ELSEVIER

Emerging Markets Review
1 (2000) 152–164

EMERGING MARKETS REVIEW

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Simple technical trading rules of stock returns: evidence from 1987 to 1998 in Chile

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Received 13 January 2000; received in revised form 20 March 2000; accepted 2 May 2000

Abstract

This paper tests two of the simplest and most popular trading rules — moving average and trading range break-out — in the Chilean stock market. Overall, our results are similar to the ones of Brock et al. (1992), providing strong support for the technical strategies. In fact, buy signals consistently generate higher returns than sell signals. Moreover, returns following sell signals are negative, which is not easily explained by any of the currently existing equilibrium models. However, we do not observe any difference regarding the risk for the signs of buys and sells, a result explained by the fact that the Chilean stock market is highly concentrated and illiquid.

JEL classifications: G10; G14; G15

Keywords: Stock returns; Trading rules; Moving average; Trading range; Chilean stock market

1. Introduction

Technical analysis encompasses a broad range of trading rules that attempt to predict stock prices. The theoretical foundations of this analysis are based on the

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1566-0141/00/$ - see front matter
PII: S1566-0141(00)00006-6

fact that information is incorporated slowly into stock prices, and that it would then be possible to obtain excessive returns by observing the historical price trend. Accordingly, if prices instantaneously reflect all relevant information, they would quickly change when new information is received, bringing about random changes, thereby invalidating the use of any technical analysis.

The purpose of our paper is to investigate the predictive ability of the most widely used technical indicators[1] and the magnitudes of the returns that are derived from these techniques for the market in Chile. The theoretical bases underlying our hypotheses are explained in Brock et al. (1992), Jegadeesh (1990), Urrutia (1994) and Gregoire (1985).

In fact, Brock et al. (1992) investigate the predictability of stock returns by resorting to traditional technical rules covering a period of 90 years, on the basis of the Dow Jones industrial index. Their results show that buy signals consistently generate higher returns than sell signals, and that the returns following buy signals are less volatile than the returns following sell signals. On the other hand, returns that follow sell signals are negative, which could not be accounted for by any of the equilibrium models studied within the frame of that research. The latter provides us evidence that supports the idea that technical rules yield significant returns in statistical and economic terms.[2] The predictability of the returns on the stocks may be attributed to either market inefficiency or systematic changes in expected stock returns, where models of expected returns cannot satisfactorily explain the observed empirical regularity.

In turn, Urrutia (1994) examines the Random Walk hypothesis in the case of Latin American countries, and suggests that it should be rejected in Chile, validating what was suggested by Gregoire (1985). Furthermore, he concludes that the Chilean stock market shows a substantially slower adjustment to information shocks as compared to United States and European markets. This situation is explained by the low liquidity of Chilean markets and infrequent trading, involving the presence of transitory components in stock prices, which makes the technical analysis useful in Chile.

In fact, the presence of transitory components in stock prices suggest the convenience of applying trading rules, such as those studied by De Bondt and Thaler (1985), who suggest the purchase of stocks whose prices have undergone recent declines. These authors suggest that transactions with noise, encouraged by investors whose demand for stock is determined by factors alien to the expected return, account for this phenomenon, where the transitory components of stock returns would bring about the change in the trend of stock prices. In turn, Conrad et al. (1994), Blume et al. (1994) and Campbell et al. (1993) also arrive at this conclusion. They use a variant of the strategy of the contrary portfolio proposed by Lehmann (1990), ascertaining the phenomenon of the mean reversion of stock

[1] If a technical indicator is to fulfill its function, it should yield a return exceeding the sum of transaction costs plus the negative return given by its own false signals.

[2] Transaction costs were not considered.

prices over the short-term, explained by temporary components. These results have been validated by Parisi and Acevedo (1999) for the Chilean case.

Our research is divided into three parts. The first overviews the data used and technical rules studied. The second addresses the results attained and, finally, the third submits our conclusions.

