Technical analysis and artificial neural networks as prediction tools in the equity markets

Technical Analysis and Artificial Neural Networks as prediction tools in the equity markets

by

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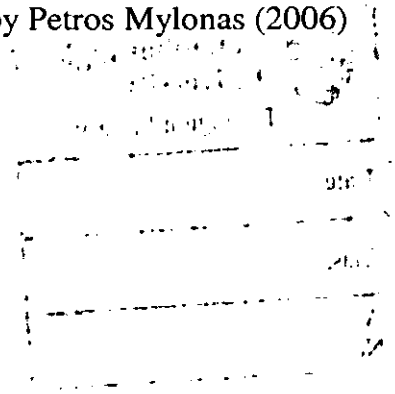

Abstract

This study investigates the possible forecast power of a wide spectrum of technical rules on the equity markets. Two equity indices (Nasdaq Composite and Athens General Index) have been chosen as case studies. The results of the tests show that there is evidence of forecast power for many of the technical strategies. The optimization methodology improves substantially the achieved returns. The performance is higher in the case of Nasdaq Composite which could be a paradox since it is a much more developed and efficient market. The performance of technical strategies deteriorates dramatically during the most recent period.

When transaction costs are taken into account in a realistic way, the technical trading strategies fail in the majority of the cases to generate higher returns than a naïve buy-and-hold strategy. It is proved that transaction costs generate an inflated effect on the total profits which can be more than double the nominal amount paid in these costs. The importance of trading cost has been underestimated by many previous studies mainly due to unrealistic ways for their calculation. The unsatisfactory performance of technical analysis during different time horizons and data is mainly due to its static nature that deprives the method from adjusting to the constantly changing market and economic conditions. The proposed solution is a trading model that combines artificial neural networks, genetic algorithms and technical analysis. The results are very optimistic since there is evidence for significant forecast power and consistent abnormal returns in a very difficult short term prediction as it is to predict next day's market direction.

Dedicated to my father, Ioannis Mylonas

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Contents

1. Introduction

Technical Analysis has its origins back in late 1800s when Charles Henry Dow, editor of "The Wall Street Journal", published a stock market average on July 3, 1884. That first average included 11 stocks, of which 9 were railroad companies. After a lot of amendments, the Industrial Index comprised 30 companies in 1928, and it is still the most famous index in the world securities markets. That first index in 1884 was meant to be the beginning of a whole philosophy of investment appraisal, which after many decades took the name "Technical Analysis".

Dow's first observations about stock market movements, widely known as "Dow Theory", were actually articulated as a theory by his successor in "The Wall Street Journal", William Peter Hamilton. Until his death in 1929, Hamilton wrote a large number of editorials in "The Wall Street Journal" and in "Barron's", discussing and forecasting major trends in the New York Stock Exchange. Since Dow never wrote a book on his theory, his successor explained and enhanced the basic ideas in a book called "The Stock Market Barometer", in 1922.

Although the modern methods of technical analysis are much more sophisticated than Dow and Hamilton could ever imagine, the core thinking of modern technical analysis is still based on the "Dow Theory". According to Hamilton, "the pragmatic basis for the theory, a working hypothesis, if nothing more, lies in human nature itself". What Technical Analysis is trying to capture is the human psychology behind the price movements which allow investors to profit from its changes. According to Martin Pring (1991), one of the most famous technical analysts, "the technical approach is a reflection of mass psychology "crowd" in action, it attempts to forecast future price movements on the assumption that crowd psychology moves between panic, fear and pessimism on one hand and confidence, excessive optimism and greed on the other".

Dow Theory stems from the premise that market action (prices and transaction volume) reflect all available knowledge on the asset. Therefore, there is no need to examine the fundamental determinants of an asset's value. Furthermore, according to Murphy (1986), asset price changes often precede changes in fundamentals.

The second main principle is that asset prices move in trends and thus an investor can profit by identifying the prevailing trend and following it. This is what the proponents of Technical Analysis mean when they say "follow the trend" or "the trend is your best friend".

The final basic principle of Dow Theory is that history repeats itself. In other words, market participants will act in the same way when they encounter the same conditions. In addition, by studying the price and volume history of an asset, an investor can forecast which direction the asset price will move when the same conditions prevail in the market.

The methods employed in Technical Analysis are based on either charting or mechanical rules. Using charting, which is as old as the theory itself, practitioners aim to predict future patterns by studying the patterns of the price graph for a long time in the past. The charting rules, which are responsible for giving the name of "Chartism Theory" to Technical Analysis, are to a large extent subjective, and need considerable experience and skill by users.

In contrast, the mechanical rules impose objectivity and consistency on the user since they are based on mathematical formulae which attempt to capture the nature of the price movements and take advantage of the market psychology that constitutes the major force for every change in the price direction.

Although technical analysis is as old as the Stock Market itself, it has been anathema to academics from the early beginning of its use. Its practical nature and the fact that it seems to violate the traditional theory of market efficiency are only two of the reasons that made academics treat technical methods as a heretic philosophy of market appraisal without any scientific and practical value. Lo et al (2000) claim that "technical analysis has survived through the years, perhaps because its visual mode of analysis is more conducive to human cognition, and because pattern recognition is one of the few repetitive activities for which computers do not have an absolute advantage yet".

However, the renaissance of Technical Analysis in the last decade has made it impossible for the academic community to continue ignoring its presence and possible predictive power. As a consequence, a plethora of research has been carried out on tackling a large number of issues regarding the adoption of Technical Analysis as a reliable tool for predicting asset prices. The application of methods taken from applied sciences, such as pattern recognition, makes chartism theory seem much more scientific than a few decades ago.

2. Popularity of Technical Analysis

Technical analysis methods are widely used in almost every part of the securities industry. The foreign exchange market, shares, commodities of all kinds and derivatives are areas where chartism theory is heavily applied. A very characteristic statement on the extent of the use of technical analysis was made by Neely (1997), an economist at the Federal Reserve Bank of St. Louis, who reports that "technical analysis is the most widely used trading strategy in the foreign exchange market".

A study by Menkhoff (1997), which is based on the analysis of a questionnaire survey, examined the trading behaviour of the professional participants in the foreign exchange market in Germany. A total of 523 questionnaires were sent in 1992, covering almost every important participant of the market, including 96 banking institutions and 44 management companies. Furthermore, a telephone survey and interviews were conducted in order to increase the reliability and coverage of the study. The conclusions drawn from the study are very interesting, since they illustrate that more than 87% of all respondents (FX-managers and fund managers) use technical analysis, attaching, on average, 35% importance to it for predicting FX rates. Moreover, although fundamental analysis is found to be the most important long-term predictive tool, technical analysis is not only used for short horizon forecasting. Another conclusion drawn from the study is that technical analysis is used by all types of participants regardless of age, position and size of firm that they work for, indicating that chartism theory is a widely accepted technique in the foreign exchange market.

The same methodology is followed by Allen and Taylor (1990) and Taylor and Allen (1992), who conducted a questionnaire survey covering over 400 chief foreign exchange dealers in London. Their results show that 90% of the respondents rely at least to a small extent on Technical Analysis when they form their trading strategy. Although technical analysis and fundamental analysis are found to be complementary, the former was of declining importance for long forecasting horizons.

The widespread use of technical analysis is also reported by a large number of studies such as the one by Osler and Chang (1999), who estimate that over 90% of the participants in the foreign exchange market in London and Hong Kong rely on technical strategies.

Cheung et al (2004) conducted a survey of UK-based foreign exchange dealers in 1998. They report that 32.7% of the traders who participated in the study answered that they currently follow a technical trading based strategy. Furthermore, the results of the survey reveal that, for the medium run (6 months), 26.3% indicated technical trading as the most important factor that determines exchange rate movements. Apart from the fact that technical analysis is widespread in the foreign exchange industry, the results of the survey illustrate that its popularity has increased considerably in recent years, since only 13.8% reported that the trading strategy they had followed five years ago was technical based.

The importance of technical analysis for foreign exchange dealers is further supported by another study by Lui and Mole (1998) through a questionnaire survey conducted in 1995, which covered 152 members of the Hong Kong Forex Association. That study revealed that over 85% of the respondents use technical analysis for forming their trading strategies. As far as the forecasting horizon is concerned, technical analysis methods are used for shorter horizons, more than fundamental analysis, and its importance diminishes as the time horizon is extended. According to the results extracted from the questionnaires, due to its short-term nature, technical analysis is used heavily in predicting turning points and less in predicting trends.

A report by The Group of Thirty (1985) is also consistent with the previous research which illustrates that technical analysis is considered to be a very important predictive tool in the foreign exchange market. According to that report, 97% of banks and 87% of other financial institutions and stock brokerage agencies believed that technical analysis affects exchange rates considerably. Nevertheless, 12% of the participants answered that they ignored technical analysis when they designed their trading strategy.

The influence of Chartism Theory on financial markets is also reported for the equities markets where, although there is a plethora of studies regarding the effectiveness of technical trading methods on various equities markets, there is scant evidence about its significance to market participants. One of the first reports was made by the Securities Commission of the US in 1946 (SEC 1946). According to the responses to a large number of questionnaires, 13% of investors attributed the 6.1% fall in the prices on the NYSE on 3rd September 1946 to predictions that were based on Dow theory.

Shiller (1987) shows that market participants in the equity industry are affected by the signals of technical analysis when they encounter extreme market conditions such as the crash of 1987. In questionnaires that were sent out concerning October 19, 1987, Shiller received nearly 1000 responses. Almost one third of the investors that took part in the study answered that their trading behaviour during the time of the market crash was influenced by technical analysis considerations (one of them was that the prices followed a long term bearish trendline).

Consistent with the previous studies regarding the influence of technical analysis on various markets are the findings of the Liquidity Data Bank, generated by the Chicago Board of Trade (TASC 1988). According to the Data Bank, which includes details of about 6.5 million investors, 19% of the investors obtain their best information regarding their trading selections from business magazines which offer fundamental and technical analyses.

Wong and Cheung (1999) also sent out questionnaires to a large number of investment professionals and analysts in Hong Kong and showed that technical analysis is used widely, with its significance being higher when the investment horizon is short.

The increasing interest in the use and accuracy of technical trading rules is also shown by the considerable increase in academic studies that have been devoted to the analysis of the above issues, and whose numbers have accelerated in the last few years.

