# Are Technical Trading Rules Profitable? Evidence for Head-and-Shoulder Rules[1]

by

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**Abstract**

The profitability of chartist trading rules on foreign exchange markets is still under debate. Since simple technical trading rules may not adequately capture the complex phenomenon of chartist trading, this paper focuses on the prominent head-and-shoulder pattern as a representative trading rule which incorporates various „technical" ideas such as smoothed trends, trend reversal, resistance levels, and volatility clustering. For various combinations of the building blocks of head-and-shoulder definitions the result is generally negative: Returns to head-and-shoulder trading rules are not significantly positive - and if there is any evidence for non-zero returns at all, then it is is evidence for negative returns.

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# I. Introduction

The profitability of technical trading rules in foreign exchange markets has been the subject of some debate. Traditionally, academic scholars have been very skeptical about their usefulness (Malkiel (1990)), probably due to the widespread feeling that relative prices must somehow be related to fundamentals – and technical (or chartist) trading simply ignores fundamentals. But while it is easy to deride technical trading rules as something similar to superstition or astrology, it is less easy to explain why these techniques continue to stay popular among market participants.

In the last years, several papers have presented evidence that some simple trading rules are useful for predicting future exchange rates and give rise to excess profits, cf. Dooley and Shafer (1983), Sweeney (1986), Taylor (1992), Neely et al. (1996), LeBaron (1998)[2]. Further analysis by Szakmary and Mathur (1997), LeBaron (1999), and Saacke (1999), however, has shown that the profitability of these rules (i. e. moving average rules or peak-and-trough-progression rules) is almost exclusively due to subperiods in which a central bank actively intervened in the foreign exchange markets. By and large, the analysis of intervention-dependent subsamples suggests that periods of central bank intervention are extremely profitable for technical traders who rely on very simple technical rules to predict movements in the exchange rate, while these rules have next to no significant excess returns for intervention-free periods. This reinforces the traditional academic position since excess profits to technical traders are limited to occasions in which one might argue that the efficient market property of foreign exchange was distorted by the existence of a large player with important private information on future exchange rate targets. While this stops short of understanding *why* technical trading can be profitable under these circumstances, it seems reassuring to find that these technical trading rules are unsuccessful under „normal“ conditions.

However, most academic analysis of technical trading rules has focused on simple rules like the moving average rules, where buy or sell signals are determined by comparing the current exchange rate with a moving average of past exchange rates of a certain length. There is no doubt that this rule is *inter alia* in widespread use on foreign exchange markets (Cornell and Dietrich (1978)), but it is unlikely that it adequately describes the complex phenomenon of technical trading, cf. Pring (1991). A typical chartist trader will use a rather complicated mixture of various indicators, out of which the simple rules mentioned above are but one of a multitude of constituents. While it is clearly impossible to adequately formalize this complex concept of technical trade, some popular receptions of chartist trading rules like the so-called head-and-shoulder rule may reflect the behavior of chartists better than the simple rules, since, for instance, the head-and-shoulder pattern consists of a combination of several simpler indicators: Smoothed trends, peak-and-trough-progression patterns, resistance levels, volatility clustering, time limits and trend reversal patterns. See Osler and Chang (1995) or the definition in the body of this paper for details.

The objective of this paper is hence an investigation on the profitability of the head-and-shoulder rule as a representative complex chartist trading rule. The paper is structured as follows: After briefly describing the data in section II I will discuss five possible constituents of the head-and-shoulder rule following Osler and Chang‘s (1995) definition. This is done in

[2] These results are in sharp contrast to similar investigations for stock markets, where no significant excess returns have been found, see Fama and Blume (1966).

section III. In section IV I evaluate the profitability of Osler and Chang's head-and-shoulder rule and various related rules. The general result will be that such rules have no significant potential for excess profitability even if subperiods of central bank intervention are included. Section V concludes.