2. Data and technical rules

To ascertain our hypothesis we use IPSA daily closing prices for the period 2 January 1987–9 September 1998. This information was obtained from the Santiago Stock Exchange (Bolsa de Comercio de Santiago) and involved a total of 2916 observations. The IPSA was chosen for its high quality in comparison to other Chilean market indices available, in line with Parisi and Soto (1999). Even though this index includes some shares that may show discontinuous trading, it is deemed to be the most adequate for the purposes of this research, as this shortcoming is widely offset by its being, among other characteristics, the most representative index of the Chilean stock exchange.

This paper analyzes 32 variations of the technical trading rules for the same data series, so as to avoid omitting any type of signal or phenomenon due to the particular features of each rule. Those signs, which may not be detected by one technical rule,[3] may be pinpointed by another rule more in keeping with the situation under study. Next, we calculate the number of signals, both for buying and selling; average returns on buys, sells and spreads between buys and sells; and standard deviations for these returns and their corresponding t-tests.[4] Subsequently, we analyze the yearly average returns of the investment strategies, to decide whether we accept or reject the hypotheses put forth.

The first trading rule studied in this paper is the simplest one, known as the moving average (MA). This rule states that investors must buy when the short-term MA is higher than the long-term MA, and hold the investment until the short-term MA crosses the long-term MA. After this signal the investors either liquidate their positions or sell short. Though there are many alternatives to this rule, we selected the most popular ones, following Brock et al. (1992), and they are 1–50, 1–150, 5–150, 1–200 and 2–200, where the first number signals the short-term MA and the second the long-term MA. The key point in the use of MAs is to identify a moving average that is sensitive enough to detect a correct signal while at the same time remaining insensitive to wrong signals.

We study the variable-length MA (VMA) that yields signals to buy (sell) when the short-term MA is over (under) the long-term MA by an amount that exceeds

[3] Given their lengths, bands and market characteristics.

[4] The t-tests for buys (sells) are the followings: $(U_r - U)/(\sigma^2/N + \sigma^2/N_r)^{1/2}$ where U_r and N_r are the expected returns and the number of signals for buys and sells, and U and N are the unconditional expectation and the number of observations, respectively. σ^2 is the estimated variance for the entire sample.

the band, holding the position until the short-term MA crosses over the upper bound of the band formed on the basis of the long-term MA. It is well worth pointing out that it does not generate any signal at all if the short-term MA is within the band bounded by limits of ±1% with respect to the long-term MA.

Likewise, we study the fixed-length moving average (FMA) technique, which emphasizes those returns that take place after a cross between the MA and the observed price during a previously defined time-period. With this method, the buy (sell) signal is generated when the short-term MA crosses the long-term MA from below (above), holding the investment position for 10 days after either a signal buy or sell while ignoring the other signals occurring during the holding period.

On the other hand, the trading range break-out technique (TRBO) is also studied. This technique states that a buy signal is generated when the price exceeds the resistance level, defined as the local maximum, whereas a sell signal occurs when the price falls below the support level, defined as the local minimum. If the price drops below the support level, it is assumed that the price will continue to fall and, therefore, it is advisable to sell. For practical purposes, and also for the sake of consistency with the other technical rules, maximum and minimum values were calculated for the 50, 150 and 200 previous days. Furthermore, the returns were calculated with and without a 1% band and for holding periods of 10 days after a buy or sell signal, ignoring the remaining signals. Unlike Brock et al. (1992), with this technique we also analyze the case of variable lengths, or of daily returns.

Following the methodology proposed by Brock et al. (1992), we first analyze daily return series and 10-day holding periods, on the basis of the daily closing prices of the IPSA. Subsequently, the technical indicators are applied to the data series to calculate the daily returns[5] and the 10 days returns for each indicator.