3. Literature Review

Although technical analysis techniques have been applied for more than a century, they have been traditionally treated with only contempt and rejection in academic circles.

A lot of factors have contributed to that treatment. First, the fact that a part of technical theory is based on the analysis of graphical interpretations of price without precise rules has made academics believe that such methods cannot be regarded as scientific. The technical patterns cannot be easily tested for their accuracy in predicting price behaviour and thus they are treated as purely practical methods that lack the foundation of any theory.

But the main reason is that technical analysis theory violates one of the basic principles of financial theory, the efficient market hypothesis. According to the efficient market hypothesis, it is impossible to predict future prices from the observation of past returns and therefore any technical trading system that is based on chartism theory would dispute the fundamentals of financial theory.

3.1 Technical Analysis and Market Efficiency Theory

As already mentioned, the contempt that academics have shown for technical analysis has been based on the fact that, according to efficient market theory, it is impossible to profit from past information. Since all available information is instantly reflected in prices, technical analysis could never make profits from exploiting any patterns which can be revealed from the analysis of past prices.

Nevertheless, technical trading rules have been proved to have significant forecasting ability by many studies. One implication of the profitability of technical analysis is that markets are not efficient. When a market is efficient, prices move according to all new information and past prices cannot have any predictive ability. Thus there cannot be a relationship between the prices at day t_{-1} and the price at day t since prices follow a random walk. The validity of this hypothesis has been tested by a large number of studies using standard statistical tests such as autocorrelation of price series or returns.

The first results come from Fama (1965), who finds the existence of positive first-order autocorrelation of daily returns on the stocks of large firms. A large number of more recent studies have provided evidence for the autocorrelation of past returns.

Lo and MacKinley (1988) prove that weekly returns of several portfolios that comprise stocks of NYSE and are categorized by size, produce evidence of positive autocorrelation.

Brock et al (1992) find positive autocorrelation in returns of the Dow Jones Industrial Average, and similar results are found by Hudson et al (1996), Mills (1997), Feng and Smith (1997) and Gencay and Stengos (1998), who find evidence of autocorrelation at the first lag.

Barkoulas and Travlos (1998) produce evidence of positive first order autocorrelation for the daily returns of a value-weighted index (for the period 1981-1990) that comprises the thirty most marketable stocks in the Athens Stock Exchange.

Evidence of positive serial correlation is also provided by Isakov and Hollistein (1998) for the Swiss Bank Corporation General Index during the period 1969-1997. One more study by Fernandez-Rodriguez et al (1999) also shows the existence of first order serial autocorrelation for the General Index of the Madrid Stock Exchange from 1966 to 1997.

The predictability of future returns based on the analysis of past data is further illustrated by many other studies which find evidence of negative serial autocorelation of past returns. De Bondt and Thaler (1985), French and Roll (1986), Poterba and Summers (1988), and Chopra et al (1992) all report that past returns of individual stocks and various portfolios are negatively serial correlated.

Apart from the fact that the studies above cast some doubt on the validity of efficient market theory, their results also provide evidence of the existence of the prerequisite factors for the forecasting ability of technical trading methods. However, the presence of serial dependence between past returns does not constitute firm evidence of a violation of the efficient market theory, since this implies that constant excess returns will be available from the analysis of these dependencies. Even the proved profitability of various technical rules may be due to various biases and measurement errors, as will be discussed later in this thesis. In addition, as Neely (1997) states, the efficient market hypothesis implies that "no strategy should allow investors and traders to make unusual returns except by taking excessive risk".

Therefore, even the evidence for profitability of technical trading rules is not sufficient to constitute an unquestionable proof of inefficiencies. Further research should be carried out to explore whether any excess returns yielded by technical analysis can be explained as compensation for excess risk taken by the user of the technical trading system.

All of the above considerations have led a number of researchers to consider technical analysis profitability and market inefficiencies as notions that do not have to be interrelated. For instance, Bessembinder and Chan (1998) conclude that "the evidence of technical forecast power need not be inconsistent with market efficiency".

The fact that technical analysis can be profitable without excluding market efficiencies is also supported by the argument that one interpretation of the predictive ability of technical analysis is that market are efficient and that the forecasting power of technical analysis reflects the time-variation of equilibrium expected returns. Feng and Smith (1997) report that the technical rule profits found by their study can be considered to be fair compensation for the risk of price discontinuity and the time-varying risk premia of asset returns.

In addition, Ito (1999) demonstrates that the excess returns generated by technical rules can be explained by the risk-return relation suggested by asset pricing theory. In addition, the trading rule profits that the study finds for the various countries are regarded as a fair compensation for the riskiness of the trading rules.

Kavajecz and White (2002) offer a revolutionary explanation of the value of technical trading and its relationship with market efficiency. They suggest that the value of technical analysis is not in direct conflict with market efficiency, but it is closely related to the amount and nature of liquidity on limit order books. Support and resistance levels are shown to be related to peaks in liquidity on the limit order book. The moving average indicators also reveal information about the relative position of cumulative depth on the book. According to the findings of this study, when the moving average indicator signals that prices are rising (falling), we should expect sell-side limit order book prices to be closer to (father from) the quoted midpoint and buy-side limit order prices to be farther away (closer).

Olson (2004) claims that market inefficiencies reported in previous studies may have been only temporary inefficiencies. This conclusion is based on the fact that risk-adjusted trading rule profits (simple moving averages), using 18 exchange rate series, have declined over time from an average of over 3% in the late 1970s and early 1980s

to about zero in the 1990s. Therefore, Olson concludes that any abnormal returns shown in the past "represented a temporary inefficiency that is now being corrected".

To conclude, further research is needed to clarify the sources of any excess returns produced by technical trading rules in order to have a better idea of the exact relationship of market efficiency and technical analysis. However, it seems that the contempt that the academic community has shown for technical analysis, which was traditionally based on market efficiency theory, seems now to be premature.

3.2 Foreign Exchange Market

Although technical analysis was first developed for use in the stock market, its main principles have penetrated the operation of all other asset markets. Since the early 1970s, with the beginning of floating exchange rates, technical trading principles have been applied to such an extent that technical analysis is now considered to be the most widely used forecasting method in the Foreign Exchange market.

In addition, in the last few years there has been a resurgence of academic interest in the accuracy of technical analysis in the FX markets. This is mainly due to the fact that there has been increased evidence that assets markets in general, and the foreign exchange markets in particular, are driven by herd behaviour rather than rational expectations (Williamson, 1999). As Frankel and Rose (1996) suggest, exchange rates are driven in the short term by driftless random walks and not by the macroeconomic fundamentals which should normally price currencies at their fair value. A number of other studies lead to the conclusion that fundamentals are incapable of explaining exchange rate fluctuations, at least at a short horizon (see Dornbush (1976), Meese and Rogoff (1983), Messe (1990), Taylor (1995), Williamson (1999))

Furthermore, a plethora of studies claim that the signals of technical analysis have had considerable influence on traders' behaviour and that they are thought to be responsible for various irrational patterns in FX rates. Frankel and Froot (1990) explain the rise of the US dollar between 1981 and 1985 as a result of an increase in the use of technical analysis at the expense of fundamental models. In addition, Frankel and Froot (1986, 1987) illustrate that the dollar-bubble of the mid 1980s made FX traders base their decisions increasingly on technical signals, when at the same time fundamental models had lost most of their prestige after their repeated errors over the preceding years in forecasting the reversal of the dollar's rise.

Goodhart (1988) reaches the conclusion that the interplay between fundamentalists and chartists affects market outcomes. Levin (1997) also shows that with

homogenous groups of asset holders maintaining both chartist and fundamentalist expectations, the exchange rate will most likely move to a speculative bubble.

Apart from the effects that technical analysis is claimed to have on trader's behaviour and on currency rates, it seems that predictability is somehow related to central bank intervention. LeBaron (1994) examines the predictive ability of simple moving averages for the Deutsch Mark and the Japanese Yen during 1979-1992, and finds that the technical rules lead to excess returns even after transaction costs are taken into consideration. However, when periods in which the Federal Reserve was actively intervening are removed, those excess returns are almost eliminated. Neely and Weller (1999a) claim that the performance of technical trading rules deteriorates when the Federal Reserve intervenes.

Martin (2001) showed that technical analysis generated statistically significant returns even after transaction costs, in most of the spot foreign exchange markets of the developing countries that were examined. However, such profitability of technical analysis is found to be induced by central bank intervention. In most cases, the excess returns yielded by the signals of technical rules were abnormally high before intervention day. For the days after the intervention, the performance of the trading rules deteriorates dramatically. The fact that returns are much higher at day t-1 (one day before the intervention) leads to the hypothesis that strong trends exhibited by technical rules cause that intervention. However, the studies conclude that further research should be carried out to clarify the exact relationship, if there is any, between technical analysis and central bank interventions.

On the other hand, Neely (2002) provides strong evidence that intervention does not generate technical trading rule profitability. Rather, intervention responds to exchange rate trends from which trading rules have recently profited.

Saacke (2002) demonstrates that moving average rules are extremely profitable on days when central banks intervene and he finds solid evidence that technical trading rules tend to bet against central banks. He concludes that, even if interventions were a reason for the profitability of technical analysis, surely they would surely not be the only one.

The recent interest in academic circles about technical analysis is partly due to a large number of studies have shown that technical trading rules can yield excess returns in the foreign exchange market. A number of studies have examined the predictability of various trading rules, concluding that the rules can earn significant excess returns net of transaction costs (Dooley and Shafer (1983), Sweeney (1986), Goodman (1990), Brock et al. (1992), Levich and Tomas (1993), Osler and Chang (1995), Neely, Weller and Dittmar (1997)).

Furthermore, Dempster and Jones (1998a,b) examined the efficacy of chart patterns[1] in trading USD/GBP and showed that their detection through the use of automated pattern recognition can consistently enhance trading profitability.

Lee et al (2001) examine the predictive ability of moving average rules and a chart formation called 'the channel'. The rules are applied to thirteen Latin American currencies and prove to be profitable for four of them. The study suggests that, due to differences in the statistical properties of exchange rates, some trading rules may be more suitable for specific currencies.

Lucke (2003) examined the forecast power of the "head-and-shoulder" pattern that is widely used in the industry. He concluded that no positive returns could be generated when he tried to forecast the exchange rates for many currencies.

