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Technical Analysis Seems To Be A Valuable Investment Tool In The Athens And Frankfurt Stock Exchanges

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Abstract

This study investigates the forecast power of technical analysis in the equity markets by applying simple technical trading rules to the Athens General Index and DAX. The results produce evidence that technical analysis is a valuable investment tool, especially in the case of the Athens Stock Exchange. Moreover, the ability of simple moving average rules appears to be dominant in the last few years, when excess returns are earned over a naïve buy-and-hold strategy even after the deduction of transaction costs.

Keywords*: Technical analysis, stock exchange, effective investment*

JEL Classification*: F21, G15*

1. Introduction – Literature Review

The origin of Technical Analysis, which has recently regained the respect of investment community, is traced back in the end of 18th century when Charles H. Dow begun building his theories regarding market behavior in the Wall Street Journal. (Later, his theories were put together in a book by S.A. Nelson (1902) titled "The ABC of Stock Speculation"). The next major steps in founding technical analysis were made by Hamilton (1922) with the book "The Stock Market Barometer" and Rhea (1932) who published a book called "Dow Theory".

Technical analysis is based on the concept that market action discounts everything, prices move in trends and market history repeats itself. Therefore, the main prerequisite for the technical analysts to make useful forecasts is that markets should not follow a random walk. Given that Technical Analysis is quite subjective and moreover implies the violation of efficient market hypothesis, it is not recognized by the academic community as a valid investment methodology. As Malkiel (1990) states, "technical strategies are usually amusing, often comforting, but of no real value".

Nonetheless, a very large number of studies have proved that technical trading strategies are widely used by the majority of the professionals in the securities market.

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A report by The Group of Thirty (1985) illustrates that 97% of the banks and 87% of other financial institutions believe that technical analysis affects foreign exchange rates. Surveys conducted by Allen and Taylor (1990 and 1991), Menkhoff (1997), Lui and Mole (1998), Cheung et al (1999) and Osler and Chang (1999) have revealed that the vast majority of the foreign exchange dealers rely on technical analysis when forming their trading strategy. Shiller (1987) also underlines that technical analysis affects equity industry, especially in extreme market conditions such as the crash of 1987. Another survey conducted by Wong and Cheung (1999) indicate that Hong Kong analysts rely more on technical and fundamental analyses and less on portfolio analysis, in order to form their strategy in the stock market.

In addition, the fact that technical analysis has become an integral part of every research department in the securities industry and the increasing number of academic studies regarding the predictive power of various technical trading rules, constitute undisputable evidence that its popularity is currently very high.

A plethora of studies have concluded that there is significant predictive value of technical analysis in the foreign exchange markets. Studies of Dooley and Shafer (1984), Sweeny (1986), Goodman (1980), Levish and Tomas (1993), Osler and Chang (1995) and Neely, Weller and Dittmar (1997) found evidence that technical trading rules can yield excess returns in trading foreign exchange rates. However, there is a small number of studies, which advocate that technical rules do not lead to satisfactory returns in the FX market (see Goodhart and Curcio (1992), Curcio et al (1997), Osler and Chang (1999)).

The predictive ability of technical analysis in the stock market, which is the purpose of this study, has been heavily researched during the last two decades. The vast majority of the relative studies use moving average rules as the most representative technical analysis indicators and they are focused on the major stock indices in the United States and Great Britain.

The first studies were carried out in the 1960s and they concluded that there was no evidence that technical analysis was of satisfactory predictive value. Alexander (1961) first proved that a number of filter rules could lead to excess returns on Dow Jones Industrial Average and Standard and Poor's but with a later study Alexander (1964) underlined that those returns vanished when transaction costs were taken into account. A few years later, Fama and Blume (1966) examined the same rules and were led to the same conclusion. The failure of technical analysis was also supported by a lot of other studies during the rest of 60s, which produced evidence that those rules were incapable of yielding a higher return than a buy-and-hold strategy (see Van Horne and Parker (1967), Levy (1967) and James (1968)).

The demonstration of the failure of technical analysis had obviously discouraged the academic community to carry out research in the same area during the period 1970-1990. The renaissance of technical analysis took place in the 1990s, mostly as a result of the development of computer technology, which made the use of various technical indicators and the access to the necessary databases and real time data, easily accessible.

Brock, Lackonishok and Le Baron (1992) published an influential study with the view to examine whether simple moving averages and trading range breakouts had significant forecast power in the Dow Jones Industrial Average during the period 1897-1986. The study concluded that the rules tested consistently generated returns which were higher than the normal returns. This study has inspired a large number

of academics that have applied exactly the same research methodology and trading rules. For example, Hudson et al (1996) examine the same moving average rules for the FT-30 and proved that the performance of technical analysis was not satisfactory. In contrast, a large number of other studies support the predictive value of simple technical trading rules when they are applied into both developed and emerging stock markets (Mills (1997), Sullivan et al (1997), Bessembinder and Chan (1998), Ito (1999), Ahmed at al (2000), Parisi and Vasquez (2000), Gunsasekarage and Power (2001)).

However, a substantial number of the above studies underline the fact that the predictive value of technical analysis has deteriorated dramatically during the recent years. This conclusion raises the question whether the markets have become more efficient with the growth of information technology since from time to time it has been advocated that the performance of technical analysis stems from the fact that it is a self-fulfilling prophecy.

Within the above framework, the present study aims to investigate the efficacy of technical analysis on the Athens stock exchange and Frankfurt stock exchange, an area that has not been heavily researched by previous studies. Regarding the Athens stock exchange, Markellos (1998) applied three popular indicators (MACD, KAIRI, RSI) to the Athens General Index for the period October 1985-September 1995 and found that those rules outperformed the buy-and-hold strategy. Courouklis (1998) also examined the profitability of different types of moving average rules for the Athens General Index in a decade (Sept. 1988 – Sept 1998) and found that technical analysis had had significant forecast power.

Detry and Gregoire (2001) used the same rules and methodology with Brock et al (1992) studied the Bank Index of the Athens Stock Exchange and Airlines and Airports Index of the Frankfurt Stock Exchange and proved that technical analysis can lead to superior returns even after the deduction of transaction costs.