3. Results

The IPSA series for the 2915 daily returns show a mean of 0.127%, with a standard deviation of 0.0143. The return series display negative skewness and wider tails than a normal distribution. In turn, the Jarque–Bera test indicates the rejection of the normality null hypothesis in the distribution of the returns. Likewise, the correlograms for the returns indicate the presence of a significant serial correlation.

The IPSA series for the 265 unconditional returns of 10-day non-overlapping periods show a mean of 1.554%, with a standard deviation of 0.652, displaying significant signs of skewness and kurtosis. In terms of the above data, the Jarque–Bera normality test indicates the rejection of the normality null hypothesis, in spite of the fact that the calculation of the returns for 10-day non-overlapping holding periods tends to smooth the distribution of the returns and to make it more consistent with a normal performance. The correlograms for the sample

[5] In this paper, returns are computed as the differences of natural logarithms of the quotes of the index.

indicate that the unconditional returns of 10 days show a significant serial correlation, though smaller with respect to the daily returns series.

Table 1 shows the summary of the results obtained with the 10 VMA rules analyzed. As can be observed, the number of buy signals that is given by each one of the rules is higher than the number of sell signals, corroborating the fact that during the period under study the Santiago Stock Exchange showed, in a broad sense, a primary upward trend.

For returns on buys, five of the 10 tests reject the equality null hypothesis with the expectation of a daily unconditional return; these results correspond to the rules[6] (1,50,0%), (1,50,1%), (1,150,0%), (1,150,1%) and (5,150,0%). In turn, the mean of the daily returns on buys for all technical rules is 0.1655%, substantially different from the daily unconditional mean return for the whole sample.

The mean of the returns on sells for all technical rules reaches −0.0512%, substantially different from the daily unconditional mean return for the whole sample. For returns on sells, almost all tests reject the equality null hypothesis with respect to the daily unconditional return, excluding (5,150,1%), (2,200,0) and (2,200,1%). The latter is an interesting result because this VMA rule would be useful to prevent losses, which can be ascertained by observing that all returns to sell signals are negative.

The standard deviations for the returns on buys and sells for each technical rule differ among each other, and are relatively higher for sells. This finding is according to what was expected. On the other hand, all standard deviations are lower than the unconditional standard deviation of the complete sample.

With respect to the spreads between buys and sells, they are significant in statistical terms for nine of the rules used, and the mean for all the rules is 0.2176%. It should be noted that, in most cases, the inclusion of a 1% band in the technical rules increases these spreads, by eliminating the weaker buy or sell signals. However, the accuracy of the buy and sell signals does not significantly improve by adding this band, a situation observed in Table 1, columns 8 and 9, where the fractions of the returns higher than zero remain practically unaltered.

Table 2 shows the results obtained with the 10 FMA rules analyzed. As can be observed, the number of buy signals given by each of the technical rules does not feature a clear pattern with respect to the sell signals when we observe all rules on an overall basis. For the returns on buys, all of the 10 tests statistically reject the equality null hypothesis with the unconditional return for 10 days. In turn, the mean of the returns on buys for technical rules is 3.793%, substantially different from the unconditional mean return for 10 days for the whole sample. For the returns obtained on the basis of the sell signals, only five of the tests reject the equality null hypothesis with the expectation of a daily unconditional return at 5% of significance. The mean of the returns on sells for all technical rules is −1.117%, which is substantially different from the unconditional mean return for 10 days in the whole sample.

[6] The first number shows a base-out of 1 day; the second one shows the number of days of the moving average, and the last one, the percentage of the Bollinger bands.