However, although the number of studies which have shown that the profitability of technical rules in the FX market is significant, most of them are characterised by a number of drawbacks: i) almost all of the studies examine rules that have been chosen ex post and that imposes a bias to the results; ii) most of the studies examine long time periods, more than two years, and thus it is doubtful if their results are applicable since the majority of FX practitioners use technical analysis to predict rates only at very short horizons (Taylor and Allen (1992)). In addition, as already mentioned, for shorter forecasting horizon, more weight is placed on technical analysis by market participants, while fundamental analysis is regarded as more important for long term

[1] Head & Shoulder and Channel patterns

horizons (Bask 1999); iii) transactions costs have not been taken into account in several cases; iv) examined rules have been chosen arbitrarily without even, in some cases, being the ones that are used most frequently by the majority of traders.

On the other hand, various studies claim that technical rules do not lead to excess returns in the FX market for most of the currencies studied, eg. Goodhart and Curcio (1992), Curcio et al (1997), Osler and Chang (1999), Papadamou and Tsopoglou (2001), Neely and Weller (2003), and Rubio (2004b). However, most of the studies that reject technical analysis should not be regarded as providing unquestionable evidence of a lack of predictive ability for technical analysis, since the vast majority of them use naive rules that do not capture completely the complexity of FX markets.

In conclusion, further research should be carried out incorporating more dynamic approaches and methods of technical analysis before we can reach a reliable conclusion as to the accuracy of the signals created by technical analysis models. During the last few years there have been a number of recent studies which have used more revolutionary thinking in creating a technical trading system. Neely et al (1997) use genetic programming for identifying optimal trading rules in the FX market during 1981-95 and their model leads to economically significant excess returns after transaction costs. A recent study by Neely and Weller (1999b) also uses genetic programming to select the optimal technical rule for an intraday horizon and, although they find predictive ability in the examined models, the excess returns vanish when transaction costs are taken into account.

Furthermore, Rode et al (1995) construct a trading system which is not based on predefined technical rules but is updated constantly with the optimal rules. It not only achieves superior returns, but also reduces the overall risk of the system.

Foreign exchange markets have a distinctive feature compared to other asset markets, which is the fact that market participants objectives may differ considerably from maximizing economic agents. Central banks intervene to keep in line monetary policy and not to profit from the market and, moreover, they have private information about key economic fundamentals that move the market. That makes the nature of Foreign

Exchange markets even more complicated and unpredictable than simple trading systems.

3.3 Equity Markets

The predictive ability of technical trading rules with regard to stock prices is an area which has been heavily researched over the years. The first studies took place in the 1960s and they are considered to be responsible for the contempt with which technical analysis is held in academic circles. Alexander (1961) examined the profitability of technical analysis by using a number of filter rules for the Dow Jones Industrial and Standard and Poor's stock indices. Although the first results indicated the achievement of excess returns in contrast to a buy and hold strategy, another study by Alexander (1964) concludes that any excess returns from filter rules vanish when transaction costs are taken into account.

Fama and Blume (1966) support the results of these studies, since filter rules are shown not to be profitable when they are used on the 30 stocks of the Dow Jones Index. The unanimity about the failure of technical analysis continues with two more studies by Van Horne and Parker (1967) and James (1968) who, after having examined various moving averages, reach the conclusion that no trading rule based on moving averages could lead to returns higher than those yielded by a buy and hold strategy.

Levy (1967) produces the first optimistic results on the capability of technical rules to predict future share prices. He tests several "relative strength" ratios, together with moving averages for the computation of historical ratios, on weekly closing prices of 200 stocks on the New York Stock Exchange and he finds that excess returns are obtainable even after transaction costs are deducted.

Jensen and Benington (1970) test two of the same rules that were proved to be profitable by Levy (1967), but over a much longer time period, and conclude that there was no evidence for excess returns after transaction costs.

The studies above had obviously created the impression in the academic world that technical analysis is of very little use and this might be the reason for the absence of any study regarding technical analysis for many years during the 1970s and 1980s.

Colby and Myers (1988) examined the predictability of the Wall Street Technical Market Index (WSTMI)[2] for the period 18 October 1974 to 31 December 1986. They concluded that WSTMI managed to produce accurate signals about the direction of Dow Jones Industrial Average and the accuracy increased considerably when the forecasting period was longer.

Another study by Brock, Lackonishok and Le Baron (1992) examines the use of simple moving averages and trading range breaks for the Dow Jones Industrial Index for the period 1897-1986 and reports that there is evidence of forecasting power in those rules in the absence of transaction costs. In addition, this study led to very interesting results which instigated a number of other studies. The returns obtained from buy (sell) signals consistently generate higher (lower) than "normal" returns. However, the returns following buy signals are less volatile than returns following sell signals and they were also negative, which is consistent with the theoretical equilibrium models. This study has proved to be very influential and has inspired a large number of other studies by academics.

Motivated by results produced by the previous study, Hudson et al (1996) examine the predictability of the same technical rules for the Financial Times 30 Index in the London Stock Exchange. This study covers a long period (July 1935-January 1994) and indicates that the trading rules used in the study could not lead to excess returns when transaction costs are taken into account. Transactions costs are relatively high since, even for the most favoured of investors, they exceed 1% per round trip transaction, which is higher than the return of 0.8% generated by technical analysis rules.

Mills (1997) examines the statistical significance of simple moving average rules and trading range breaks for the same index and period as the previous study, and concludes that the trading rules examined generated higher returns than the buy-and-hold strategy until the early 1980s. After that period and for the rest of the sample the performance of the trading rules deteriorates dramatically. According to this study,

[2] WSTMI is a combination of ten technical indicators designed to forecast DJIA for the long term. WSTMI was reported to forecast DJIA 81.6% of the time 52 weeks in advance, 79.5% of the time 26 weeks in advance, 70.4% of the time 13 weeks in advance, 62.6% of the time 5 weeks in advance and 58.5% of the time in advance.

the obvious change in the "behaviour" of the market takes place around 1982 and this fact illustrates that, before applying a "successful" technical strategy to the real market, the stationarity of that market (time series) should be examined in advance. Although these results are consistent with those produced by Brock et al (1992), whose sample ends in 1986, there is a significant divergence with the conclusions extracted by Hudson et al (1996), who do not provide any evidence of deterioration of performance of the trading rules for the sub-period 1981-94.

Very important results are also given by Sullivan et al (1997), who test the consistency of the results generated by Brock et al (1992) when data-snooping effects are taken into account. This study illustrates that technical trading rules had significant forecasting power for the period 1897-1986 for the Dow Jones Industrial Index, even after accounting for data snooping. However, for the next ten years (1987-1996) the previous results do not provide any evidence for the predictive ability of technical analysis. That conclusion is in agreement with the results by Mills (1997), and it illustrates even further the fact that something has changed in stock exchanges which has made it impossible for simple trading rules to yield an excess return.

Bessembinder and Chan (1998) examine the validity of the results reported by Brock et al (1992) and advocate that the latter study has the drawback that it does not include any statistical tests for the set of rules that are used which are subject to data-snooping bias. The tests based on the Dow Jones Industrial Index for the period 1926-1991 find evidence of the predictive ability of technical analysis even after adjusting for return measurement errors caused by nonsynchronous trading, by adding a one day lag between the signal produced by the rules and the actual buys or sells. Moreover, it is reported that the forecast power of technical analysis has weakened in recent years, which confirms the results of the previous studies.

In a more recent study, analyzing further the initial results of Brock et al (1992), LeBaron (1999) examines the behaviour of moving average and momentum technical rules to over 100 years (1897-Feb. 1999) of the Dow Jones Industrial Average. Although the application of those simple trading strategies yield high returns for the whole trading period, a more in-depth look for the sub-period 1988-1999 reveals that the performance of technical analysis has deteriorated dramatically in these last years.

The fact that, for the last 10 years of the study, there are no positive returns confirms the results first found by Mills (1997) for the UK and then by Sullivan et al (1997) for the United States.

Kwon and Kirsh (2002) also extend the work of Brock et al (1992) by including in their research trading volume moving averages. Furthermore, this study applies the technical rules to very broad indices of the NYSE and Nasdaq to capture the performance of technical analysis from 1962 to 1996. In general, the results support the conclusions extracted by Brock et al (1992). This study also concludes, like many previous studies, that there is a weakening in profit potential over time, which is obviously evidence that markets are becoming more efficient.

Feng and Smith (1997) use simple technical trading rules (simple moving averages) for the S&P 500 daily index from 1962 to 1994 and conclude that there is evidence of superior predictive ability, while returns may be interpreted as fair compensation for the time varying risk and jump risk premia.

Yeung et al (2002) investigate the forecast ability of many technical indicators, such as Bollinger Bands, Commodity Channel Index, RSI and the Money Flow index, to identify overbought and oversold stocks. The S&P 500 universe is used from 1990 to 2002 and only Bollinger Bands prove to lead to superior returns when trading costs are taken into account.

The very common conclusion among the researchers, that the forecast ability of technical analysis has diminished considerably during the last few years, is investigated further by Summers et al (2004). According to that study, using exactly the same data and time periods as Hudson et al (1996), the increase in volatility in recent periods can be viewed as an increase in the noise level in the data, a fact that makes the detection of patterns in the data more difficult and thus the prediction of future data very weak. The very impressive result of that paper is that the rules derived from the period April 1936- October 1950 show more predictive power in the period October 1950 – January 1994 than rules derived from data within the last period.

Graphical Patterns

The improvement of information technology over the last two decades has enabled researchers to apply complex automated pattern recognition methodologies to examine the predictive power of technical patterns in the financial markets. As a result, there has been an increasing number of studies which attempt to investigate the forecast ability of graphical patterns in the stock markets.

Lo et al (2000) evaluate the predictive value of several chart patterns in a large number of US stocks from 1962 to 1996 and extract the conclusion that technical analysis "does provide incremental information and may have some practical value". The results are more supporting for Nasdaq stocks.

Leigh, Paz and Purvis (2002) and Leigh et al (2002) are two more studies that attempt to measure the performance of graphical patterns as technical trading tools in the NYSE Composite Index. Both studies focus on the chart pattern 'bull flag'. A 'flag' is a pattern like a parallelogram with masts on either side, showing a consolidation within a trend. A 'bull flag' is a horizontal or sloping flag of consolidation followed by a sharp rise in the positive direction. The results of both studies provide solid evidence that the technical patterns can generate significant abnormal returns even in a very developed and theoretically efficient market such as the New York Stock Exchange.