Wittmer (2000) also used DAX data to examine various technical trading strategies. He concluded that technical analysis produced very satisfactory results, but he suggested that it should not be used as a stand-alone method.

2.Data

The data series used in this study are daily prices of the Athens General Index (AGI) from October 1986 to December 2002, which is the longest available data in electronic form. The corresponding data for DAX index of the Frankfurt Stock Exchange cover the period 1980 - 2002.

Athens General Index includes the largest 60 firms listed on the Athens Stock Exchange and it is a value weighted price index. DAX index is also a price index which includes the largest 30 firms and it is calculated as the weighted average of the market value of the shares which are freely floated.

The stocks included in both stock indices are very actively traded and thus the problem of non-synchronous trading should be of little value in this study. To avoid any problems of data snooping, the full samples have been divided into almost equal non-overlapping subsamples, a methodlogy that is also useful in assessing whether there is significant difference of the predictive value of technical analysis during different time periods. Furthermore, the subsamples will help to examine if there is a

substantial deterioration of the performance of technical analysis in the recent years, as it has been advocated by a large number of other studies.

For the Athens General Index the subsamples cover the periods : 13/9/86-1991, 1992-1997 and 1998-2002 a total of 4033 observations. The data of DAX index has been also divided into the following three subsamples: 1980-1987, 1988-1995 and 1996-2002, a total of 5769 observations.

3.Methodology

To ascertain the predictive value of technical analysis, we use simple moving average rules with a band of zero or one percent. Although, infinite variations of moving averages might be used, we have chosen the ones applied by Brock et al (1992), to avoid any problems of data snooping and lead to results comparable with a very large number of previous studies that have applied exactly the same technical rules. A total of ten Variable Length Moving Average rules (VLMA) have been applied to both data sets. These rules are: (1,50), (1,150), (5,150), (1,200), (2,200) with bands of zero or one percent.

The rules suggest buy (sell) signals when the short-term moving average is above (below) the long-term moving average and with a band of zero all trading days are actually classified as either buy or sell signals. When a band of one percent is applied the short-term moving average must exceed (fall) the long-term moving average by at least one percent and remain above (below) to give buy (sell) signals. Whenever the short-term moving average is within the band of $\pm 1\%$, which is imposed around the long-term moving average, no signals are given and the investors remain out of the market with cash.

4. Sample statistics

The following Table shows the descriptive statistics for both indices, together with autocorrelation values. Returns are calculated using the equation: $r_t = \log_e(I_t) - \log_e(I_{t-1})$, where r_t is the calculated daily return and I_t is the level of the index on day t.

Table 1 shows that mean returns of both indices are positive in all of the periods, with the Athens General Index exhibiting higher volatility than DAX, a finding consistent with the fact that Athens Stock Exchange had been an emerging market until the last few years.

The autocorrelation coefficients of the squared returns are used to test the nonlinearity structure of the results (see Marraval (1983)). It is worth noting that, as Neftci (1991) has underlined, the presence of nonlinearity in the results is necessary for the success of technical analysis in the securities markets.

The returns of Athens General Index are strongly leptokyrtic (fat tailed) and negatively skewed for the entire series (1986-2002) and the first subsample (1986-91). In the second subsample (1992-1997) the returns are also leptokurtic but at a lower level and they have an almost symmetrical distribution. Finally, the returns of the most recent subsample (1998-2002) show signs of a platykurtic and symmetrical distribution. A significant linear autocorrelation of one period lag is present for the full sample and the three subsamples but it appears to have weakened

considerably towards the recent years. However, this weakening in the linear autocorrelation structure of returns does not happen in the non-linear autocorrelation, a fact that is very important for the predictability of those returns.

The return series of DAX display a strong leptokyrtic distribution in all of the periods with the exception of the most recent subsample (1996-2002). A negative skewness in the returns is also present in all of the subperiods. The linear autocorrelation is generally very weak in the period as a whole, but the non-linear autocorrelation is significant for a large number of lags, even though it appears to have weakened since the early years of the sample.

5.Empirical Results

Results for the ten Moving Average rules are presented in Table 2 and Table 3 and they are calculated according to the methodology applied by the majority of previous studies. The technical strategies exhibit satisfactory predictive value but their strength varies considerably from one period to the other. The reliability of moving average rules as a prediction tool is significantly higher in the AGI than in DAX**.** This finding is consistent with that of Ito (1999) and Ahmed et al (2000) who demonstrated that technical trading rules exhibit stronger forecast power for the emerging markets than for the developed markets. However, only in a few cases t-statistics reject the hypothesis that returns generated by VMLA rules equal the unconditional returns at the 0.05 confidence level.

In the entire series, first and last subsamples of AGI, all of the Buy-Sell returns are positive and exceed the unconditional one-day return. However in the second subsample (1992-1997) the adoption of the (2,200) strategy with and without a band of one percent, would lead to an average loss since the Buy-Sell returns are negative. The majority of average sell returns are negative only in the full sample and the recent subsample (1998-2002). Buy signals appear to be more accurate than sell signals, which may be due to the fact that in average the market was rising in all of the periods studied. However, the volatility of the Buy signals as this is measured by standard deviation, is much higher than the one of Sell signals.

In the case of DAX, the predictive ability of technical analysis is only obvious in the entire series and the most recent subsample (1996-2002), where Buy-Sell return exceeds by a large percent the unconditional return of a buy and hold strategy in all of the moving average rules. The most discouraging results are extracted from the second subsample (1988-1995) where all of the Sell returns are positive and only two strategies manage to yield a higher Buy-Sell return than the unconditional return. In contrast with the results of Athens General Index, the volatility of sell returns is much higher than the one of buy returns.

The most effective strategy is proved to be the combination of 1 and 50 day moving averages (1,50) with or without a band for both indices and in almost all of the periods. This conclusion coincides with the results of Brock et al (1992), Hudson et al (1996), Mills (1997), Parisi and Vasquez (2000) and Gusasekarage and Power (2001) who applied the same rules to different indices (Dow Jones Industrial Average, FTSE 30, IPSA in Chile, Bombay National Index, Colombo all Share Price Index, Dhaka All Share Price Index, Karachi 100 Index).