Table 1
Results of standard statistical tests for variable length moving averages (VMA)[a]

V.M.A.	*N* (Buys)	*N* (Sells)	Buys	Sells	S.D. Buys	S.D. Sells	Buys > 0	Sells > 0	Spread
(1,50,0)	1745	11 058	0.00245 (4.68)*	−0.00094 (−8.07)*	0.01365	0.01522	0.58	0.46	0.00339 (8.68)*
(1,50,0.01)	1635	957	0.00247 (3.63)*	−0.00097 (−7.72)*	0.01378	0.01572	0.58	0.46	0.00344 (8.35)*
(1,150,0)	1962	741	0.00150 (1.98)*	−0.00016 (−3.02)*	0.01383	0.01449	0.55	0.48	0.00160 (2.17)*
(1,150,0.01)	1868	638	0.00156 (1.97)*	−0.00030 (−3.05)*	0.01393	0.01489	0.55	0.47	0.00186 (2.33)*
(5,150,0)	1965	737	0.0014 (1.92)**	−0.0048 (−2.47)*	0.01382	0.01444	0.55	0.49	0.0062 (2.12)*
(5,150,0.01)	1854	645	0.00143 (3.37)*	−0.0038 (−0.608)	0.01398	0.01461	0.55	0.49	−0.00237 (1.611)
(1,200,0)	2061	641	0.00153 (0.989)	−0.0008 (−3.232)*	0.01391	0.01419	0.55	0.47	0.00233 (2.488)*
(1,200,0.01)	1982	559	0.00153 (0.989)	−0.00011 (−3.09)*	0.0138	0.01468	0.55	0.47	0.00164 (2.38)*
(2,200,0)	2080	636	0.00132 (1.645)	−0.00023 (−1.408)	0.01404	0.01445	0.54	0.48	0.00155 (2.403)*
(2,200,0.01)	2005	354	0.00136 (1.768)**	−0.0007 (−1.678)	0.01403	0.01464	0.55	0.48	0.00206 (2.689)*
Average			0.001655	−0.000512					0.002176

[a] The table presents the results for the sample of 2916 IPSA daily closing prices. Moving averages are identified as (short, long, band) where short and long represent the short- and long-term moving averages and band represents the percentage of the long-term average needed to generate a signal. *N*(Buy) and *N*(Sell) are the number of buy and sell signals generated by each technical indicator. In brackets is given the *t*-tests, that verify the differences in the means of the returns on buys and sells of the daily unconditional mean. S.D. Buy and S.D. Sell represent the standard deviations of the returns on buys and sells. Buy > 0 and Sell > 0 are the fraction of returns on buys and sells higher than zero. The last row indicates averages of the buys and sells and the spread using the 10 indicators. The numbers marked * (**) are significant at 5% (10%).

Table 2
Results of standard statistical tests for fixed length moving averages (FMA)[a]

F.M.A.	N (Buys)	N (Sells)	Buys	Sells	S.D. Buys	S.D. Sells	Buys > 0	Sells > 0	Spread
(1,50,0)	26	23	0.03227 (3.188)*	−0.00198 (−3.156)*	0.05334	0.04532	0.69	0.39	0.03425 (4.686)*
(1,50,0.01)	26	26	0.02800 (2.374)*	−0.00542 (−4.7198)*	0.053	0.05525	0.65	0.50	0.03342 (4.719)*
(1,150,0)	18	20	0.02896 (8.202)*	−0.00192 (−3.491)*	0.05861	0.03545	0.72	0.40	0.03936 (8.846)*
(1,150,0.01)	15	15	0.03661 (9.321)*	−0.00286 (−1.066)	0.05241	0.02973	0.80	0.40	0.03947 (7.55)*
(5,150,0)	1	4	0.04732 (3.161)*	−0.03065 (−4.549)*	N/D	0.10343	1.00	0.50	0.07798 (4.871)*
(5,150,0.01)	1	2	0.06978 (4.735)*	−0.08622 (−8.70)*	N/D	0.1144	1.00	0.50	0.156 (3.684)*
(1,200,0)	14	17	0.03531 (8.498)*	0.00201 (0.0206)	0.05674	0.03842	0.79	0.41	0.03329 (6.442)*
(1,200,0.01)	12	17	0.03131 (6.952)*	0.00953 (2.18)*	0.05027	0.03504	0.67	0.47	0.02178 (2.559)*
(2,200,0)	13	16	0.03065 (7.215)*	0.00679 (1.350)	0.05140	0.04153	0.77	0.44	0.02386 (4.464)*
(2,200,0.01)	11	14	0.03933 (8.645)*	−0.00094 (−0.749)	0.05581	0.03759	0.82	0.36	0.04027 (6.980)*
Average			0.03793	−0.0117					0.04412