Jacquier and Yao (2002) tested the predictability and profitability of various moving average rules on the Dow Jones Industrial Average Index (DJIA) and the Deutsche Mark to USD exchange rate. There is evidence for profitability but this depends on the length of the time series under investigation. At relatively short horizons of 5 and 10 years, trading rules do not consistently beat the buy and hold strategy. However, the performance persistence of the rules is evident for periods above five years.

In a recent study, Dawson and Steely (2003) found evidence that there have been clear technical patterns in the daily movement of stocks contained within the FTSE-100 and FTSE-250 indices in UK over the period 26 October 1986 to 30 May, 2001. However, the technical patterns such as Head and Shoulders or Double Tops and

Double Bottoms did not offer any added value in achieving more accurate market predictions.

The predictive value of technical analysis in the world stock markets

Apart from the majority of the studies which are focused on the stock markets of the United States and the United Kingdom, the interest of the academic community in technical analysis worldwide is very obvious from the plethora of research regarding the stock markets globally.

Batten and Ellis (1996) examine several technical trading systems for the Australian All Ordinaries Share Price Index over the period 1987-1991 and, although these trading systems produce higher returns than a buy-and-hold strategy, when transaction costs are taken into account the excess returns vanish.

Wong (1997a, 1997b) examines the profitability of simple moving average rules when applied to the Hang Seng Index (Hong Kong) from 1969 to 1992, and he concludes that these rules have superior market timing ability that lead to excess returns.

-Rodriguez et al (1999a) inspect the profitability of the same rules used by Brock et al (1992) for the General Index of the Madrid Stock Exchange (from 4 January 1966 to 15 October 1997) and they demonstrate that these technical trading rules lead to excess returns which "may not seem to be high enough to translate into profits after transaction costs are considered".

Isakov and Holistein (1999) carry out one of the few studies which, apart from the use of moving average rules, also examine the profitability of oscillators such as the Relative Strength Index (RSI) and Stochastic indicators that are very popular among the advocates of technical analysis.

On average, the technical strategies used in that study generate higher returns than a buy-and-hold strategy, with the most profitable rule being the double moving average of one and five days. The use of oscillators does not add any value to the profitability

of simple moving average rules. In addition, when transaction costs are taken into account, the results show that only institutional/large investors are able to earn an excess return from the application of technical analysis since they pay less than 0.3% transaction costs. The study concludes that, for individual/small investors, there is no gain in following the signals produced by the technical trading rules since their profit is lower than the one that a buy-and-hold strategy generates.

Ito (1999) applies the same rules as Brock et al. (1992) to the US, Canadian, Japanese, Indonesian, Mexican and Taiwanese equity indices and concludes that technical analysis has significant forecasting ability, even after transaction costs are deducted, for all markets except for the US. A very interesting conclusion of this study is that technical analysis is found to be more profitable for emerging markets than for developed markets.

Ratner and Leal (1999) apply variable length moving averages to several emerging equity markets in Latin America and Asia for the period 1982 to April 1995 and their research leads to mixed results about the profitability of technical analysis. In four markets (Taiwan, Korea, Thailand and Mexico), the technical rules applied are found to generate excess returns after transaction costs are taken into account. Nevertheless, for the markets of India, Philippines, Malaysia, Argentina, Brazil and Chile, there is no evidence that simple technical trading rules are more profitable after trading costs than a buy-and-hold strategy.

Wittmer (2000) examines the forecasting ability of various technical strategies in the DAX and S&P-500 indices and finds that they produce better results than random signals. However, because the success of technical strategies depends on the random price behaviour, he concludes that technical analysis should not be used as a stand alone method.

Gunasekarage and Power (2001) demonstrate that moving average rules can lead to excess returns in South Asian Markets (The Colombo Stock Exchange, the Dhaka Stock Exchange and the Karachi Stock Exchange). The predictive ability of technical rules is claimed to be strongly associated with the inefficient nature of these markets. The underperformance of technical trading strategies in the more developed Bombay

Stock Exchange supports further the argument that technical analysis leads to excess returns when it is used in smaller and thus inefficient markets.

Shachmurove et al (2001) found that the moving average rules lead to superior returns when they are used on the Tel-Aviv 25 stock index. However, when the same rules are used to predict the S&P 500, the performance of technical analysis is very poor. This is explained by the fact that moving average methods are more widely used in the United States and thus the benefit of using the method there is limited.

Wong et al (2003) examined the performance of moving average rules and the RSI indicator in the Singapore Stock Exchange and showed that both technical strategies generate significant abnormal returns. In addition, it is claimed that, because of the obvious forecasting ability of technical analysis, most member firms have specific trading teams that rely heavily on technical analysis.

A recent study by Bee and Gazzini (2004) tested the profitability of technical analysis in the Italian stock market by applying the bootstrap methodology. The conclusion was that even simple technical strategies yielded statistically significant excess returns with respect to the Buy-and-Hold.

Markellos (1998) applied three popular technical indicators (MACD, KAIRI, RSI) to the Athens General Index for the period 13/10/1986 to 11/9/1995 and, although the purpose of the specific study is not to test the profitability of these methods, the returns yielded by all three indicators outperform the return of a buy-and-hold strategy. Apart from the very impressive returns, the technical rules are found to decrease considerably the risk of any of the trading systems compared to the risk of a buy-and-hold strategy, when the risk is measured by the standard deviation of returns.

Kourouklis (1999) examined the ability of various 35 day moving average rules in forecasting the Athens general index from September 1988 to September 1998 and he finds that the simple, weighted and exponential moving averages outperform a buy-and-hold strategy for the same period after trading costs are deducted. The predictive power of technical analysis is more obvious when the simple moving average yields a cumulative return of 1,371% compared to 532% for the buy-and-hold strategy.

Moreover, a large number of different oscillators are found to have significant predictive power (more than 2,000%) over the same period. However, the latter results suffer from data snooping bias and thus should be treated with caution.

A very interesting study was also conducted by Fang and Xu (2003), who applied a strategy that combines technical analysis and conventional time series forecasts to three Dow Jones Averages[3] of the US stock market. The results suggest that, even though both strategies have forecasting ability, a combined approach outperform both technical trading rules and time series forecasts.

Although the profitability of technical trading systems in the stock markets is an area that has been heavily researched over the last few years, there are still many questions that have to be answered. The research carried out so far examines just part of the complex nature of stock price predictability and the contribution of technical analysis to that field.

[3] The three indices were the Dow Jones Industrial Average, the DJ Transportation Average and the DJ Utilities Average.

3.4 Discussion

Although the plethora of studies reviewed above have examined a large number of issues regarding the profitability of technical analysis in financial markets, there is still a lot to be researched before a final conclusion can be reached.

First, almost all the studies use very simple technical rules in order to examine the predictive ability of technical analysis. These rules are very popular but they capture only a small part of market sentiment. For example, moving average rules, which seem to be the most popular in academic circles, are only trend chasing techniques with a large number of deficiencies. Since moving average rules are actually timing tools for the inspection of a market trend, their performance is very poor when the market trends sideways without a consistent direction, at least at a short horizon. The situation where the market does not have a trend may occur from a third to a half of the time (Murphy 1986). There are more sophisticated technical trading rules that cover all of the spectrum of market psychology which technical analysis is trying to capture and they should be examined before a fair conclusion is reached.

In addition, there are very few studies that integrate new technologies into traditional technical trading systems. Although it is premature to reach a verdict about the success of these attempts, it seems that a new age of collaboration between technical analysis and high-tech methodologies, such as artificial intelligence, has evolved.

Chenoweth et al (1996) integrate technical indicators, such as ADX and MACD into an Artificial Neural Network system, with very promising results for the S&P 500 index for the period 1982-1993. That trading system earns excess return over a buy-and-hold strategy and its profitability improves considerably when the technical indicators are embedded into the system.

Gencay and Stengos (1998) examine the predictability of feed-forward networks and the results illustrate that the past signals generated by moving average rules and a volume indicator increase the forecast accuracy of the trading system, which finally leads to excess returns.

Allen and Karjalainen (1999) use genetic algorithms to find the optimum technical trading rules for the S&P 500 index for the period 1928-1995. However, the results of this study show that, out of sample, the rules generated during the learning process do not lead to excess returns.

Second, in only very few studies is a combination of different technical rules used to construct a trading system and even the simple technical indicators are never used to form a multi-indicator trading system. Very interesting conclusions could be extracted from the test of a system that comprises a number of indicators according to the part of market psychology that these indicators capture. For instance, the following methodology could be used to construct a more complete technical trading system that would be able to give a fairer picture of the predictive power of technical analysis.

The following questions might be useful in designing that trading system:

i) Does the market have a trend or does it move sideways? (Indicators such as the Directional Movement Index in combination with an R square indicator could be used)

ii) If the market is shown to have a persistent trend by the previous indicators, what kind of trend is it, Upward/Downward? (Moving averages and price oscillators could be used to identify the type of trend).

iii) After identifying the type of trend, the next question would be: what is the momentum of this trend? Is it accelerating or decelerating? The answer to the latter question helps to increase the market position as long as the trend strengthens or give an early warning signal. A peak of the trend could be identified in order to gives an early reversal signal even before the trend changes. Indicators such as a simple momentum indicator or Percent of Change to identify just the strength of the trend or a Relative Strength Index or Stochastics, could be used so as to have a picture of whether the persistent trend has entered an extreme range (extreme optimism or pessimism in market psychology).

iv) In addition to all of the above, the role of volume should be considered and it is very important to make the observation that volume is ignored completely by the vast majority of academic studies. Simple indicators such the On Balance Volume, Chaikin Oscillator or Money Flow Index can be used to identify if the volume confirms what is happening to the price of the asset. It is obvious that the extent to which the market participates in any direction, something that is clear from the volume, just determines the duration and reliability of this market movement. A rally in the market should be accompanied by an increase in the market volume and the same should be happening in a strong correction. In few words, we can say that the volume must confirm the market direction.

As Blume et al (1994) show in their study, "the volume provides information on information quality of traders that cannot be deduced from the price statistic". It is also reported that, although volume in itself is not of any importance, when it is used in relation with other factors, it produces significant information that cannot be revealed from the analysis of just the price series.