Striking results are extracted from the most recent subsamples for both Athens General Index and DAX where the performance of all the moving average rules is

impressive. The sell signals are in most of the strategies twice as many as the Buy signals. It is worth noting that the average returns of sell signals are negative and experience a much lower volatility than the buy signals. This is inconsistent with the findings of a plethora of studies, which have documented that the performance of technical analysis has deteriorated considerably during the recent years (see Brock et al (1992), Mills (1997), Sullivan et al (1997), Bessembinder and Chan (1998))

The fact that the last subsample covers both a very bullish and a very bearish part of the history of Athens Stock Exchange and Frankfurt Stock Exchange, increases further the importance of these results since technical analysis proves to perform satisfactory in different market conditions.

The unusual performance of the moving average strategies in the last subperiod, coincides with the findings of Gencay (1998) who demonstrated that technical analysis has impressive performance in trendy market conditions but experiences very poor performance in driftless markets

Furthermore, there seem to be a very strong positive relation between the performance of moving average rules and the volatility of the market. In all of the periods that technical analysis generates excess returns the standard deviation (see Table 1) is much higher than that of the periods that the rules perform badly.

6.Returns versus the Buy-and-Hold Strategy

Although the previous results in Tables 10-13, provide a very good estimation of the predictive value of moving average rules, they are insufficient to clarify whether they can lead to economically significant results. The "paper" profits shown in those results may differ considerably from the real profits that an investor can gain in the a real trading environment. A direct way of assessing the profitability of technical analysis is the simulation of the real trading process and the comparison of the resulted cumulative returns with the corresponding returns of the buy-and-hold strategy. The investor is assumed to reinvest profits after a winning trade until the end of the period as he normally does in real life. However, a crucial factor that determines the profitability of a trading strategy is transaction costs. The importance o transaction costs has been underlined by most empirical studies, which assert that the profits generated by the technical trading rules disappear after the deduction of transaction costs. For example, Domowitz et al (1999) have claimed that transaction costs can be so large that they eliminate the profits of these strategies.

Transaction costs include commissions, fees, stamp duties and any other expenses, which are charged to the investor by brokerage firms, other intermediaries, the government etc. There exist, also, additional (implicit) costs that comprise the bid-ask spread, the price impact or slippage and the opportunity cost. The implicit costs are affected mainly by the liquidity of the market and thus emerging markets normally face high implicit costs.

For the purpose of this study the transaction costs are assumed to be, in all of the periods, 60 basis points (bps) for the Athens Stock Exchange and 39 bps for DAX, except for the period 1996-2002 when the costs are assumed to be 35 bps. The above assumptions are mainly based on the studies of Domowitz et al (1999,2000) who estimated trading costs in the Athens Stock Exchange and Frankfurt Stock

Exchange, at 65.5 basis points(bps) and 37.7 bps respectively. Meyer (2002) also estimated trading costs of Frankfurt Stock Exchange at 39.04 bps.

Tables 14-17, which present the returns of the rules in the absence of trading costs (columns 1-5) as well as the annual cumulative total profit or loss when the trading costs are deducted (the last two columns), suggest the following:

Technical analysis is proved to be an effective investment tool in the Athens Stock Exchange. Even after the deduction of transaction costs, a large number of moving average rules are more profitable than a buy-and-hold strategy in all subperiods. This is not the case for the Frankfurt Stock Exchange, where the results are very discouraging even in the absence of transaction costs, since only a very small number of rules yield satisfactory returns in the full period as well as the first and second subperiods (1988-1995).

Technical analysis produces impressive results especially in the most recent period for both indices. In the absence of transaction costs, even the least successful rules strongly outperform the buy-and-hold strategy. Transaction costs don't reduce the effectiveness of technical analysis rules in the Athens Stock Exchange, as well as in certain periods in the Frankfurt Stock Exchange. All of the technical rules in the AGI and a substantial number of them in DAX, generate excess returns over the buy-and-hold strategy.

Losing trades are more than twice the wining trades even in the case of most profitable rules. Although that seems to be a paradox, it is explained by the nature of moving average strategies, which aim to exploit the largest part of a trend and apply indirectly a stop-loss methodology when a false signal is generated.

7. Conclusions – Discussion

Results provide evidence that technical analysis has forecast power in both the Athens and Frankfurt stock exchanges. However, its strength is significantly higher in the Athens Stock Exchange since the majority of technical rules lead to substantial profits in most of the subperiods.

In addition, technical trading rules prove to offer excess returns over the buy-and-hold strategy even after trading costs are deducted by applying the most possible realistic methodology. Their performance is once more higher in the Athens General Index and this is in line with other studies that have underlined the superior performance of technical analysis in emerging markets. However, the superior forecast power of technical rules in the AGI may be explained by the high volatility which seems to be a determinant factor for the success of technical analysis.

The most effective technicall rule is proved to be for both indices, the combination of one and fifty day moving averages. This strategy is also the "winner" in most of the studies that have applied similar rules and methodology. Losing trades are significantly more than the winning trades in all of the cases without exception. This may reveal a very important part of the nature of technical analysis, which is the ability of technical rules to apply a stop-loss methodology during the trading process.

Furthermore, a very important finding stems form the impressive results of moving average strategies during the most recent subsperiod, in both markets under consideration. Nevertheless, this is inconsistent with a large number of previous

studies, which have underlined that the performance of technical analysis has disminished dramatically in recent years.

Finally, despite the impressive results which have been obtained within the framework of the present study, further investigation is necessary, through the application of more advanced technical rules with a better ability to capture the increased complexity of the world equity markets.