## II. The Data[3]

Data used for the empirical analysis consist of daily spot exchange rates for the US dollar (USD), the German mark (DM), the British pound (BP), the Swiss franken (SF), and the Japanese yen (YEN). The rates are defined relative to the US dollar, but the analysis will in general cover all relevant cross rates. Interest rates for each national currency are overnight rates, where daily overnight rates were calculated by dividing annual rates by 260. (Dividing by 365 would be inappropriate because of weekends. The divisor 260 is obtained from assuming 52 weeks with 5 working days each).

German and US data are available from 3/1/73 until 12/31/98 and 6/30/99, respectively, British data from 3/6/73 until 12/31/96, Swiss data from 1/2/74 until 12/31/96, and Japanese data from 2/1/82 until 6/30/99.

Denoting by $s_t$ the log of the spot exchange rate at *t* and by $i_t$ and $i_t^*$ the daily interest rate of home and foreign country at *t*, daily trading rule returns $r_t$ are approximated as

$$r_t \approx s_t - s_{t-1} - \frac{1}{260}\left(i_{t-1} - i_{t-1}^*\right).$$

This formula neglects transaction costs which I assume to be small. But it might be important to note that the definition of the returns is biased in favor of technical trading since it overstates the true returns.

Apart from exchange rate data, limited data on central bank interventions are available for the Federal Reserve and the German Bundesbank. For the latter, the interventions vis-à-vis the USD are available (1/2/79 to 31/12/96), for the former both the interventions with respect to the German mark and the Japanese yen (3/1/73 to 31/12/96).

## III. Defining Head-and-Shoulder Rules

We will now proceed to define (or discuss possible definitions of) head-and-shoulder trading rules. Intuitively, a shoulder-head-shoulder (SHS) pattern is a sequence of three peaks in the time series of the exchange rate, where the second peak (the head) is higher than the first and the third (the shoulders). The line through the global minima between head and shoulders is

[3] The data used in this analysis were kindly provided by Chris Neely, Federal Reserve Bank of St. Louis and by Gabriele Becker, Monetary and Economic Department, Bank for International Settlements, CH- 4002 Basle. Neely's data can be downloaded at http://www.stls.frb.org/publications/review/review98.html#JUL.

called the neckline. Since an SHS is thought to signal an imminent downtrend of the exchange rate, we will assume that a chartist infers a sell signal when the exchange rate falls below the neckline after forming the right shoulder.

Evidently, any definition of SHS patterns relies on the identification of peaks and troughs in the exchange rate. Such an identification is not unproblematic in itself as it requires arbitrary decisions on the elimination or non-elimination of certain minor peaks and troughs. In order to make the analysis as transparent and replicable as possible, I will pursue two approaches: In the first, I identify every local maximum in the exchange rate as a peak and every local minimum as a trough. This produces a somewhat erratic sequence of alternating peaks and troughs, some of which may be just negligible occurrences. In the second approach, I try to filter out the unimportant peaks and troughs by using a computer program due to Bry and Boschan (1971) which was originally designed to identify business cycle turning points[4].

The Bry-Boschan program was set up at the NBER for use with monthly data. It enforces certain minimum requirements for a sequence of peaks and troughs in order to be interpretable as „business cycles", the most important of which are a minimum length between two peaks or two troughs of fifteen months and a minimum length between a peak and a trough (or a trough and a peak) of five months. For the present application I have not changed these settings – except for the fact that the use of daily data transforms the time unit for the minimum lengths in days.

Apart from these minimum lengths requirements, the general principle of the Bry-Boschan procedure is an identification of peaks and troughs starting from a strongly smoothed version of the time series and moving gradually to the unsmoothed time series. For each version of a smoothed series, peaks or troughs are deleted if they are not in the proximity of similar extrema of the preceding series with higher smoothness and if they violate the minimum length requirements. Also, an alternation of peaks and troughs is enforced by deleting the smaller of two peaks or the larger of two troughs. More details can be found in a recent description of this procedure by King and Plosser (1994).