The same conclusions are reached by the study of Bremer and Hiraki (1999), who study the relationship between short-term returns for stocks in the Tokyo Stock Exchange and lagged trading volume. The study illustrates that lagged trading volume acts as a predictor of future stock returns.

Third, since the majority of the studies employ end-of-day data with the methodology that is used, the returns calculated are not realistic to a large extent. One reason is that the researchers do not use the lag between the time that signals are generated and the time that the actual buying or selling of the particular asset takes place. For example, when a buy signal is generated on day t, the buying of the asset can only take place at the opening on t+1 even in an ideal situation. Furthermore, in the case of "thin" markets or stocks the tests may yield excess returns compared to the buy-and-hold strategy, but it is very doubtful whether an institutional client, for example, could complete a large amount of transactions at the theoretical price that studies use to calculate the returns even with a one day lag.

Fourth, the technical rules that the researchers use are chosen arbitrarily and they are almost the same across the vast majority of studies. Although they are supposed to avoid data snooping effects by choosing the rules *ad-hoc*, they ignore one of the most important principles of securities markets. Every market, and even every stock, should not be expected to move in the same way because its trading behaviour is just the mirror of the trading behaviour of market participants of a specific market or stock. Although the developed markets are very liquid with a lot of participants, they still have unique characteristics and they should be treated as such by traders. A possible solution would be a trading system which first evaluates market psychology and identifies its main characteristics and then makes the necessary adjustments to the trading rules used for forecasting. Such system might be constructed with the use of Artificial Neural Networks and various steps should be taken to avoid data snooping biases.

4. Empirical Results

4.1 Sample and Data Description

Two data series are used in this study with the view to reaching more complete conclusions on whether technical trading rules lead to abnormal returns in different market conditions. The first is the Athens General Index (ATG), which is calculated as the weighted average of the value of the biggest 59 companies in regard to their capitalization on the Athens Stock Exchange (ASE). The index was developed with a base value of 100 as of 31st December 1980. The data used in this study are the closing values of ATG from October 1986 to the last trading day in 2000, a total of 3537 observations. This data is considered to be representative of the Athens Stock Exchange since it accounts for more than 90% of its total trading volume.

All the stocks of the index are actively traded and thus problems associated with nonsynchronous trading should be of no concern for the results of this study. To capture the behaviour of technical analysis when applied in different market and macroeconomic conditions, the sample is divided into three non-overlapping subsamples. These cover the periods 13/10/86 - 12/11/90, 13/11/90 - 31/12/96 and 2/1/97 - 31/12/00. The following graph presents the Athens General Index and the periods studied:

Graph A. Athens General Index

The subsamples are very representative of all the major changes in both the Athens Stock Exchange and the transition of the Greek economy from developing to developed status.

The first period covers a bull phase in the Athens Stock Exchange, signaled by the "Economic Stability" measures announced on 11th October 1985 and the optimism created by the candidacy of Athens to host the Olympic Games of 1996. However, the increase of ATG is interrupted twice, first by the crash in international markets on 19th October 1987 and secondly by the decision in September 1990 that Atlanta would organize the Olympic Games of 1996.

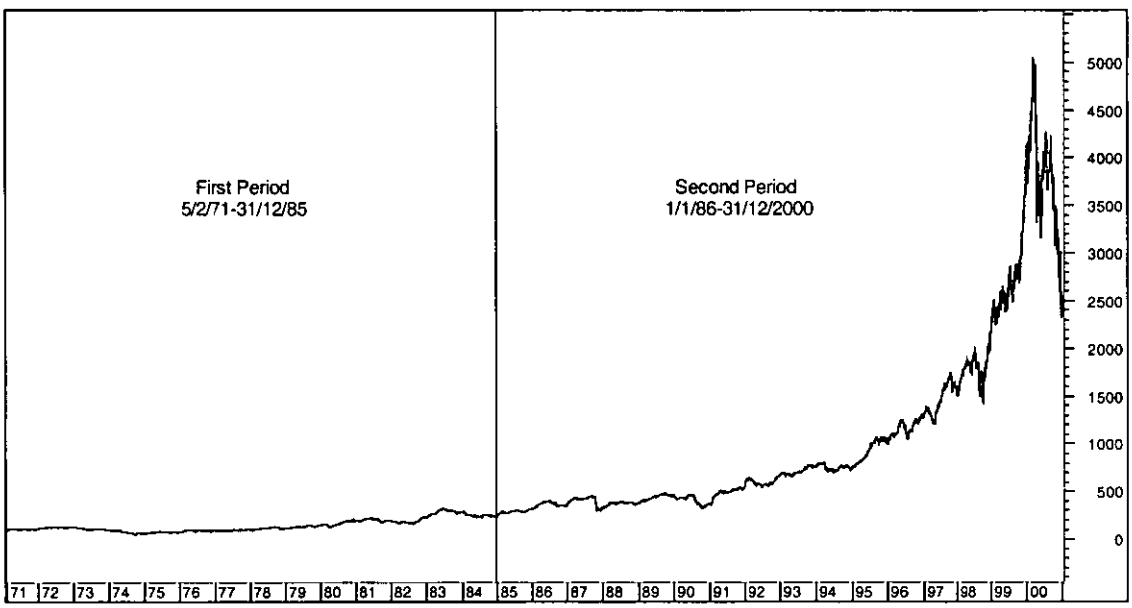
The second subsample represents a mainly flat market, which generally moved sideways. The main events that characterise this period is the global recession of 1991-1992 that kept world markets bearish, a substantial increase in IPOs in 1993 and 1994, and finally the high interest by investors in the construction sector.

Finally, the last subsample covers the most important events in both the history of the Athens Stock Exchange and the Greek economy. In the beginning of 1997, the upward phase of an economic cycle began, bringing major improvements in the Greek economy. The attempts of Greece to meet the criteria set by the Maastricht Treaty rewarded by the decision to allow Greece to join the rest of the eleven countries in introducing the Euro as legal tender in 2002. Between 1997 and the highest point in 1999, the Athens Stock Exchange experienced a growth of 566%, which was followed by a rapid correction since most of the shares were significantly overvalued. This period was also characterised by a massive increase in the total number of private investors, who reached the impressive number of 1.5 million, and a substantial increase in the participation of foreign institutional investors that inevitably led to rapid increases in turnover.

The second data series used in this study is the Nasdaq Composite Index from 5th February 1971 to the last trading day of the year 2000, a total of 7567 observations (closing prices). The Nasdaq Composite Index comprises 4282 members and was developed with a base level of 100 as of 5th February 1971. The database comprises

closing prices of the index and was taken for this study from the National Association of Securities Dealers Inc. website.

Graph B. Nasdaq Composite Index



Two non-overlapping subsamples are used in order to give more complete results on the profitability of technical analysis and to avoid the effects of data snooping to some extent. The two subsamples cover the periods from 5th February 1971 to 31st December 1985 and from 2nd January 1986 to 29th December 2000.

4.2 Technical Indicators

Keeping in mind the results drawn by previous academic studies regarding the dangers of "data snooping", when the same data series are used to both discover and test trading strategies, the technical rules used in this study are the ones that have been known to practitioners of technical analysis for the last few decades and are currently included in almost all technical analysis software.

Although some technical indicators used to test the predictive ability of technical analysis are relatively new, they have become a standard in contemporary thinking of technical analysis and thus it is not presumptuous to regard any conclusions drawn as realistic.

The largest part of this study is focused on a wide spectrum of moving average (MA) rules and this enhances further the research already carried out by a large number of studies that were focused solely on the simple moving average. Six different types of moving averages are applied to the two time series. These are the simple, weighted, exponential, triangular, time series and variable moving average. How all of these indicators are calculated will be explained below:

i) *Simple Moving Average*

The n day simple moving average for day d is calculated as:

$$A_d = \frac{\sum_{i=1}^{n} M_{(d-i)+1}}{n} \quad , n \leq d$$

In other words, a simple moving average is just the moving sum of a data set divided by the number of data points which means that the same weight is given to any of the days.

ii) *Weighted Moving Average*

The n day weighted moving average for day d is computed as:

$$A_d = \frac{\sum_{i=1}^{n} W_i M_{(d-i)+1}}{\sum_{i=1}^{n} W_i} \quad , \quad n \leq d$$

The concept behind the calculation of a weighted moving average is that the recent data is more important than past data and thus a higher weight is assigned as we approach the last observations. For the purpose of this study, the weights increase linearly from 1 to the last day of the moving average.

iii) *Exponential Moving Average*

This indicator is just another type of weighted moving average in which the weights are powers of S, the so-called smoothing constant.
The n-day exponential moving average is calculated as:

$A_d = \frac{\sum_{i=1}^{d} S^{i-1} M_{(d-i)+1}}{\sum_{i=1}^{d} S^{i-1}}$. The next term is given by: $A_d = (1-S)M_d + SA_{d-1}$

However, traders prefer to define a moving average by its time periods (n) to find the corresponding smoothing constant S. For this purpose we have $S = \frac{2}{n+1}$

iv) *Triangular Moving Average*

The triangular moving average is again another type of weighted moving average but uses a completely different weighting scheme. In comparison to weighted and exponential moving averages, which assign higher weights to the most recent data, in the triangular moving average the higher weight is assigned to the middle portion of the price series. For example, to calculate a 5-day moving average, we need to construct the following triangular integer window over the time series :

$$A_d = \frac{x_{(d-4)} + 2x_{(d-3)} + 3x_{(d-2)} + 2x_{(d-1)} + x_d}{1+2+3+2+1}$$

v) *Time Series Moving Average*

The time series moving average is computed by applying linear regression techniques and its calculation is relatively simple. The last fitted values of a linear regression are connected together to form a line. The number of last points that will be drawn as lines are defined by the number of days assigned to this moving average. In order to calculate linear regression, the least squares method is used.

vi) *Variable Moving Average*

The variable moving average is just an exponential moving average with the smoothing constant adjusted to the volatility of the data series. The sensitivity of the smoothing constant used in the calculation of the moving average is adjusted to the volatility of the data so that more weight is given to the most recent data. The volatility of the data may be defined by a number of volatility indicators. The volatility index that is used by the majority of technical analysis software for the calculation of the Variable Moving Average, is the Chande Momentum Oscillator[4].