[a] The table presents the results for the sample of 2916 IPSA daily closing prices, where the returns correspond to 10-day holding periods after a crossing of moving averages. Moving averages are identified as (short, long, band) where short and long represent the short- and long-term moving averages and band represents the percentage on the long-term average needed to generate a signal. *N*(Buy) and *N*(Sell) are the number of buy and sell signals generated by each technical indicator. In brackets is given the *t*-tests, that verify the differences in the means of the return on buys and sells of the daily unconditional mean. S.D. Buy and S.D. Sell represent the standard deviations of the returns on buys and sells. Buy > 0 and Sell > 0 are the fraction of returns on buys and sells higher than zero. The last row indicates averages of the buys and sells and the spread using the 10 indicators. The numbers marked * (**) are significant at 5% (10%).

In this case, the standard deviations for the returns on buys and sells for each technical rule also differ with respect to each other, being relatively higher for buys. On the other hand, in eight of the 10 cases studied, the standard deviations of the returns on buys are higher than the unconditional deviation for 10 days for the whole sample. In turn, all the standard deviations of the returns on sells are lower than the unconditional deviation for 10 days for the complete sample, which is 0.045%. With respect to the spreads[7] between buys and sells, they are significant in statistical terms for 10 of the rules used, and the mean for all rules is 4.412%.

[7] Spread is the difference between the mean daily buy and sell returns.

Table 3
Results of standard statistical tests for variable length trading range break-outs (VTRBO)[a]

VTRBO	*N* (buys)	*N* (sells)	Buys	Sells	S.D. Buys	S.D. Sells	Buys > 0	Sells > 0	Spread
(1,50,0)	473	173	0.00621 (8.513)*	−0.00376 (−7.197)	0.01395	0.02020	0.68	0.41	0.00997 (11.089)*
(1,50,0.01)	216	82	0.00917 (10.1316)*	−0.00322 (−4.551)*	0.01586	0.02493	0.73	0.43	0.01239 (9.436)*
(1,150,0)	320	53	0.00727 (6.3288)*	−0.00450 (−3.246)*	0.01467	0.02438	0.72	0.38	0.01178 (5.547)*
(1,150,0.01)	142	29	0.01093 (8.194)*	−0.00707 (−3.371)*	0.01663	0.03135	0.77	0.38	0.01800 (6.169)*
(1,200,0)	291	40	0.00717 (5.939)*	−0.00401 (−2.607)*	0.01475	0.02500	0.71	0.38	0.01117 (4.627)*
(1,200,0.01)	137	23	0.01115 (7.363)*	−0.00469 (−2.2108)*	0.01675	0.03239	0.77	0.39	0.01584 (4.910)*
Average			0.007011	−0.00454					0.011552

[a]The table presents the results for the sample of 2916 IPSA daily closing prices. The indicators are identified as (short, long, band) where short represents the daily quote, long represents the number of previous days needed to calculate local maximum and minimum values and band represents the percentage on the local maximum and minimum values needed to generate a signal. *N*(Buy) and *N*(Sell) are the number of buy and sell signals generated by each technical indicator. In brackets is given the *t*-tests, that verify the differences in the means of the return on buys and sells of the daily unconditional mean. S.D. Buy and S.D. Sell represent the standard deviations of the returns on buys and sells. Buy > 0 and Sell > 0 are the fraction of returns on buys and sells higher than zero. The last row indicates averages of the buys and sells and spreads using the six indicators. The numbers marked * (**) are significant at 5% (10%).