For a given sequence of (final) peaks and troughs it is useful to number four consecutive peaks as *P0, P1, P2, P3* and the troughs between the peaks as *T0, T1,* and *T3.* Denote the time at which these extrema occur by $t_{P0}$, $t_{T0}$, etc. Osler and Chang (1995, henceforth OC) define a head-and-shoulder pattern through the following conditions:

**SHS1:** The head is higher than the shoulders:

$$P2 > \max\{P1, P3\}$$

**SHS2:** The pattern is preceded by a generally positive underlying trend:

$$P1 > P0 \text{ and } T1 > T0$$

**SHS3 (Balance):** The left (right) shoulder must be at least as high as the midpoint between right (left) shoulder and its preceding (anteceding) trough:

[4] The original Bry-Boschan program was written in Fortran. I thank Mark Watson of Northwestern University for making his GAUSS version of this program available to me.

$$P1 \geq 0.5(P3 + T2)$$
$$P3 \geq 0.5(P1 + T1)$$

**SHS4 (Symmetry):** The time between left shoulder and head must not be more than 2.5 times the time between head and right shoulder and vice versa:

$$t_{P2} - t_{P1} < 2.5(t_{P3} - t_{P2})$$
$$t_{P3} - t_{P2} < 2.5(t_{P2} - t_{P1})$$

**SHS5 (Time limit):** Let $t$ denote the time at which the exchange rate $S_t$ falls below the neckline:

$$S_t < T1 + \frac{t - t_{T1}}{t_{T2} - t_{T1}}(T_2 - T_1).$$

This must not happen too long after the formation of the right shoulder, say:

$$t < t_{P3} + (t_{P3} - t_{P1})$$

The first important point to note about this definition is the fact that it combines at least the four technical concepts of smoothed trends, trend reversal, resistance levels, and volatility clustering. SHS1 and SHS 2 postulate the existence of an underlying upward trend between *P0* and *P2*, hence a positive smoothed trend up to *P2*. In addition, SHS1 postulates some evidence for „trend reversal", i. e. evidence for the right shoulder[5]. SHS3 corresponds to the idea of certain „resistance levels" which may or may not be honored by the exchange rate: SHS3 requires the trend reversal to be serious enough to warrant a sell signal (in the sense that the exchange rate falls below (a first „resistance level") *P1*). It also intends to ensure that there is still a considerable danger of falling even farther (since SHS3 requires the exchange rate to be above (a second „resistance level") *T2*, so that it is still considerably higher than the recent experience of *T1*). SHS4 captures a notion of „volatility clustering": If the exchange rate was variable enough to produce a sequence of generally upwards oriented peaks and troughs in a certain time interval, then one should be warned that a similar downward development is also possible in (very roughly) the same time. SHS5, finally, combines the idea of „resistance levels" with „volatility clustering" by specifying time and level requirements for a sell signal.

Apparently, the SHS rule is an already fairly complex aggregate of different simpler technical, i. e. non-fundamental, concepts. But its definition involves a number of rather arbitrary decisions, in particular with reference to SHS3, SHS4, and SHS5. For instance, one might as well postulate larger or lower bounds for *P1* and *P3* in the balance property or one could increase or decrease the admissible time in SHS4 or SHS5. Various modifications of OC's definition will be applied in the following section. Since we will find that situatiuons in which SHS1 through SHS5 are simultaneously fulfilled are relatively rare, it seems sensible to study alternative definitions of head-and-shoulder rules which are less strict than OC's. I will do so by dispensing of some SHS requirements altogether. For instance, for SHS5 it might be

[5] This aspect also comprises the simple peak-and-trough progression rule of Pring (1991).

sensible to increase the admissible time for the exchange rate to fall below the neckline. I will set the admissble time equal to plus infinity by „turning off“ SHS5 in some of the evaluations below. Similarly, I will experiment with alternative definitions in which I dispense either of the balance (SHS3) or the symmetry (SHS4) condition. I also weaken the requirements for a preceding uptrend by turning SHS2 off in some evaluations. The only condition which seems indispensable if the pattern should rightly be coined shoulder-head-shoulder is SHS1 – and I use SHS5 for timing the buy/sell decision.