The calculation of the Variable Moving Average is given by the formula:

VMA(n)=(sc * Volatility Index * close)+(1-sc * VolatilityIndex) *yesterday's VMA

n=days of moving average, $sc = \frac{2}{n+1}$ (smoothing constant)

For the purpose of this study the 9-period Chande Momentum Oscillator is used as the Volatility Index. The CMO was developed by Tushar Chande (1992) and is given by:

$$CMO = \frac{\sum up - \sum down}{\sum up + \sum down},$$

where $\sum up$ is the sum of the changes in the security or index over the upward days, $\sum down$ is the sum of the changes over the downward days

[4] See Chande (1993)

However, apart from the different types of Moving Averages, two other famous technical indicators are applied. These are:

vii) Moving Average Convergence/Divergence (MACD)

MACD indicator is computed by subtracting the value of a 26-period exponential moving average from a 12-period exponential moving average which actually means that uses the exponential constants of 0.075 and 0.15. The signal line is an exponential average of MACD. The MACD signals trend changes and indicates the start of new trend direction. When the MACD crosses above (below) the signal line a buy (sell) signal is generated. The indicator was developed by Appel (1979) and since then has been a part of every technical analysis book or software.

viii) Momentum Strategies

A Momentum strategy tries to measure the strength of the trend and is given by: $Momentum_t = P_t - P_{t-d}$, where d defines the number of days in the past. For example, a buy signal is generated when P_t crosses above P_{t-50} and a sell signal when P_t crosses below P_{t-50}.

ix) Forecast Oscillator

Forecast Oscillator was developed by Tushar Chande (1993) and is considered to be a linear regression based indicator. The Forecast Oscillator plots the percentage difference between the forecast price (generated by an x-period linear regression line) and the actual price. The oscillator is above zero when the forecast price is greater than the actual price negative if its below. If the forecast price and the actual price are equal, the oscillator would plot zero. The formula used is :

$$FO = 100 \times \frac{close - forecast_{-1}}{close}$$

Actual prices that are persistently below the forecast price suggest lower prices ahead. Likewise, actual prices that are persistently above the forecast price suggest higher prices ahead. Short-term traders should use shorter time periods and perhaps more relaxed standards for the required length of time above or below the forecast price. Normally, long-term traders should use longer time periods and perhaps stricter standards for the required length of time above or below the forecast price.

4.3 Technical Trading Strategies

A large number of trading strategies are investigated in this study, which cover a large part of the contemporary thinking on Technical Analysis. It must be underlined that in the case of the Athens Stock Exchange General Index, short selling is not allowed and thus, when a sell signal is generated, the investors just moves out of the market and waits until a buy signal is generated in order to go long.

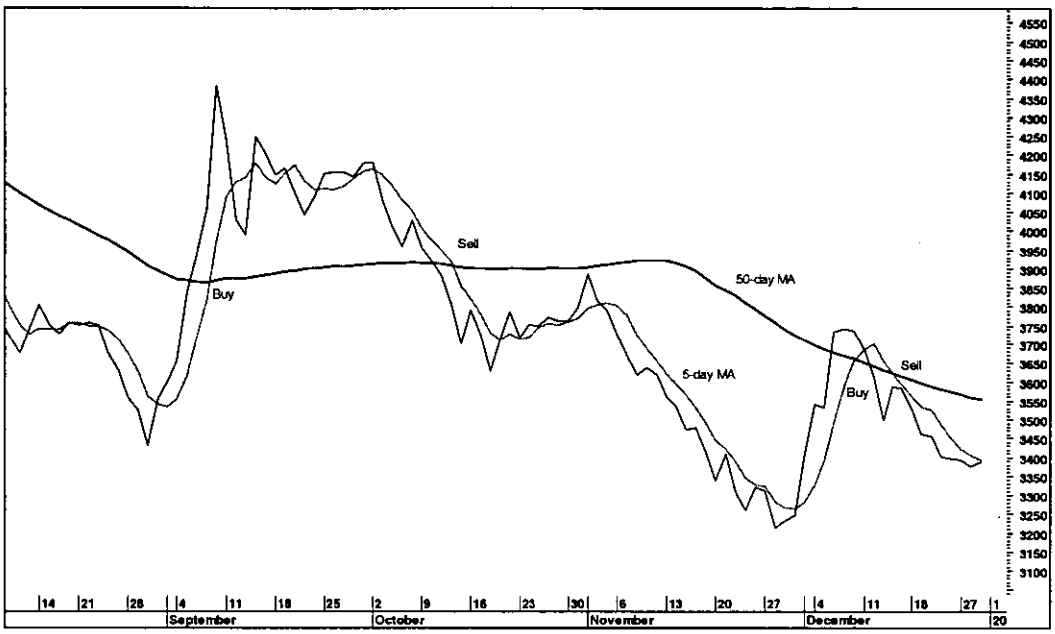
In the Nasdaq, short selling is allowed and thus for the purpose of this study, the investor is either long or short according to the signal that is generated by the trading strategy.

The different types of trading strategies that have been applied are:

i) Moving Average Crossover Rule

According to this rule, a buy (sell) signal is generated when a short-period moving average crosses above (below) a long period moving average. The following graph shows how the signals are generated in a moving average crossover strategy with a long (50-day) Moving Average and a short (5-day) Moving Average. It is obvious that the last Buy signal is just a 'whipsaw' (false signal).

Graph C. Moving Average Crossover Rule



If the short moving average was a 1-day MA then the buy (sell) signals would be generated whenever the price line crossed above (below) the long (14-day or 50-day) MA. It is obvious that the longer moving average generates fewer trades and thus it may be more appropriate for investors with a longer term investment horizon. It is logical to assume that the long term moving averages may be more profitable in markets with a strong constant trend, while a short term moving average is more useful in predicting markets that trade within a certain range.

ii) Moving Average Crossover Rule with a filter of 1%

A buy (sell) signal is initiated when the short-period moving average crosses above (below) the long-period moving average by more than 1%. The filter of 1% is applied in order to avoid whipsaws, so that the change in the trend must be confirmed by a crossover of at least 1%.

iii) Moving Average Crossover Rule with a filter of one day

The main concept is the same as the previous rule and a buy (sell) signal is generated when the short-period MA crosses and remains above (below) the long-period MA for at least one day.

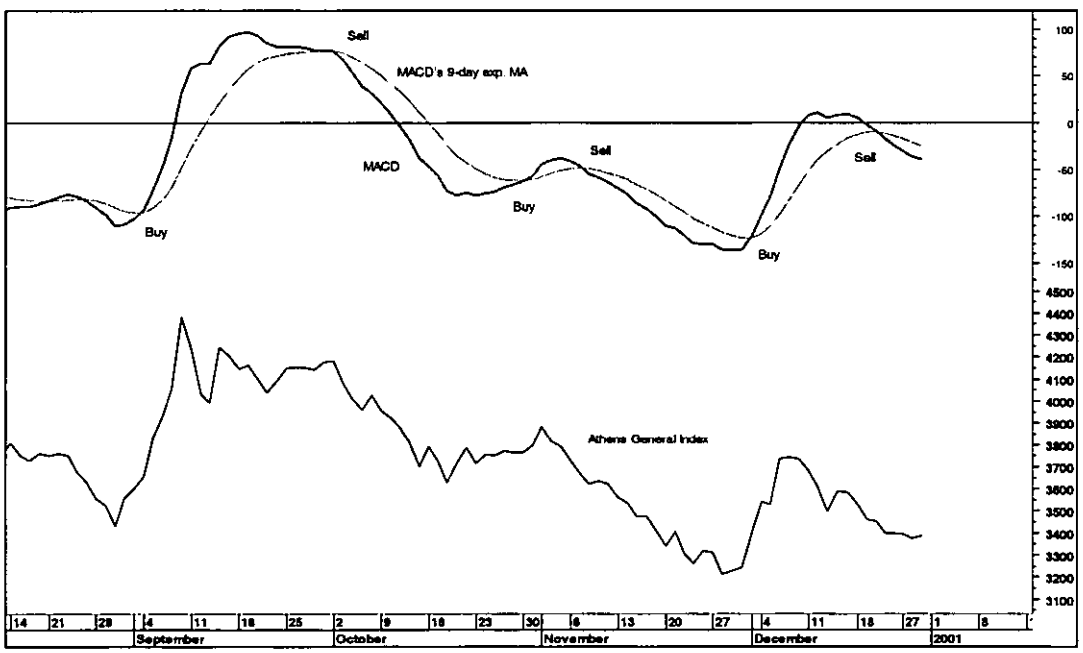
A large number of different combinations of parameters are used for the Moving Average rules, the majority of which are considered to be very popular and some have also been investigated by many previous studies, such as Brock et al (1992), Hudson et al (1996) and Mills (1997).

In addition, the optimisation of parameters for all of the Moving Averages through historical simulation has been employed in order to investigate whether such a methodology could lead to substantially improved results.

iv) MACD crossover rule

According to this rule, a buy (sell) signal is generated when MACD crosses above (below) its 9-period exponential moving average. This trading strategy is used in exactly the same way as it was developed by Appel (1979) and is used by the majority of traders in order to lead to "realistic" results. The following graph presents the way MACD crossover rules works in practice and how buy or sell signals are generated.