Table 3 shows the results obtained with the six VTRBO rules analyzed. As can be observed, the number of buy signals given by each one of the technical rules is higher than the sell signals. For the return on buys, all the tests reject the equality null hypothesis, with the unconditional return. The latter could be due to the fact that these rules have a high level of accuracy, as shown in Table 3, columns 8 and 9. The buy signals generate positive returns in 73% of cases on average, whereas sell signals are right, on average, only by 39.5%. In turn, the mean of the returns on buys for all technical rules is 0.701%, which is substantially different from the daily unconditional mean return in the whole sample. For the return on sells, all the tests reject the null hypothesis. The mean of the returns on sells for all technical rules is −0.459%. The standard deviations for the returns on buys and sells in the case of each technical rule differ among themselves and do show a clear pattern, being higher than the unconditional standard deviation of the complete sample. At the same time, the standard deviations on sells were higher than those generated by the buy signals.

With respect to the spreads between buys and sells, these are statistically significant for all rules used, the mean for all rules being 1.152%. It should be noted that the inclusion of a 1% band in the technical rules does increase these spreads by eliminating weak buy and sell signals. The accuracy of the buy and sell signals does not experience any radical change, as evidenced in Table 3, columns 8 and 9, where the fractions increase slightly both for buys and sells.

Table 4 shows the results for six FTRBO rules analyzed. From Table 4, it follows that in all cases considered the number of buy signals that is given by each one of the technical rules is higher than for the sell signals. For the returns on buys, four tests statistically reject the equality null hypothesis with the unconditional return for 10 days. The mean of the returns on buys for all technical rules is 2.853%, which is statistically different from the unconditional mean return for 10 days in the whole sample. For the returns on sells, four of the tests statistically reject the null hypothesis with the unconditional return for 10 days in the entire sample. The means of the returns on sells for all technical rules is 2.688%, which is substantially different from the unconditional mean return for 10 days in the sample, but this return was expected to be negative, result explained by the low number of signs.

The spreads between buys and sells are statistically significant at 5% in all the rules used, and the mean for all of them reaches 2.127%. A factor that is worth mentioning is that the inclusion of a 1% band decreases the spreads two out of three times.

Next, in order to simulate a strategy in which a loan is obtained under a buy signal and the proceeds invested in the index, and under a sell signal the stock is sold and the proceeds are invested in a risk-free security, the following assumptions must be observed: (i) the borrowing and placement rates are the same; and (ii) the risk during the buying and selling periods is the same. The purpose of this exercise is to measure, all other things being equal, the average annual returns in excess that the different techniques studied would yield. To this end, the returns were obtained by subtracting from the multiplication of the average number of yearly buy signals by the daily buying mean return (10 days), the multiplication of the

Table 4
Results of standard statistical tests for fixed length trading range break-outs (FTRBO)[a]

FTRBO	N (buys)	N (sells)	Buys	Sells (ver)	S.D. Buys	S.D. Sells	Buys > 0	Sells > 0	Spread
(1,50,0)	18	18	0.03213 (8.920)*	−0.0111 (−3.876)*	0.04611	0.03381	0.83	0.39	0.0433 (9.076)*
(1,50,0.01)	0	0	N/D	N/D	N/D	N/D	N/D	N/D	N/D
(1,150,0)	4	5	0.01559 (2.009)*	0.003142 (4.676)*	0.05414	0.03085	0.50	0.80	−0.01583 (−1.648)
(1,150,0.01)	4	5	0.01168 (1.454)	0.02796 (4.141)*	0.07174	0.03393	0.50	0.80	−0.01627 (−1.694)
(2,200,0)	2	3	0.0305 (3.650)*	0.03921 (4.507)*	0.05140	0.04153	0.50	0.67	0.07425 (5.680)*
(2,200,0.01)	1	2	0.05429 (3.651)*	0.075222 (7.236)*	0.05581	0.03759	0.80	0.80	0.0209 (3.684)*
Average			0.02883	0.02688					0.02127