Finally, it should be clear that all the discussion above also applies for „negative“ SHS patterns, i. e. for SHS patterns in the negative of the exchange rate. Clearly, such patterns may be taken to communicate buy signals.

# IV. Empirical Evaluation

We will now proceed to investigate empirically the profitability of head-and-shoulder rules. Assuming that these patterns reflect buy or sell signals, the profitability of, say, holding a certain currency depends on how long it is hold. Since, from a chartist’s point of view, a SHS pattern may be a sufficient, but not a necessary feature of an imminent trend reversal, it would clearly be inappropriate to suppose the trader to hold the currency until the next, reverse SHS pattern emerges. Instead, I assume that the trader aims at taking advantage of his hopeful recognition of an imminent, say, upward trend by buying the currency when the exchange rate crosses the neckline and selling it not too many days later. I evaluate the mean return on such transactions for any holding of the currency between one and fifteen days (i. e. three weeks). In order to bias my results in favor of chartist trading, I report just the maximum mean return achievable with this strategy and the associated t-statistic. This overstates the true return from follwing SHS rules since the trader may not succeed at choosing the optimal time for evening his position. Standard errors are computed for all observed returns in order to check the significance of the mean returns. I report the associated t-statistics in the tables below.

Table 1 gives the results for the head and shoulder rule as defined by SHS1-SHS5. „BB turns“ ignores peaks and troughs not identified by the Bry-Boschan procedure, while „all turns“ takes all turns, however minor, seriously. For convenience, the mean returns per day are multiplied by 260 (the assumed number of working days) to scale them on an annual basis.

Table 1

Results for SHS1-SHS5

| | all turns (237 SHS) | | BB turns (31 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | 0.100 | 0.249 | 0.939 | 0.442 |
| 2 | -0.161 | -0.493 | -0.306 | -0.280 |
| 3 | -0.222 | -0.716 | -0.725 | -0.821 |
| 4 | -0.243 | -0.797 | -0.886 | -1.151 |
| 5 | -0.319 | -1.052 | -1.031 | -1.415 |
| 6 | -0.361 | -1.211 | -1.099 | -1.546 |
| 7 | -0.404 | -1.351 | -0.791 | -1.000 |
| 8 | -0.379 | -1.277 | -0.868 | -1.133 |
| 9 | -0.407 | -1.386 | -0.904 | -1.202 |
| 10 | -0.370 | -1.294 | -0.990 | -1.319 |
| 11 | -0.424 | -1.479 | -1.073 | -1.441 |
| 12 | -0.420 | -1.462 | -1.105 | -1.485 |
| 13 | -0.444 | -1.545 | -1.134 | -1.531 |
| 14 | -0.426 | -1.480 | -1.141 | -1.540 |
| 15 | -0.441 | -1.531 | -1.182 | -1.598 |

The following results are noteworthy: First, none of the returns obtained is significantly different from zero. Second, positive returns are obtained only for very short holdings (one day). Third, by and large returns are lower the longer the foreign currency is held. Fourth, returns are larger in absolute value for the turns identified by the Bry-Boschan procedure, reflecting the fact that these are „major“ turns incorporating greater risk. Fifth, the number of SHS formations under the Bry-Boschan procedure is very small (31 occurrences over all samples and cross rates).

Given the low number of SHS identified in particular for the BB turns, one might suspect that conditions SHS1-SHS5 may be too strong. In particular, SHS 3 and SHS 4 involve some rather arbitrary elements: Why is it necessary that the second shoulder is at least as high as the midpoint between first shoulder and subsequent trough? Since any minimum height requirement for the shoulders involves some arbitrary settings, I simply delete SHS3 altogether and study SHS patterns defined by SHS1, SHS2, SHS4, and SHS5, cf. Table 2. Similarly, I „turn off“ SHS4 and study patterns that merely fulfil SHS1-SHS3 and SHS5 in Table 3.