Graph D. MACD crossover rule



This indicator has also been used in many different ways by a plethora of traders, with some having as a prerequisite for a buy (sell) signal that MACD has to be above

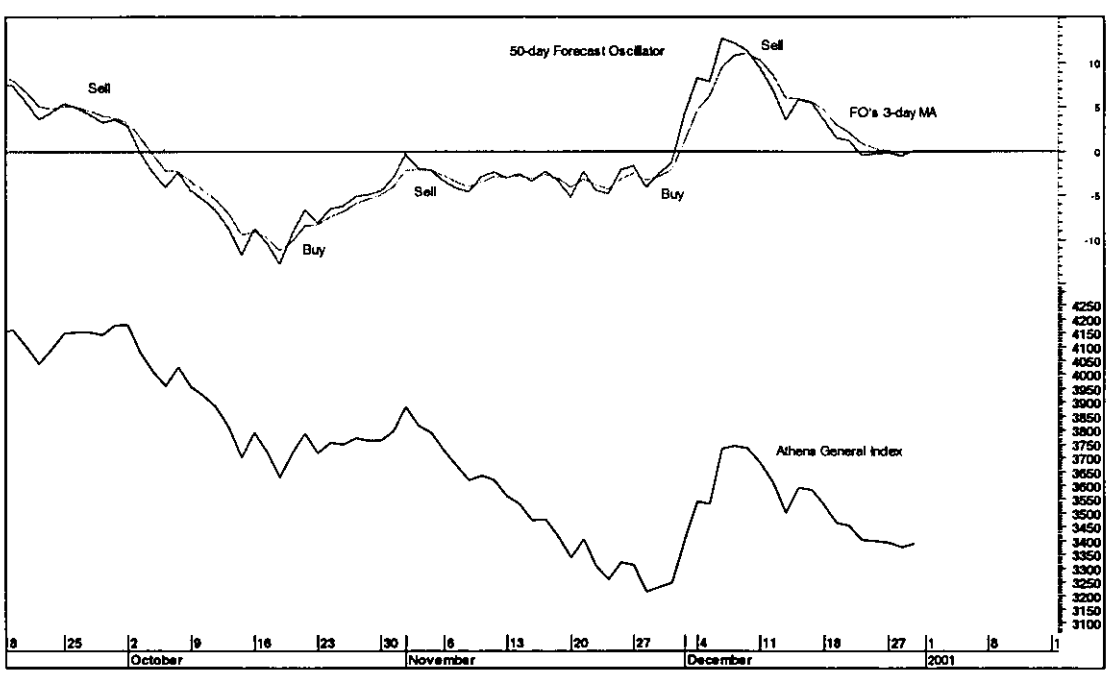
(below) zero. Others focus on a possible positive or negative divergence between MACD and the price graph. For example, a positive divergence happens when the price reaches a new low and MACD does not.

v) Forecast Oscillator strategy

Normally a simple trading strategy which is based on the forecast oscillator generates a buy signal when the forecast oscillator is positive and a sell signal when the forecast oscillator is negative. For the purpose of this study a three-day simple moving average of the computed forecast oscillator is used to trigger a buy or sell signal and improve the performance of the strategy. Then, a buy (sell) signal is generated when the forecast oscillator crosses above (below) its moving average.

The following graph present the forecast oscillator strategy and how this generates buy and sell signals.

Graph E. Forecast Oscillator Strategy



Only the most important signals were drawn on the graph above and it is obvious that a large number of signals are emitted during the strategy. More trades lead to higher

total trading costs and a satisfactory return must be high enough to cover these costs and still outperform the simple buy-and-hold strategy.

4.4 Results

4.4.1 Athens General Index

A. Sample Statistics

Table I contains summary statistics for the entire series and the three subsamples. Returns are calculated as the daily changes in the logarithmic index levels, $r_t = \ln(I_t) - \ln(I_{t-1})$,where r_t is the calculated daily return and I_t is the level of the index on day t. The mean return is positive for the entire series and for the three subsamples, which explains the appreciation of the index. However, for the second subsample the mean return is almost zero since the index moved sideways and remained almost stable.

Returns are strongly leptokurtic (fat tailed) for the entire series and for the two earlier subsamples (13/10/86-12/11/90 and 13/11/90-31/12/96) and platykurtic for the last and most recent subsample (2/1/97-31/12/00). The entire sample and the first two subsamples are skewed to the right, but the last subsample shows signs of negative skewness, which could be associated with a strong downside movement that continued for a many months after the end of this subsample.

Volatility, which is measured by the standard deviation, is relatively high in all subsamples and this could be explained by the emerging status of the Athens Stock Exchange. The presence of first order autocorrelation in returns is obvious in all of the subsamples and in the entire series. The autocorrelation is relatively high for the first subsample but weakens considerably in the second subsample. The third subsample shows an increase in autocorrelation in comparison to the second subsample.

The non-linear autocorrelation structure of returns, as measured by the autocorrelation coefficient of the squared returns, remains almost stable for all of the subsamples. Maraval (1983) justifies the use of squared observations, returns in this case, as a tool to test nonlinearity. Neftci (1991) argues that the presence of nonlinearity in returns is very important, since it is necessary in order for the trading rules examined in the study to have potential predictive power.

Table I. Summary statistics for daily returns for Athens General Index

	Full Sample	13/10/86-12/11/90	13/11/90-31/12/96	2/1/97-31/12/00
N	3536	1002	1532	1000
Mean	0.00103	0.00215	0.00012	0.00127
Std. dev.	0.02023	0.02496	0.01474	0.02205
Skewness	0.282	0.299	0.686	-0.125
Kurtosis	11.944	15.013	7.38	1.709
ρ(1)	0.231	0.319	0.121	0.192
ρ(2)	0.002	0.012	-0.017	0.006
ρ(3)	-0.027	-0.049	0.014	-0.021
ρ(4)	-0.054	-0.114	0.025	-0.036
ρ(5)	-0.015	-0.027	0.038	-0.021
ρ^2(1)	0.231	0.223	0.202	0.207
ρ^2(2)	0.23	0.23	0.122	0.209
ρ^2(3)	0.124	0.103	0.17	0.135
ρ^2(4)	0.3	0.324	0.133	0.148
ρ^2(5)	0.128	0.12	0.1	0.061
Bar. St. error	0.017	0.032	0.026	0.032

Results are presented for the full sample and for three nonoverlapping subperiods. Returns are measured as log differences of the level of the index: $r_t=\ln(x_t/x_{t-1})$. ρ(i) is the estimated autocorrelation at lag i of r_t for each series. ρ^2 is the estimated autocorrelation at lag i of r_t^2 for each series. "Bartlett st. error" refers to the Barlett standard error for the autocorrelation, $1/\sqrt{N}$.

B. Moving Average trading strategies

The results from the trading strategies based on various Moving Average rules are presented in Appendix I (Table I – Table IV). A number of statistics are calculated in order to have a clear picture of the potential predictive power of these strategies. First, the number of buy (sell) signals is computed, which is the total number of days that the trader was long (out) between a buy and a sell signal emitted by the trading strategy. We should bear in mind that short selling is not allowed in the Athens Stock Exchange and thus, when a sell signal is generated, the investor must close the position and remain out of the market until a new buy signal is generated.

The mean daily buy and sell returns are also computed so as to have a good indication of whether the trading strategy has some predictive power. If returns on days that the trader is long are significantly higher then the days that the trader is out of the market,

then we can conclude that the trading rules can lead to abnormal profits. Finally, the t-statistics are computed based on the formulae given by Brock et al (1992).

However, apart from the computation of statistics that are related to the mean daily returns emitted by buy and sell signals, a very useful and straightforward procedure to measure the predictive power of technical trading rules is to compare the total returns yielded by these rules with the return of a Buy-and-Hold strategy.

Based on the difference between Buy and Sell mean returns for the full sample, we extract the conclusion that the Moving Average rules have significant predictive ability since all differences are positive. The corresponding t-statistics for the majority of these differences are highly significant, thus rejecting the null hypothesis that the returns of the examined technical trading rules equal the unconditional return.

However, if we evaluate the performance of these trading strategies by comparing their returns with those generated by a Buy-and-Hold strategy, the predictive ability reduces significantly. Only 40% of the trading strategies tested exceeded the return of a Buy-and-Hold strategy.

If we continue to evaluate the performance of Moving Average rules based on the difference between Buy and Sell returns, we observe that the majority of the rules can add value to the trading performance of the investor in all subsamples.

Regarding the percentage of the Buy and Sell returns that are greater than zero (Buy>0, Out>0 statistics), we notice that, for the full sample, more than 50% of the "Buy" returns are greater than zero, with the vast majority of "Sell" returns being less than zero. However, these statistics are different for two of the three subsamples (13/10/86-12/11/90 and 2/1/97-31/12/2000), where the majority of "Out>0" statistics are greater than zero, giving an indication of the poor performance of the trading rules.

In the second subsample (13/11/90-31/12/96), where the market remained relatively stable, all of the "Buy>0" statistics are more than 50% and "Out>0" are in the region of 46% to 50% for all of the strategies.

Nevertheless, if we compare the total return yielded by the trading strategies with the return of a Buy-and-Hold strategy, we observe that in the full sample and in the subsamples, less than half of the rules exceed the return of a Buy-and-Hold strategy. Furthermore, the performance of the Moving Average Rules reduces significantly in the last subsample (1997-2000), when only 8.8% of the trading rules lead to an abnormal return.

A striking conclusion of these results is that the simple moving average rule, which is widely used in almost all of the previous studies, never leads to the highest return. Other types of Moving Averages yield the highest returns in all subsamples. The weighted moving average rule seems to have the highest forecasting ability since it generates very high returns in all periods. The 14 day moving average seems superior, but this may be due to the fact that transaction costs are not taken into account, which in this case could eliminate the returns since this short moving average produces a very large number of trades.

Taking a closer look at the table of results, it is obvious that the number of losing trades is much higher than the number of winning trades, even in strategies with the highest total return. Although this seems to be a paradox, it is not because it depicts the core philosophy of technical analysis. The philosophy of gurus of technical analysis who say "Ride the trend" and "the trend is your best friend", together with the main goal of technical analysis to apply a "stop loss" methodology, lead to this phenomenon. The technical rules are constructed to exploit the largest part of an upward trend and to restrict losses if the trend starts to change unexpectedly.

C. Optimisation of the Moving Average rules

The optimisation of the parameters of technical indicators, through a historical simulation of the data, is currently an integral part of the contemporary thinking of Technical Analysis and related software.

In order to avoid spurious results as an effect of data snooping, data series have been divided into two non-overlapping subsamples. Each technical rule is optimised for a long period in the past (first subsample) and then the optimised technical strategy is tested on the last subsample.

Two different trading strategies are tested through optimization:
a) A buy (sell) signal is generated when the closing price crosses above (below) the moving average. The optimisation of the parameters takes place for the period 13/10/1986 - 31/12/1996 and the testing of the strategies defined by the previous process takes place in the period 2/1/1997 - 31/12/2000. The range for the optimisation parameters (the length of the MA) is from 10 to 200 days with a step of 2 days (96 tests).

b) The second rule is the simple crossover strategy where a buy (sell) signal is triggered when the short (long) moving average crosses above the long (short) moving average. The range for the optimisation of the parameters for the short-period MA is from 1 to 5 days with a step of 1 day and for the long-period moving average from 10 to 200 days with a step of 5 days (195 tests).