[a]The table presents the results for the sample of 2916 IPSA daily closing prices, where the returns correspond to 10-day holding periods after a crossing of moving averages. The indicators are identified as (short, long, band) where short represents the daily quote, long represents the number of previous days needed to calculate local maximum and minimum and band represents the percentage on the local maximum and minimum needed to generate a signal. *N*(Buy) and *N*(Sell) are the number of buy and sell signals generated by each technical indicator. In brackets is presented the *t*-tests, that verify the differences in the means of the return on buys and sells of the daily unconditional mean. S.D. Buy and S.D. Sell represent the standard deviations of the returns on buys and sells. Buy > 0 and Sell > 0 are the fraction of returns on purchases and sells higher than zero. The last row indicates averages of the buys and sells and spreads using the six indicators. The numbers marked * (**) are significant at 5% (10%).

average number of yearly sell signals by the daily selling mean return (10 days). Table 5 shows the results of the strategy proposed. Given the assumptions, the most surprising results in magnitude are those obtained for the VMA. For all other technical indicators, even though they are all positive, they are less significant, representing only an approximate calculation of what could have been the return with each one of these indicators. On the other hand, even though the latter results seem surprising in relation to the results in Brock et al. (1992), we must exert caution as the buy and sell signals for each rule are few in relation to the period of time studied, especially in the case of the fixed length and fixed length range break-out moving average.

In the Chilean case, it is possible to standardize the transaction costs for the average investor buying or selling shares. On each transaction, the investor must pay a variable commission on a monthly basis and a decreasing commission for the additional amounts in excess of certain limits, plus the commissions collected by the brokers, which vary according to the client, the volumes involved, the agreements entered into by them and the brokers themselves. During the period under study, the average commission collected by the brokers amounts to 0.5%. Accord-

Table 5
Yearly mean returns in excess

	VMA	FMA	VTRBO	FTRBO
(1,50,0)	0.45	0.08	0.31	0.7
(1,50,0.01)	0.42	0.07	0.19	N/D
(1,150,0)	0.24	0.06	0.22	0.1
(1,150,0.01)	0.25	0.05	0.15	0.1
(1,200,0)	0.27	0.04	0.19	0.1
(1,200,0.01)	0.26	0.02	0.14	0.1
(2,200,0)	0.22	0.02	–	–
(2,200,0.01)	0.23	0.04	–	–
(5,150,0)	0.20	0.01	–	–
(5,150,0.01)	0.20	0.02	–	–

ingly, the investor must pay a 1% commission for either buying or selling, plus the legal expenses for the transfer of the certificates and additionally, the payment of the Value Added Tax (IVA).[8]

Though we had not identified the agents that could take advantage of these trading rules, when assigning the same cost to all of them, the broker's commission should be lower in the case of big investors and should not exist at all in the case of those brokers that manage their own investment portfolio. Furthermore, the exchange fee goes down as the volume traded increases, a factor that would make the transaction cost go down and, thereby, could cause the analysis of the cost-effectiveness of the trading rules to be positive, in particular in the case of VMAs. Therefore, the only way in which it would be possible to take advantage of the trading rules is in the case of brokers that trade large volumes or institutional investors that have entered into special agreements with the stock exchange in order not to pay exchange rights.

The predictive ability observed in the Chilean capital market may be due to the fact that simple technical trading rules capture changes in the expected returns that derive from an equilibrium model, or to the fact that the market is inefficient, being difficult to distinguish these two alternative explanations. However, though the first possibility may seem plausible, it is difficult to imagine an equilibrium model that may predict such negative returns over a period of time as the one studied.

4. Conclusions

From the results yielded by the traditional tests for the technical rules studied it may be concluded that, in all cases, the returns on buys were positive and the returns on sells were negative, thereby validating one of our hypotheses. The idea

[8] Value Added Tax, which was 18% during the period under study.

that these negative returns are associated with seasonal conditions of some type is rejected by the fact that sell signals and negative returns begin to occur strongly during the second semester of 1995, when the Chilean market began to present a primary downward trend.