Table 2

Results for SHS1, SHS2, SHS4, SHS5

| | all turns (880 SHS) | | BB turns (66 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | -0.578 | -3.174 | 1.435 | 1.330 |
| 2 | -0.587 | -3.561 | 0.619 | 0.889 |
| 3 | -0.597 | -3.753 | 0.609 | 0.996 |
| 4 | -0.565 | -3.596 | 0.492 | 0.838 |
| 5 | -0.568 | -3.653 | 0.452 | 0.783 |
| 6 | -0.567 | -3.675 | 0.402 | 0.704 |
| 7 | -0.567 | -3.684 | 0.535 | 0.903 |
| 8 | -0.578 | -3.779 | 0.658 | 1.146 |
| 9 | -0.613 | -4.017 | 0.616 | 1.070 |
| 10 | -0.610 | -4.033 | 0.613 | 1.090 |
| 11 | -0.610 | -4.030 | 0.568 | 1.008 |
| 12 | -0.593 | -3.939 | 0.563 | 1.009 |
| 13 | -0.603 | -3.997 | 0.548 | 0.985 |
| 14 | -0.596 | -3.954 | 0.539 | 0.965 |
| 15 | -0.604 | -4.017 | 0.534 | 0.957 |

Apparently, deleting SHS3 leads to very different results. Note first that the number of SHS patterns has more than doubled for both types of turns. Further, taking all turns implies that the returns to a SHS trading rule are negative throughout. These negative returns are highly significant under the normal distribution. However, since the distribution of the returns is known to have heavy tails, the normal approximation is invalid. One could essentially bootstrap the empirical distribution of the returns to find out whether t-statistics around –4 are indeed significant, but for our purposes it is certainly sufficient to state that this type of SHS trading rule is certainly unprofitable.

The picture is different for the BB turns. Here we find positive returns throughout, but while these are more pronounced than in Table 1 they are still not significant. Moreover, it is noteworthy that again we find the strongest evidence for excess profitability for the shortest holding period.

Deleting SHS4 (the symmetry condition) is equivalent to extending the admissible time for the formation of the right shoulder to infinity. But the original time constraint as formulated in SHS4 was apparently not very restrictive, since turning off SHS4 hardly changes the number of identified SHS patterns (both for all and the BB turns). The results are therefore very similar to those displayed in Table 1. In particular, there is not the slightest evidence for significant excess profitability of this version of a head and shoulder rule.

Table 3

Results for SHS1, SHS2, SHS3, SHS5

| | all turns (259 SHS) | | BB turns (33 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | 0.023 | 0.062 | 1.052 | 0.526 |
| 2 | -0.255 | -0.820 | -0.113 | -0.108 |
| 3 | -0.199 | -0.650 | -0.517 | -0.605 |
| 4 | -0.247 | -0.837 | -0.661 | -0.876 |
| 5 | -0.322 | -1.103 | -0.784 | -1.083 |
| 6 | -0.370 | -1.289 | -0.836 | -1.176 |
| 7 | -0.410 | -1.427 | -0.543 | -0.696 |
| 8 | -0.392 | -1.381 | -0.620 | -0.818 |
| 9 | -0.423 | -1.507 | -0.651 | -0.871 |
| 10 | -0.397 | -1.448 | -0.735 | -0.986 |
| 11 | -0.449 | -1.634 | -0.811 | -1.093 |
| 12 | -0.448 | -1.628 | -0.846 | -1.145 |
| 13 | -0.466 | -1.689 | -0.874 | -1.186 |
| 14 | -0.449 | -1.626 | -0.878 | -1.192 |
| 15 | -0.464 | -1.676 | -0.911 | -1.234 |

For the sake of completeness, I also report the results for deleting SHS2 (note that SHS5 is indispensable for timing the buy/sell signal and SHS1 is essential for the head-and-shoulder property). We see that dispensing of SHS2 results in more than doubling the number of occurences, but again, there is no evidence of significant profitability under either identification rule for the turns in the time series.

