM at growing SATL testifies the bearish trend setting. The more absolute value of STLM, the more potential the bearish trend has.

- Growing “fast” FATL trend line at the growing “slow” SATL trend line is evidence of the strong bullish trend on the market.
- Falling “fast” line of FATL at the falling “slow” line of SATL is evidence of the strong bearish trend on the market.
- Growing FATL line at falling SATL line is evidence of either bullish correction at the bearish trend or consolidation.
- Falling FATL line at growing SATL line is evidence of either bearish correction at the bullish trend or consolidation.
- The beginning or resuming the movement in one direction of FATL and SATL lines give signals either on the tendency reversal or finishing the correction and resuming price movement in the SATL direction.

Characteristic of the System

Overall performance of the system functioning according to the AT&CF- method is given in Table 1. Here you can find the system’s work characteristics on long (EUR/USD buy) and short (EUR/USD sell) positions separately.

Cumulative value of the P&L trading system functioning on the base of the AT&CF-method is shown in Fig.2. Dependence of P&L on time has distinctly marked linear tendency to growth.

Table 2 shows time behavior characteristic of the trading system work including P&L of one operation and cumulative value of

Table 2. Time behavior characteristic of the trading system work based on AT&CF-method including P&L with one entry the market and total P&L (ending).

05/05/99	SSExit	SS0	1 mio EUR	1.0723	1.0723	\$ -13400	\$161800
12/05/99	Sell	S3	1 mio EUR	1.0712	1.0910		
04/06/99	SSExit	SS3	1 mio EUR	1.0362	1.0362	\$ 35000	\$196800
15/06/99	Sell	S2A	1 mio EUR	1.0423	1.0611		
15/07/99	SSExit	SS3	1 mio EUR	1.0258	1.0258	\$ 16500	\$213300
20/07/99	Buy	L8	1 mio EUR	1.0315	1.0146		
30/07/99	LSExit	LS3	1 mio EUR	1.0683	1.0683	\$ 36800	\$250100
05/08/99	Sell	S4	1 mio EUR	1.0777	1.0900		
19/08/99	SSExit	SS2	1 mio EUR	1.0565	1.0565	\$ 21200	\$271300
23/08/99	Sell	S6	1 mio EUR	1.0681	1.0853		
31/08/99	SSExit	SS3	1 mio EUR	1.0542	1.0542	\$ 13900	\$285200
08/09/99	Sell	S3	1 mio EUR	1.0586	1.0811		
16/09/99	SSExit	SS3	1 mio EUR	1.0464	1.0464	\$ 12200	\$297400
21/09/99	Buy	L8	1 mio EUR	1.0365	1.0197		
08/10/99	LSExit	LS3	1 mio EUR	1.0666	1.0666	\$ 30100	\$327500
25/10/99	Sell	S8	1 mio EUR	1.0688	1.0832		
29/10/99	SSExit	SS2	1 mio EUR	1.0548	1.0548	\$ 14000	\$341500
19/11/99	Sell	S2A	1 mio EUR	1.0294	1.0451		
17/12/99	SSExit	L1	1 mio EUR	1.0080	1.0451	\$21400	\$362900
17/12/99	Buy	L1	1 mio EUR	1.0066	0.9847		
12/01/00	LSExit	LS3	1 mio EUR	1.0287	1.0287	\$ 22100	\$385000
11/02/00	Sell	S2A	1 mio EUR	0.9850	1.0023		
17/02/00	SSExit	L7	1 mio EUR	0.9860	1.0023	\$ -1000	\$384000
17/02/00	Buy	L7	1 mio EUR	0.9853	0.9662		
25/02/00	LSExit	S3	1 mio EUR	0.9912	0.9862	\$ 5900	\$389900
25/02/00	Sell	S3	1 mio EUR	0.9920	1.0186		
09/03/00	SSExit	SS3	1 mio EUR	0.9642	0.9642	\$ 27800	\$417700
22/03/00	Sell	S2A	1 mio EUR	0.9605	0.9826		
01/05/00	SSExit	SS1	1 mio EUR	0.9122	0.9122	\$ 48300	\$466000
15/05/00	Sell	S5	1 mio EUR	0.9200	0.9417		
23/05/00	SSExit	L7	1 mio EUR	0.9023	0.9417	\$ 17700	\$483700
23/05/00	Buy	L7	1 mio EUR	0.9016	0.8757		
01/06/00	LSExit	LS1	1 mio EUR	0.9370	0.9370	\$ 35400	\$519100
19/06/00	Sell	S4	1 mio EUR	0.9635	0.9822		
27/06/00	SSExit	SS2	1 mio EUR	0.9399	0.9399	\$ 23600	\$542700
07/07/00	Sell	S1	1 mio EUR	0.9506	0.9662		
10/08/00	SSExit	SS3	1 mio EUR	0.9050	0.9050	\$ 45600	\$588300
21/08/00	Sell	S2B	1 mio EUR	0.9068	0.9235		
12/09/00	SSExit	SS1	1 mio EUR	0.8616	0.8616	\$45200	\$633500
21/09/00	Buy	L4	1 mio EUR	0.8488	0.8282		
28/09/00	LSExit	LS1	1 mio EUR	0.8830	0.8830	\$34200	\$667700
11/10/00	Buy	L1	1 mio EUR	0.8711	0.8547		
13/10/00	LSExit	LS0	1 mio EUR	0.8547	0.8547	\$ -16400	\$651300
08/11/00	Sell	S3	1 mio EUR	0.8598	0.8783		
28/11/00	SSExit	L1	1 mio EUR	0.8527	0.8783	\$7100	\$658400
28/11/00	Buy	L1	1 mio EUR	0.8522	0.8340		
08/12/00	LSExit	LS0	1 mio EUR	0.8859	0.8859	\$33700	\$692100

P&L. The first column shows data of operations made, the second one – the type of operation.

Here the following symbolic notations are used: Buy – EUR/USD, Sell – EUR/USD, L Exit (Long Exit) – is long position closing for EUR/USD, S Exit (Short Exit) – is short position closing for EUR/USD, LSExit (Long Stop-Exit) – exit from long position with stop signal, SSExit (Short Stop-Exit) – exit from short position with stop signal.

Table 2 shows that our system is not a system of continuous action,

that leaves fairly big potential for its characteristics improvement.

Table 1 shows that average profit for one trading operation (with profit or losses) is \$19,225, and the ratio of maximal sequence of gains to maximal sequence of losses is 10 to 2. With this fact consideration the chosen strategy brings to the conclusion: through limited number of the market entries the total risk to lose the first (primary) margin tented to zero. Direct confirmation of this paradoxical at first sight conclusion is the fact that in 6 months trading

(February 8, 1999.), the amount of money on the account was \$212,700 (\$100,000 – primary margin, \$112,700 – received profit). Thus the primary margin can be simply withdrawn from the account (debited). After that the trading begins with zero probability to lose it. If to choose another strategy, for example, trading with permanent financial leverage, the curve P&L in Fig. 2 would be almost parabolic. And in this case the risk would be at the same level defined by average risk for one market entry.