References

1. Ahmed, P., Beck., K. and Goldreyer, E. , 2000, "Can Moving Average Technical Trading Strategies Help in Volatile and Declining Markets? A Study of Some Emerging Asian Markets", Managerial Finance, 26, pp. 49-62
2. Alexander, S. (1961), "Price Movements in speculative markets: Trends or random walks", Industrial Management Review, II, May, pp. 7-26
3. Alexander, S. (1964), "Price movements in speculative markets: Trend or random walks", Number 2, Industrial Management Review, V, Spring, pp. 25-46
4. Allen, H. and Taylor, M. (1990), "Charts Noise and Fundamentals in the London Foreign Exchange Market", Economic Journal, 100, pp. 49-52
5. Bessembinder, H. and Chan, K. (1998), "Market Efficiency and the Returns to Technical Analysis", Financial Management, Vol. 27, No.2 Summer, pp. 5-17
6. Brock, W., Lakonishok, J. and LeBaron, B. (1992), "Simple Technical Trading Rules and the Stochastic Properties of Stock Returns", Journal of Finance, Vol. XLVII, No.5, pp.1731-1764

7. Cheung, Y., Chinn, M. and Marsh, I, (1999), "How do UK-based foreign exchange dealers think their market operates?", Working paper, June, City University – London
8. Courouklis, H. (1999), "Technical analysis: Theory and practice / Techniki Analysi : Theoria kai praktikes efarmoges" (in Greek), Meta publications, Athens, Greece
9. Curcio, R., Goodhart, C., Guillaume, D. and Payne, R. (1997), "Do technical trading rules generate profits? Conclusions from the intra-day foreign exchange market",
10. International Journal of Financial Economics, 2, pp.267-280
11. Detry, P. and Gregoire, P. (2001), "Other evidences of the predictive power of technical analysis: the moving averages rules on European indexes", Working Paper, February, European Financial Management Association
12. Domowitz, I., Glen, J. and Madhavan, A. (1999), "International Equity Trading Costs: A Cross-Sectional and Time-Series Analysis", Working Paper, Pensylvania State University
13. Domowitz, I., Glen, J. and Madhavan, A. (2000), "Liquidity, Volatility, and Equity Trading Costs Across Countries and Over Time", Working Paper 322, The William Davidson Institute, Business School, University of Michigan
14. Dooley, M. and Shafer, J. (1984), "Floating and the world state of world trade developments", in D. Bigman and T. Taya Eds, Bolinger, Cambridge, pp. 43-69

15. Fama, E. and Blume, M. (1966), “Filter rules and stock market trading”, Journal of Business, XXXIX January, pp.226-241
16. Gencay, R. (1998), “The predictability of security returns with simple technical trading rules”, Journal of Empirical Finance, 5, pp. 347-359
17. Goodhart, C. and Curcio, R., 1992, “When support/resistance levels are broken, can profits be made? Evidence from the foreign exchange market”, Discussion Paper 142, London School of Economics, Markets Group
18. Goodman, S. (1980), “Who’s better than the toss of a coin ?”, Euromoney magazine, September, pp.82-89
19. Group of Thirty, (1985), “The Foreign Exchange Market in the 1980s : The views of market participants”, Group of Thirty, New York
20. Gsasekarage, A. and Power, D. (2001), “The profitability of moving average trading rules in South Asian stock markets”, Emerging Markets Review, 2, pp.17-33
21. Hamilton, W. (1922), “The Stock Market Barometer” (Harper Brothers, New York)
22. Hudson, R., Dempsey, M. and Keasey, K. (1996), “A note on the weak form of efficiency of capital markets: The application of simple technical trading rules to UK stock prices - 1935 to 1994”, Journal of Banking and Finance, 20, pp.1121-1132
23. Ito, A (1999), “Profits on technical trading rules and time-varying expected returns: Evidence from Pasific-Basin equity markets”, Pasific-Basin Journal, 7, pp. 283-330

24. James, F. Jr. (1968), "Monthly Moving Averages. An effective Investment Tool ?", Journal of Financial and Quantitative Analysis, September, pp. 315-326

25. Levish, R. and Thomas, L. (1993), "The significance of technical trading rule profits in the foreign exchange market: a bootstrap approach", Journal of International Money and Finance, 12, pp.451-474

26. Levy, R. (1967), "Relative Strength as a criterion for investment selection", Journal of Finance, Vol. XXII, pp.595-610

27. Lui, Y. and Mole, D. (1998), "The use of fundamental and technical analyses by foreign exchange dealers: Hong Kong evidence", Journal of International Money and Finance, 17, pp.535-545

28. Malkiel, B., 1990, "A Random Walk Down Wall Street", (5th edn, Norton, New York)

29. Maravall, A. (1983), "An application of non-linear time series forecasting;", Journal of Business and Economic Statistics, 1, pp. 66-74

30. Markellos, R. (1998), "Backtesting technical analysis trading systems: The cointegration cumulative profit test", Financial Risk Management, in C. Siriopoulos Eds., Paratiritis, Thessaloniki, Greece

31. Menkhoff, L. (1997), "Examining the use of technical currency analysis", International Journal of Financial Economics, 2, pp. 307-318

32. Meyer, T., 2002, "The eastward enlargement of the eurozone: The shaping of the capital markets", Working Paper, No.5, Ezoneplus, European Commission

33. Mills, T. (1997), "Technical Analysis and the London Stock Exchange: Testing Trading Rules Using the FT30", International Journal of Financial Economics, 2, pp. 319-331
34. Neely, C., Weller, P. And Dittmar, R. (1997), "Is technical analysis in the foreign exchange market profitable? A genetic programming approach", Journal of Financial and Quantitative Analysis, Vol. 32, No.4, pp.405-426
35. Neftci, S. (1991), "Naïve trading rules in financial markets and Weiner-Kolmogorov prediction theory: A study of "technical analysis", Journal of Business, 64, pp. 549-71
36. Nelson, S. (1902), "The ABC of Stock Speculation" (reprint 1978 by Frazer Publishing Company, Vermont)
37. Osler, C. And Chang K., (1995), "Head and Shoulders: Not just a flaky pattern", Staff Papers No.4, August, Federal Reserve Bank of New York
38. Parisi, F. and Vasquez, A. (2000), "Simple technical trading rules of stock returns: evidenve from 1987 to 1998 in Chile", Emerging Markets Review, 1, pp.152-164
39. Rhea, R. (1932), "Dow Theory" (Barron's, New York)
40. Shiller, R. (1987), "Investor behaviour in the October 1987 crash: Survey evidence", Discussion paper No. 853, Cowles Foundation for research in Economics, Yale University
41. Sullivan, R., Timmermann, A. and White, H. (1997), "Data-Snooping, technical trading rule performance, and the bootstrap", Discussion paper 97-31, Department of Economics - University of California, San Diego