On the other hand, the bias of the tests and the unavailability of an extensive database do not allow us to validate or reject our hypothesis regarding standard deviations, preventing any possible type of conclusion regarding the risk for the periods of buys and sells. This fact also complicates the inference from the FMA, VTRBO and FTRBO trading rules, given that these technical rules give very few signals per year.

On the other hand, when we calculate the MAs, the stock prices were also weighted, the Simple MAs being computed as typical. This should be taken into account as it considers the older values, and the more recent ones are considered in the same way; that is, the signals may experience some delay. This is due to the fact that the most relevant information with respect to the change in the trend could be found in the more recent values in time.

Therefore, it may be concluded that the more robust results obtained are those achieved for the VMA, given the number of signals which these technical rules yield, in which the great statistical significance of the returns on sells is surprisingly higher with respect to the returns on buys. Thereby this trading rule presents a very special ability to avoid losses on this account.

Finally, the results validate the conclusion reached by Gregoire (1985) and Urrutia (1994), as to the economic possibility of using investment strategies of a technical nature in Chile. However, it must be considered that the transaction costs in the Chilean capital market are high, which could limit our results, bringing them closer to those obtained by Allen and Karjalainen (1999), where the use of trading rules yield abnormal returns from the statistical but not the economic standpoint. On the other hand, these investment strategies would indeed yield significant abnormal results from the economic standpoint, in the case of investors having low transaction costs, as is the case of some institutional investors and the stock exchange brokers themselves, though not in the case of the ordinary investor.

Acknowledgements

The authors are thankful to Rick Burns, Lance Nail, Ximena Besnier, Antonino Parisi, Jorge Gregoire, and Ivonne Moya for useful comments on an earlier draft of the paper, and especially to the EMR's editor, Javier Estrada, and to the referee in the later version. The final version of this paper was prepared when Parisi was a visiting Professor at the Department of Economic and Finance, University of Alabama at Birmingham.

References

Allen, F., Karjalainen, R., 1999. Using genetic algorithms to find technical trading rules. J. Financial Econ. 51, 245–271.

Blume, L., Easley, O'Hara, M., 1994. Market statistics and technical analysis: the role of volume. J. Finance 48, 153–181.

Brock, W., Lakonishok, J., LeBaron, B., 1992. Simple technical trading rules and stochastic properties of stock returns. J. Finance 47, 1731–1764.

Campbell, J.Y., Grossman, S.J., Wang, J., 1993. Trading volume and serial correlation in stock returns. Q. J. Econ. 108, 905–940.

Conrad, J., Hammeed, A., Niden, C., 1994. Volume and autocovariance in short-horizon individual security returns. J. Finance 49, 1305–1329.

De Bondt and Thaler 1985, Does the stock market overreact? J Finance 40, 793–805.

Gregoire, J., 1985. El ajuste de los precios accionarios a la información. Paradigmas Administración 7, 121–131.

Jegadeesh, N., 1990. Evidence of predictable behavior of securities returns. J. Finance 45, 881–898.

Lehmann, B., 1990. Fads, martingales and market efficiency. Q. J. Econ. 105, 1–28.

Parisi, F., Acevedo, C., 1999. Volume and autocovariance in short-horizon stock returns: evidence from 1992 to 1998 in Chile. Working Paper, Departamento de Administración, Universidad de Chile.

Parisi, F., Soto, C., 1999. Transmisión de precio y varianza en las bolsas de comercio chilenas y oportunidades de arbitraje. Working Paper, Departamento de Administración, Universidad de Chile.

Urrutia, J., 1994. Time series properties of four Latin American equity markets: Argentina, Brazil, Chile and Mexico. Estudios Administración 2, 1–8.