Table 4

Results for SHS1, SHS3, SHS4, SHS5

| | all turns (542 SHS) | | BB turns (72 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | 0.059 | 0.251 | 0.666 | 0.679 |
| 2 | -0.003 | -0.015 | 0.180 | 0.306 |
| 3 | -0.045 | -0.225 | -0.079 | -0.155 |
| 4 | -0.021 | -0.106 | -0.207 | -0.432 |
| 5 | -0.091 | -0.463 | -0.267 | -0.566 |
| 6 | -0.105 | -0.539 | -0.331 | -0.701 |
| 7 | -0.138 | -0.708 | -0.154 | -0.313 |
| 8 | -0.123 | -0.635 | -0.199 | -0.411 |
| 9 | -0.140 | -0.726 | -0.222 | -0.463 |
| 10 | -0.119 | -0.630 | -0.261 | -0.543 |
| 11 | -0.157 | -0.829 | -0.280 | -0.586 |
| 12 | -0.158 | -0.836 | -0.297 | -0.621 |
| 13 | -0.183 | -0.970 | -0.288 | -0.608 |
| 14 | -0.173 | -0.919 | -0.312 | -0.655 |
| 15 | -0.186 | -0.986 | -0.346 | -0.725 |

Table 5

Results for SHS1, SHS2, SHS3, SHS4

| | all turns (237 SHS) | | BB turns (31 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | 0.100 | 0.249 | 0.939 | 0.442 |
| 2 | -0.161 | -0.493 | -0.306 | -0.280 |
| 3 | -0.222 | -0.716 | -0.725 | -0.821 |
| 4 | -0.243 | -0.797 | -0.886 | -1.151 |
| 5 | -0.319 | -1.052 | -1.031 | -1.415 |
| 6 | -0.361 | -1.211 | -1.099 | -1.546 |
| 7 | -0.404 | -1.351 | -0.791 | -1.000 |
| 8 | -0.379 | -1.277 | -0.868 | -1.133 |
| 9 | -0.407 | -1.386 | -0.904 | -1.202 |
| 10 | -0.370 | -1.294 | -0.990 | -1.319 |
| 11 | -0.424 | -1.479 | -1.073 | -1.441 |
| 12 | -0.420 | -1.462 | -1.105 | -1.485 |
| 13 | -0.444 | -1.545 | -1.134 | -1.531 |
| 14 | -0.426 | -1.480 | -1.141 | -1.540 |
| 15 | -0.441 | -1.531 | -1.182 | -1.598 |

Finally, one might want to know if profitable SHS strategies can be obtained if two (or even three) of the properties SHS1-SHS5 are neglected. The answer is generally no. Positive returns remain insignificant (at t-statistics well below 2), while, similar to Table 3, negative returns are much more impressive under some circumstances (t-statistics of around –4 for certain configurations). I suppress the extensive results in this paper, the interested reader may receive them upon request. As an illustration, I merely illustrate what happens if we delete both SHS2 (the preceding trend property) and SHS3 (the balance condition) simultaneously, cf. Table 5.

Table 5

Results for SHS1, SHS4, SHS5

| | all turns (1600 SHS) | | BB turns (81 SHS) | |
|---|---|---|---|---|
| holding period (working days) | mean return (annual) | t-statistic | mean return (annual) | t-statistic |
| 1 | 0.209 | 1.465 | 0.569 | 0.646 |
| 2 | 0.120 | 0.929 | 0.162 | 0.301 |
| 3 | 0.057 | 0.458 | -0.061 | -0.130 |
| 4 | 0.111 | 0.920 | -0.117 | -0.265 |
| 5 | 0.120 | 1.005 | -0.155 | -0.359 |
| 6 | 0.097 | 0.825 | -0.201 | -0.465 |
| 7 | 0.097 | 0.822 | -0.0421 | -0.094 |
| 8 | 0.099 | 0.848 | -0.187 | -0.425 |
| 9 | 0.087 | 0.750 | -0.198 | -0.454 |
| 10 | 0.094 | 0.809 | -0.232 | -0.531 |
| 11 | 0.083 | 0.718 | -0.245 | -0.561 |
| 12 | 0.101 | 0.879 | -0.254 | -0.581 |
| 13 | 0.086 | 0.754 | -0.244 | -0.567 |
| 14 | 0.090 | 0.788 | -0.265 | -0.610 |
| 15 | 0.080 | 0.696 | -0.290 | -0.664 |