42. Sweeney, R. (1986), "Beating the foreign exchange market", Journal of Finance, 41, pp. 163-182

43. Van Horne, J. and Parker, G. (1967), "The random walk theory: An empirical test", Financial Analyst Journal, November-December, pp.87-92

44. Wittmer, R., 2000, "Can Technical Analysis still beat random systems?", IFTA Conference, October, Meinz-Germany

45. Wong, M. and Cheung, Y., 1999, "The practice of investment management in Hong Kong: market forecasting and stock selection", Omega, 27, pp. 451-465

Table 1: Summary statistics for daily returns

	Athens General Index				DAX			
	Full Sample	**1986-1991**	**1992-1997**	**1998-2002**	**Full Sample**	**1980-1987**	**1988-1995**	**1996-2002**
N	4033	1282	1501	1250	5769	1994	2011	1764
Mean	0.00074	0.00174	0.00040	0.00013	0.00031	0.00035	0.00040	0.00014
Std. dev.	0.01967	0.02405	0.01434	0.02019	0.01326	0.01093	0.01143	0.01707
Skewness	0.27965	0.44219	-0.03073	-0.01075	-0.51515	-0.79417	-0.76156	-0.27820
Kurtosis	11,94412	14,49341	3,61498	2,29060	6,75765	9,48845	14,23846	2,32447
ρ(1)	0.2209**	0.2751**	0.1928**	0.1562**	0.0086	0.0596**	-0.0057	-0.0067
t-stat	(14.0286)	(9.8483)	(7.4697)	(5.5211)	(0.6509)	(2.6430)	(-0.2535)	(-0.2795)
ρ(2)	0.0028	0.0085	-0.0583*	0.0273	-0.0359**	-0.0574*	-0.01	-0.0418
	(0.1678)	(0.2832)	(-2.1779)	(0.9416)	(-2.7261)	(-2.5534)	(-0.4500)	(-1.7562)
ρ(3)	-0.0215	-0.0384	-0.0327	0.0053	-0.0132	-0.0323	-0.0047	-0.0113
	(-1.3050)	(-1.2807)	(-1.2175)	(0.1831)	(-1.0023)	(1.4315)	(-0.2112)	(-0.4757)
ρ(4)	-0.0381*	-0.0867**	0.0023	0.0053	0.0252	0.0263	0.013	0.0362
	(-2.3114)	(-2.8878)	(0.0869)	(0.1812)	(1.9127)	(1.1644)	(0.5839)	(1.5191)

ρ(5)	-0.0113	-0.0165	-0.0024	-0.0121	0.0025	0.0619**	-0.0338	-0.0062
	(-0.6828)	(-0.5478)	(-0.0907)	(-0.4162)	(0.1904)	(2.7410)	(-1.5159)	(-0.2593)
ρ²(1)	0.2296**	0.2203**	0.2676**	0.2036**	0.2132**	0.2130**	0.1723**	0.2072**
	(14.5828)	(7.8874)	(10,3693)	(7.1989)	(16.1919)	(9.5094)	(7.7245)	(8.7042)
ρ²(2)	0.2331**	0.2205**	0.2985**	0.2267**	0.2484**	0.4842**	0.0399	0.2571**
	(14.0824)	(7.5388)	(10,4548)	(7.7017)	(17.7009)	(20.7032)	(1.7392)	(10.3636)
ρ²(3)	0.1247**	0.1050**	0.2433**	0.1378**	0.2296**	0.3321**	0.0711**	0.266**
	(17.1883)	(3.4387)	(8.2358)	(4.4728)	(15.8595)	(11.8753)	(3.0936)	(10.1209)
ρ²(4)	0.2994**	0.1931**	0.2841**	0.1946**	0.2067**	0.2245**	0.0563**	0.2643**
	(17.0406)	(10.1121)	(8.0238)	(5.3234)	(13.3620)	(7.4466)	(2.4634)	(9.4867)
ρ²(5)	0.1285**	0.1209**	0.1763**	0.0719*	0.1865**	0.3133**	0.026	0.219**
	(6.8348)	(3.6455)	(5.5693)	(2.2490)	(11.9870)	(10.1907)	(1.1219)	(7.5154)

Table 2. Athens General Index : Full Sample (1986-2002)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	1963	0,00242*	0,5436	0,02022	2021	-0,00053*	0,4607	0,01941	0.00295*
t-statistic		*3,10311*				*-2,36878*			*4,73206*
1,50,0.01	1793	0,00241**	0,5466**	0,02060*	1793	-0,00046**	0,4635	0,01968*	0.00288*
		3,78884				*-2,14904*			*5,05310*
1,150,0	1900	0,00187*	0,5326	0,02250	1984	-0,00015	0,4698	0,01712	0.00202*
		2,06432				*-1,64979*			*3,19892*
1,150,0.01	1836	0,00180	0,5332	0,02187	1886	-0,00020	0,4703	0,01714	0.00200*
		1,91390				*-1,71290*			*3,10094*
5,150,0	1907	0,00150	0,5286	0,02188	1977	-0,00049	0,4734	0,01789	0.00131*
		1,39013				*-1,01838*			*2,07470*
5,150,0.01	1843	0,00146	0,5285	0,02207	1896	0,00018	0,4720	0,01800	0.00128*
		1,30171				*-1,02229*			*1,98911*
1,200,0	1943	0,00160	0,5310	0,02288	1900	-0,00015	0,4653	0,01635	0.00175*
		1,58303				*-1,62588*			*2,75715*
1,200,0.01	1866	0,00172	0,5327	0,02317	1841	-0,00028	0,4622	0,01624	0.00200*
		1,77931				*-1,84340*			*3,09490*
2,200,0	1937	0,00162	0,5307	0,02290	1897	-0,00018	0,4655	0,01630	0.00180*
		1,61815				*-1,67978*			*2,83263*
2,200,0.01	1867	0,00156	0,5287	0,02310	1837	-0,00020	0,4654	0,01635	0.00176*
		1,48908				*-1,69755*			*2,72238*
Average return		**0,00184**				**-0,00018**			**0,00202**

*Results are presented for the full sample and for three non-overlapping subperiods. Returns are measured as ln differences of the level of the index, $r_t = \ln(x_t) - \ln(x_{t-1})$. ρ(i) is the estimated autocorrelation at lag i of r_t for each series. ρ2 is the estimated autocorrelation at lag i of squared r_t for each series. Numbers marked with * (**) are significant at the 5% (1%) levels for a two-tailed test*

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 3. Athens General Index : First subsample (1986-1991)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	708	0.00395*	0,5904	0,02370	525	-0,00056	0,4476	0,02578	0.00451*
t-statistic		*1,96319*				*-1,84633*			*3,25707*
1,50,0.01	670	0.00439*	0,5925	0,02368	464	-0.00083*	0,4461	0,02671	0.00522*
		2,31219				*-1,97310*			*3,59498*
1,150,0	603	0,00297	0,5605	0,02958	530	0,00052	0,4849	0,01935	0,00245
		1,03607				*-0,98265*			*1,71153*
1,150,0.01	593	0,00267	0,5632	0,02762	504	0,00035	0,4821	0,01935	0,00232
		0,77891				*-1,09969*			*1,59281*
5,150,0	601	0,00245	0,5641	0,02802	532	0,00112	0,4812	0,02192	0,00133
		0,59738				*-0,50004*			*0,92932*
5,150,0.01	589	0,00248	0,5603	0,02826	510	0,00121	0,4824	0,02190	0,00127
		0,61835				*-0,42109*			*0,87334*
1,200,0	627	0,00239	0,5550	0,02959	456	0,00027	0,4693	0,01835	0,00212
		0,55478				*-1,12139*			*1,43276*
1,200,0.01	615	0,00249	0,5545	0,02982	447	0,00016	0,4698	0,01794	0,00233
		0,63598				*-1,19645*			*1,55927*
2,200,0	625	0,00237	0,5536	0,02962	458	0,00031	0,4716	0,01837	0,00206
		0,53714				*-1,09263*			*1,39303*
2,200,0.01	613	0,00236	0,5530	0,02976	446	0,00052	0,4776	0,01840	0,00184
		0,52517				*-0,92307*			*1,22971*
Average return		**0,00285**				**0,00031**			**0,00255**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 4. Athens General Index : Second subsample (1992-1997)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	679	0,00157	0,5317	0,01527	772	-0,00057	0,4767	0,01335	0.00214*
t-statistic		*1,75656*				*-1,53223*			*2,83394*
1,50,0.01	604	0.00188*	0,5430	0,01557	673	-0,00035	0,4844	0,01380	0.00223*
		2,13420				*-1,13242*			*2,77205*
1,150,0	795	0,00107	0,5195	0,01513	556	-0,00014	0,4964	0,01356	0,00121
		1,05786				*-0,76344*			*1,52491*
1,150,0.01	765	0,00104	0,5163	0,01528	506	-0,00080	0,5020	0,01377	0.00184*
		0,99750				*-1,63187*			*2,23726*
5,150,0	802	0,00087	0,5137	0,01523	549	0,00013	0,5046	0,01339	0,00074
		0,74231				*-0,38275*			*0,93077*
5,150,0.01	771	0,00087	0,5175	0,01532	515	0,00012	0,5029	0,01353	0,00075
		0,73277				*-0,38747*			*0,91820*
1,200,0	803	0,00079	0,5143	0,01544	498	0,00076	0,5221	0,01300	0,00003
		0,61512				*0,47964*			*0,03665*
1,200,0.01	755	0,00081	0,5139	0,01569	462	0,00065	0,5130	0,01304	0,00016
		0,63400				*0,32215*			*0,18873*
2,200,0	805	0,00078	0,5130	0,01533	496	0,00078	0,5242	0,01280	0,00000
		0,59967				*0,50582*			*0,00000*
2,200,0.01	756	0,00066	0,5079	0,01564	461	0,00071	0,5184	0,01304	-0,00005
		0,39994				*0,40039*			*-0,05895*
Average return		**0,00103**				**0,00013**			**0,00091**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 5. Athens General Index : Third subsample (1998-2002)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	521	0,00138	0,5086	0,02086	679	-0,00061	0,4492	0,01975	0,00199
t-statistic		*1,18671*				*-0,76847*			*1,69155*
1,50,0.01	467	0,00192	0,5225	0,02170	620	-0,00045	0,4500	0,01996	0,00237
		1,63400				*-0,58456*			*1,91495*
1,150,0	350	0,00128	0,5143	0,02247	750	-0,00089	0,4427	0,01822	0,00217
		0,94145				*-1,09330*			*1,65958*
1,150,0.01	331	0,00133	0,5166	0,02290	735	-0,00086	0,4435	0,01821	0,00219
		0,96107				*-1,05444*			*1,63792*
5,150,0	354	0,00071	0,5028	0,02258	746	-0,00063	0,4477	0,01816	0,00134
		0,47693				*-0,81326*			*1,02790*
5,150,0.01	340	0,00061	0,5000	0,02280	729	-0,00078	0,4444	0,01827	0,00139
		0,38851				*-0,96673*			*1,04785*
1,200,0	335	0,00247	0,5403	0,02257	715	-0,00110	0,4336	0,01697	0.00357*
		1,88299				*-1,29868*			*2,66943*
1,200,0.01	332	0.00259*	0,5422	0,02259	710	-0,00120	0,4338	0,01686	0.00379*
		1,97254				*-1,40113*			*2,82211*
2,200,0	336	0,00244	0,5387	0,02254	714	-0,00109	0,4342	0,01699	0.00353*
		1,86104				*-1,28755*			*2,64161*
2,200,0.01	333	0,00248	0,5405	0,02247	709	-0,00112	0,4344	0,01701	0.00360*