In Table 5, not much changes for the BB turns, the picture is similar to the one presented in Table 4. For „all turns“, however, the number of SHS patterns increases dramatically as opposed to Table 2 and Table 4. While the computed returns for this strategy are positive (and much more moderate than before) they are still not significant. Consequently, there is no evidence for any significant excess profitability of head-and-shoulder rules.

One might ask if, in line with the results for the moving average and peak-to-trough progression rules, head and shoulder rules are profitable when they coincide with central bank interventions. Since data for the interventions of the Federal Reserve versus the German mark and the Japanese Yen and interventions of the German Bundesbank versus the US-$ are available, it is in principle possible to test the profitability of SHS trading rules confined to subperiods in which central bank intervention occured. It is, however, less than clear how to identify these subperiods. In this paper, I restrict my analysis to a very simple test: Using the „all-turns“-SHS definition of Table 5 (which is, for instance, more favorable of SHS trading than the full definition of Table 1 and has the advantage that the number of identified SHS structures is large), I study only those SHS patterns for which the buy or sell signal coincides with a central bank intervention aimed at the respective exchange rate. I then compute the correlation between the amount of currency sold by the central bank (i. e. the strength of the intervention) and the one day rate of return on SHS trading. (Note that such an analysis is possible only for a fairly large number of identified SHS structures in the full sample, since the coincidence of the SHS buy/sell signal and a central bank intervention is generally low).

For column 1 of Table 5 I find 13 SHS patterns in the DM/$ exchange rate coinciding with an intervention of the Federal Reserve. The correlation between the (absolute value) of currency sold by the Fed and the SHS rate of return is negative (-0.243), i. e. larger interventions lead to low rate of returns. The same holds for Bundesbank interventions: There are 32 relevant SHS patterns and the correlation is -0.311. The only evidence for a positive relationship between interventions and SHS profitability is found for Japan, where the correlation between interventtions by the Fed and the SHS returns is 0.452. This last result, however, is not very informative since it is based on only five SHS patterns coinciding with interventions of the Federal Reserve. Hence, to sum up, a quick glance at the intervention data does not suggest that SHS trading rules are profitable in periods of central bank intervention.

# V. Conclusions

This paper contributes to the ongoing debate about the profitability of chartist trading rules on foreign exchange markets. Since simple technical trading rules may not adequately capture the complex phenomenon of chartist trading, it focuses on the prominent head-and-shoulder pattern as a representative trading rule which incorporates various „technical“ ideas such as smoothed trends, trend reversal, resistance levels, and volatility clustering. For all combinations of the building blocks of SHS definitions that I have studied (the most important of which are discussed in this paper) the result is generally negative: Returns to SHS trading are not significantly positive - and if there is any evidence for non-zero returns at all, then it is is evidence for negative returns.

This finding leads naturally to the question why technical trading (and SHS trading in particular) prevails on foreign exchange markets. While this question is clearly beyond the scope of this paper, a hypothetical answer could read as follows: First, SHS patterns are rather rare on foreign exchange markets, so every professional trader will have to use other decision rules most of the time. Thus losses from the rare occurences of SHS trading do not necessarily force these traders out of the market as long as they are otherwise successful. Second, roughly 50% of SHS traders will experience positive mean returns from SHS trading if, for instance, the exchange rate follows a random walk. Those who don’t, are likely to give up SHS trading rather silently, as nobody is eager to publicly announce his failure. Those who operated profitably, on the other hand, may want to communicate their success, thus attracting new SHS traders and replacing the losers. (After all, the stable market demand for astrological services might well be explained along the same lines).

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