		1,88658				*-1,31626*			*2,68277*
Average return		**0,00172**				**-0,00087**			**0,00259**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Out") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 6. DAX : Full Sample (1980-1997)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	3541	0,00074	0,5182	0,01061	2180	-0,00017	0,4938	0,01670	0.00091*
t-statistic		*1,53946*				*-1,43016*			*2,52796*
1,50,0.01	3036	0,00073	0,5188	0,01065	1761	-0,00006	0,5051	0,01784	0.00079*
		1,42207				*-1,00781*			*1,98045*
1,150,0	3649	0,00058	0,5185	0,01081	1972	0,00054	0,4906	0,01709	0,00004
		0,95507				*0,67329*			*0,09439*
1,150,0.01	3430	0,00060	0,5204	0,01075	1778	0,00001	0,4885	0,01767	0,00059
		1,01733				*-0,81700*			*1,50896*
5,150,0	3654	0,00055	0,5164	0,01101	1967	0,00011	0,4944	0,01686	0,00044
		0,85208				*-0,58028*			*1,18598*
5,150,0.01	3422	0,00058	0,5199	0,01097	1765	0,00004	0,4938	0,01744	0,00054
		0,95021				*-0,75374*			*1,39925*
1,200,0	3654	0,00053	0,5183	0,01099	1917	0,00014	0,4927	0,01709	0,00039
		0,79860				*-0,46606*			*1,03439*
1,200,0.01	3468	0,00062	0,5231	0,01095	1741	0,00021	0,4971	0,01755	0,00042
		1,11206				*-0,27015*			*1,06501*
2,200,0	3648	0,00059	0,5192	0,01104	1923	0,00003	0,4912	0,01701	0,00057
		1,02270				*-0,80153*			*1,51662*
2,200,0.01	3468	0,00058	0,5196	0,01100	1732	0,00004	0,4934	0,01757	0,00054
		0,95069				*-0,74280*			*1,38597*
Average return		**0,00061**				**0,00009**			**0,00052**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 7. DAX : First subsample (1980-1987)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	1194	0,00087	0,5050	0,00912	752	-0,00030	0,4740	0,01335	0.00117*
t-statistic		*1,28227*				*-1,39511*			*2,29030*
1,50,0.01	1009	0,00087	0,5074	0,00932	568	-0,00028	0,4903	0,01453	0.00115*
		1,21924				*-1,21687*			*2,00130*
1,150,0	1250	0,00060	0,4968	0,00969	596	0,00001	0,4807	0,01369	0,00059
		0,62247				*-0,67267*			*1,08199*
1,150,0.01	1150	0,00063	0,5000	0,00978	523	0,00003	0,4828	0,01419	0,00061
		0,69030				*-0,60390*			*1,04717*
5,150,0	1261	0,00054	0,4933	0,00982	585	0,00013	0,4880	0,01355	0,00041
		0,46938				*-0,43682*			*0,74819*
5,150,0.01	1151	0,00054	0,4952	0,00980	519	0,00001	0,4865	0,01386	0,00053
		0,45375				*-0,63911*			*0,91333*
1,200,0	1232	0,00051	0,4951	0,01006	564	0,00025	0,4902	0,01351	0,00025
		0,38542				*-0,19141*			*0,45428*
1,200,0.01	1129	0,00064	0,5049	0,01010	466	0,00040	0,5011	0,01398	0,00024
		0,69852				*0,07629*			*0,40122*
2,200,0	1233	0,00053	0,4955	0,00992	563	0,00020	0,4893	0,01374	0,00033
		0,44851				*-0,29457*			*0,59584*
2,200,0.01	1130	0,00059	0,4991	0,01008	463	0,00029	0,4978	0,01444	0,00030
		0,58104				*-0,10617*			*0,49135*
Average return		**0,00063**				**0,00007**			**0,00056**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 8. DAX : Second subsample (1988-1995)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	1253	0,00061	0,5036	0,00946	708	0,00014	0,4929	0,01361	0,00048
t-statistic		*0,50493*				*-0,53382*			*0,88270*
1,50,0.01	1040	0,00065	0,5019	0,00937	556	0,00021	0,5000	0,01465	0,00044
		0,57188				*-0,34828*			*0,73340*
1,150,0	1318	0,00048	0,5046	0,00989	543	0,00021	0,4880	0,01368	0,00027
		0,18983				*-0,35409*			*0,46775*
1,150,0.01	1251	0,00040	0,5012	0,00989	477	0,00019	0,4864	0,01414	0,00021
		-0,00728				*-0,36198*			*0,33771*
5,150,0	1318	0,00047	0,5046	0,01019	543	0,00024	0,4880	0,01314	0,00023
		0,15778				*-0,29267*			*0,38722*
5,150,0.01	1249	0,00044	0,5060	0,01010	472	0,00016	0,4831	0,01353	0,00028
		0,08973				*-0,41340*			*0,45116*
1,200,0	1268	0,00033	0,5024	0,01000	543	0,00048	0,4917	0,01357	-0,00015
		-0,18517				*0,13911*			*-0,26065*
1,200,0.01	1218	0,00034	0,5008	0,01002	492	0,00052	0,4959	0,01391	-0,00017
		-0,14919				*0,19455*			*-0,28459*
2,200,0	1264	0,00041	0,5032	0,01014	547	0,00030	0,4899	0,01332	0,00011
		0,00974				*-0,19749*			*0,19291*
2,200,0.01	1218	0,00031	0,4984	0,01009	489	0,00016	0,4867	0,01364	0,00015
		-0,23582				*-0,42974*			*0,24480*
Average		**0,00044**				**0,00026**			**0,00018**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Sell") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 9. DAX : Third subsample (1996-2002)

Standard test results for the Variable Length Moving Average (VLMA) rules

Trading Strategy	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
1,50,0	1023	0,00070	0,5484	0,01333	692	-0,00040	0,5152	0,02174	0,00110
t-statistic		*0,83241*				*-0,70843*			*1,31023*
1,50,0.01	917	0,00060	0,5474	0,01321	610	-0,00010	0,5238	0,02244	0,00070
		0,65979				*-0,30524*			*0,78852*
1,150,0	888	0,00055	0,5586	0,01370	727	-0,00014	0,4972	0,02154	0,00068
		0,58028				*-0,36648*			*0,80030*
1,150,0.01	841	0,00073	0,5660	0,01340	678	-0,00022	0,4934	0,02204	0,00095
		0,81697				*-0,46623*			*1,07146*
5,150,0	884	0,00057	0,5566	0,01394	731	-0,00015	0,5000	0,02132	0,00072
		0,60355				*-0,38981*			*0,84049*
5,150,0.01	835	0,00073	0,5641	0,01391	673	-0,00015	0,5060	0,02198	0,00088
		0,81639				*-0,37457*			*0,98961*
1,200,0	872	0,00068	0,5608	0,01409	693	-0,00041	0,4899	0,02180	0,00110
		0,76620				*-0,72185*			*1,25919*
1,200,0.01	843	0,00086	0,5670	0,01388	669	-0,00033	0,4910	0,02196	0,00119
		0,99793				*-0,60833*			*1,34043*
2,200,0	869	0,00079	0,5627	0,01427	696	-0,00055	0,4878	0,02162	0,00134
		0,92205				*-0,89946*			*1,54275*
2,200,0.01	842	0,00078	0,5641	0,01397	664	-0,00044	0,4902	0,02194	0,00123
		0,89833				*-0,75064*			*1,38351*
Average		**0,00070**				**-0,00029**			**0,00099**

* Significant at the 5% confidence level

"Buy" ("Sell") are the mean returns of the trades generated by a buy (sell) signal. "N Buy" ("N Out") denote the total number of days generated by a buy (sell) signal, "Buy>0" and "Sell>0" are the fraction of buy and sell returns greater than zero. "Buy-Sell" is the difference between "Buy" and "Sell" returns. The numbers in italics are the t-statistics computed using the formulae given by Brock et al. (1992, footnote 9).

Table 10. Athens General Index : Full Sample (1986-2002)

Cummulative returns for the Variable Length Moving Average (VLMA) rules vs. Buy-and-Hold

						Transaction costs	
Trading Strategy	**Percent Gain**	**Total Trades**	**Winning**	**Losing**	**An. Return**	**Percent Gain**	**An. Return**
1,50,0.01	22545,59	189	68	121	1389,12	2230,20	137,41
1,50,0	19509,57	183	57	126	1202,06	2068,44	127,44
1,150,0	2280,58	73	16	57	140,52	885,46	54,56
1,150,0.01	2206,44	96	21	75	135,95	624,49	38,48
1,200,0.01	1925,8	65	19	46	118,66	823,09	50,71
2,200,0.01	1165,63	59	18	41	71,82	519,76	32,02
2,200,0	1110,82	49	15	34	68,44	568,52	35,03
1,200,0	1023,23	67	16	51	63,05	399,68	24,63
5,150,0.01	375,17	52	14	38	23,12	153,07	9,43
5,150,0	374,93	51	14	37	23,10	156,00	9,61

Buy/Hold return	**1885,14%**
An. Buy/Hold return	**116,15%**
Days in test	**5924**

Table 11. Athens General Index : First Subsample (1986-1991)

Cummulative returns for the Variable Length Moving Average (VLMA) rules vs. Buy-and-Hold

						Transaction costs	
Trading Strategy	**Percent Gain**	**Total Trades**	**Winning**	**Losing**	**An. Return**	**Percent Gain**	**An. Return**
1,50,0.01	2056,17	50	19	31	393,76	1076,27	206,11
1,50,0	1576,27	49	16	33	301,86	825,5	158,08
1,150,0	253,33	25	5	20	48,51	160,19	30,68
1,150,0.01	232,05	30	6	24	44,44	130,28	24,95
1,200,0.01	217,19	17	5	12	41,59	157,11	30,09
1,200,0	175,68	15	4	11	33,64	128,89	24,68

2,200,0	161,65	13	4	9	30,96	122,52	23,46
2,200,0.01	142,59	16	5	11	27,31	99,02	18,96
5,150,0.01	57,82	15	3	12	11,07	31,03	5,94
5,150,0	44,23	15	4	11	8,47	19,75	3,78

Buy/Hold return	**824,85%**
An. Buy/Hold return	**157,96%**
Days in test	**1906**

Table 12. Athens General Index : Second Subsample (1992-1997)

Cummulative returns for the Variable Length Moving Average (VLMA) rules vs. Buy-and-Hold

						Transaction costs	
Trading Strategy	**Percent Gain**	**Total Trades**	**Winning**	**Losing**	**An. Return**	**Percent Gain**	**An. Return**
1,50,0	285,46	63	22	41	47,53	79,91	13,31
1,50,0.01	241,27	66,00	24	42	40,17	53,65	8,93
1,150,0	137,11	26,00	6	20	22,83	72,52	12,08
1,150,0.01	114,83	38,00	9	29	19,12	35,35	5,89
5,150,0	76,23	18,00	6	12	12,69	41,14	6,85
5,150,0.01	72,03	19,00	6	13	11,99	36,14	6,02

1,200,0.01	23,56	33,00	7	26	3,92	-17,34	-2,89
1,200,0	16,01	36,00	7	29	2,67	-25,14	-4,19
2,200,0	14,64	28,00	7	21	2,44	-18,57	-3,09
2,200,0.01	7,48	31,00	7	24	1,25	-26,35	-4,39

Buy/Hold return	**84,52%**
An. Buy/Hold return	**14,07%**
Days in test	**2192**

Table 13. Athens General Index : Third Subsample (1998-2002)

Cummulative returns for the Variable Length Moving Average (VLMA) rules vs. Buy-and-Hold

						Transaction costs	
Trading Strategy	**Percent Gain**	**Total Trades**	**Winning**	**Losing**	**An. Return**	**Percent Gain**	**An. Return**
1,200,0.01	292,28	6	2	4	58,42	262,85	52,54
2,200,0.01	257,79	5	2	3	51,53	234,94	46,96
1,200,0	192,7	4	1	3	38,52	177,32	35,44
2,200,0	188,84	4	1	3	37,75	173,66	34,71
1,50,0.01	183,56	64	21	43	36,69	30,77	6,15
1,50,0	175,1	65	16	49	35,00	25,35	5,07

1,150,0.01	126,78	20	3	17	25,34	77,33	15,46
1,150,0	114,89	13	2	11	22,97	82,75	16,54
5,150,0.01	54,58	13	3	10	10,91	31,46	6,29
5,150,0	44,6	13	2	11	8,92	22,98	4,59

Buy/Hold return	**17,94%**
An. Buy/Hold return	**3,59%**
Days in test	**1826**