The results are presented in the next table :

Table II Optimisation results for Moving Average Strategies

Optimised from 13/10/86 - 31/12/96

Trading Strategy	Percent Gain	Total Trades	Winning	Losing	Short MA	Long MA	Annual Return
MA Crossovers OPT TIME	20105.18	329	167	162	2	15	1965.82
MA Crossovers OPT W	7062.08	221	87	134	1	10	690.51
MA OPT W	6905.44	220	86	134	10		675.19
MA Crossovers OPT Simple	6072.46	174	65	109	1	10	593.74
MA OPT S	6054.1	173	64	109	10		591.95
MA Crossovers OPT TRI	5345.71	183	75	108	1	10	522.69
MA OPT TRI	5329.51	182	74	108	10		521.1
MA OPT TIME	4146.67	74	27	47	82		405.45
MA OPT E	3889.57	121	39	82	20		380.31
MA Crossovers OPT E	3856.95	122	39	83	1	20	377.12
MA OPT VAR	3044.62	77	24	53	16		297.69
MA Crossovers OPT VAR	2852.67	36	17	19	3	10	278.92

Buy/Hold return	966.23%
Annual Buy/Hold return	94.47%
Observations	2536
Days in test	3733

TESTED for 2/1/97-31/12/00

Trading Strategy	Percent Gain	Total Trades	Winning	Losing	Annual Return
MA Crossovers OPT TIME	919.07	141	68	73	230.08
MA Crossovers OPT W	602.94	86	37	49	150.94
MA Crossovers OPT Simple	463.31	68	27	41	115.99
MA Crossovers OPT TRI	441.04	70	31	39	110.41
MA Crossovers OPT E	295.56	46	19	27	73.99
MA Crossovers OPT VAR	94.49	19	6	13	23.65

Trading Strategy	Percent Gain	Total Trades	Winning	Losing	Annual Return
MA opt W	591.67	85	36	49	148.12
MA opt S	359.37	67	26	41	89.97
MA opt TRI	341.21	69	30	39	85.42
MA opt E	284	45	18	27	71.10
MA opt VAR	227.66	33	9	24	56.99
MA opt TIME	114.39	36	10	26	28.64

Buy/Hold return	255.03%
Annual B/H return	63.84%
Oservations	1001
Days in test	1458

The "Days in test" is the total number of calendar days tested, "Total Trades" is the total number of completed trades, the "Annual B/H return" is given by $\frac{365}{\text{Days in test}} * \text{Percent Gain}$

Abbreviations on the table:
OPT: The Moving Averages used in the strategy are optimized with the parameters (number of days) that lead to the highest return.
Types of Moving Averages: TIME: Timeseries , W: Weighted, S: Simple, TRI: Triangular, VAR: Variable. E: Exponential

From the results on the previous page, it is obvious that the optimisation methodology improves substantially the performance of the technical trading strategies, yielding abnormal returns. Nine out of the twelve trading systems tested generated a significantly higher return then a Buy-and-Hold strategy. For the same period (2/1/97-31/12/2000), the percentage of the conventional moving average strategies that have been tested in section B and lead to a higher return than the one of a Buy-and-Hold strategy, is only 8.8%.

The results are not considered to be subject to data snooping effects since the methodology that has been followed is relatively simple and objective to a very large extent. The period that is chosen to optimise the parameters covers a period with different market conditions (upward and stable) and thus is regarded as being efficient for this purpose.

D. Various Trading Strategies

Apart from the Moving Average rules which have been widely researched by a large number of studies, we also test three more technical trading strategies in order to have a clearer picture of the predictive power of technical analysis. The first is based on the simple momentum indicator, as described by LeBaron (1999), and the second is based on the MACD Oscillator, which is one of the most famous trend indicators and was developed by Appel (1979).

The third strategy uses a relatively new indicator called Forecast Oscillator and for objectivety it is used in this study exactly as it was described by its developer Tushar Chande.

Four different types of momentum indicators and Forecast Oscillators are employed so as to extract more subjective conclusions for their validity. For this reason, we use the 14, 30, 50, 150 day versions of these rules, which capture a wide time period, from very short term to very long term.

From the results given in Appendix III-Tables I-IV, it is obvious that the forecast oscillator shows a superior predictive ability since it always leads to higher returns than the Buy-and-Hold strategy in every subsample. The differences "Buy-Out" are positive and statistically significant at the 0.05 level using a two-sided test in all periods. Even in the last subsample (1997-2000), when the Moving Average rules proved to have poor predictive ability, the Forecast Oscillator generated abnormal returns. In addition, Forecast Oscillator is the first technical trading rule that generates more winning than losing trades. However, the total number of trades is so high that any abnormal returns may vanish if transaction costs are taken into account.

Momentum strategies generate mixed results for the whole period (1986-2000) and the first two subsamples, with two out of four momentum strategies generating abnormal returns. In the "difficult" last subsample, none of the momentum strategies yields a satisfactory return when they are compared with the buy-and-hold strategy.

As far as the MACD Oscillator is concerned, this leads to relatively poor results, since it yields abnormal returns only in the full sample (1986-2000) and second subsample (13/11/90-31/12/96). In addition, in the second subsample, the "Buy" and "Sell" statistics do not reject the null hypothesis that they equal the unconditional mean returns at the 0.05 level using a two-sided test.

4.4.2 Nasdaq Composite

A. Sample Statistics

Table II reports summary statistics for daily return series for the full sample and the two subsamples. Returns are calculated as daily changes in the logarithmic index level. Mean daily returns are positive in the full sample and increase over the two subsamples, a fact that shows an upward market. Returns are negatively skewed and strongly leptokurtic (fat tailed) in all samples. A very interesting observation is that the volatility of the index, as measured by the standard deviation, increases dramatically (almost doubles) in the last fifteen years.

The linear autocorrelation between prices is strong for the first sample but weakens substantially in the second sample. However, this does not happen in the non-linear structure of returns, measured by the autocorrelation coefficient of the squared returns, which is essential for the trading rules to have predictive power.

Table III. Summary statistics for daily returns for Nasdaq Composite

	Full Sample	5/12/71-31/12/85	1/1/86-31/12/00
N	7557	3766	3791
Mean	0.00042	0.00031	0.00053
Std. dev.	0.01070	0.00748	0.01314
Skewness	-0.727	-0.755	-0.662
Kurtosis	13.127	3.845	10.455
ρ(1)	0.146	0.332	0.086
ρ(2)	0.022	0.081	0.003
ρ(3)	0.016	0.091	-0.008
ρ(4)	0.023	0.080	0.004
ρ(5)	0.027	0.064	0.014
$\rho^2(1)$	0.340	0.273	0.331
$\rho^2(2)$	0.351	0.112	0.351
$\rho^2(3)$	0.279	0.186	0.271
$\rho^2(4)$	0.321	0.158	0.316
$\rho^2(5)$	0.291	0.107	0.287
Bar. std. error	0.011	0.016	0.016

Results are presented for the full sample and for two nonoverlapping subperiods. Returns are measured as log differences of the level of the index: $r_t=\ln(x_t/x_{t-1})$. ρ(i) is the estimated autocorrelation at lag i of r_t for each series. ρ^2 is the estimated autocorrelation at lag i of r_t^2 for each series. "Bartlett st. error" refers to the Bartlett standard error for the autocorrelation, $1/\sqrt{N}$.

B. Moving Average trading strategies

The same statistics as the ones that have been used for the Athens General Index are presented in Appendix II (Table I –Table IV). Moving Average rules demonstrate impressive predictive power for the full sample (1971-2000), with almost all of the "Buy-Sell" differences being positive and statistically significant. The mean returns of "Buy" are positive and exceed the unconditional mean return in all subsamples.

All of the "Buy>0" statistics exceed the threshold of 50% in all periods examined in this study, which gives a further indication of the added value that these rules offer. We extract the same conclusion if we compare the total return yielded by each strategy for the full sample with the one generated by a "Buy-and-Hold" strategy. More then 70% of the rules examined exceed the return of the "Buy-and-Hold".

The strength of the predictive power of Moving Average rules is even more obvious in the first subsample (1971-1985). The "Buy-Sell" differences are all positive, a fact that coincides with the rest of the statistics, which show that the application of Moving Average rules could easily lead to abnormal returns. Furthermore, the comparison of the returns of the technical strategies with the return of a "Buy-and-Hold" strategy shows that more than 90% of the rules led to abnormal returns.

The forecasting ability of the Moving Average rules weakens considerably in the last subsample (1985-2000), since less than 40% of the technical rules managed to yield a higher return than the "Buy-and-Hold" strategy. Something seems to have changed in the "behaviour" of the market which Moving Average rules fail to capture.

Regarding the value of the different types of Moving Average rules, the Weighted and Exponential Moving Averages prove to have superior predictive ability than the simple moving average that has been widely researched by almost all of the previous studies. As far as the ratio of losing and winning trades is concerned, this is again in favour of the losing trades and in the majority of the strategies this ratio takes values between 1.5 and 2.

C. Optimisation of the parameters

The optimisation of the parameters of the Moving Average rules and their subsequent testing have taken place under the same conditions that have been applied to the Athens General Index.

Two different types of strategies have been applied, analogous to those for the ASE. The first emits a buy (sell) signal when the closing price is above (below) the moving average and the second (crossover strategy) emits a buy (sell) signal when the short moving average moves above (below) the long moving average.

The optimisation and testing of the rules takes place in different non-overlapping subsamples in order to avoid data snooping effects and to preserve the subjectivity of the whole procedure. For the optimisation of the parameters, the period from 1/1/1981 to 31/12/1990 has been chosen and for the testing of the optimised rules the period 1/1/1991 - 31/12/2000 is used.

The parameter for the optimisation of the simple moving average strategy takes values from 10 to 200 days with a step of 2 days (96 tests). For the crossover moving average strategy, the parameters range from 1 to 5 days with a step of 1 day for the short term moving average, and from 10 to 200 days with a step of 5 days (195 tests) for the long term moving average.

The results of this method are presented in the next table :

Table IV Optimisation results for Moving Average Strategies for Nasdaq Composite

Optimisation period : 1/1/81-31/12/90

System Name	Percent Gain	Total Trades	Winning	Losing	Short MA	Long MA	Annual return
MA OPT E	4455.76	285	126	159	10		447.24
MA Crossovers OPT E	4430	286	126	160	1	10	442.88
MA OPT S	3984.51	273	123	150	10		398.34
MA Crossovers OPT Simple	3961.41	274	123	151	1		396.03
MA OPT W	3834.81	272	122	150	14		383.38
MA Crossovers OPT W	3708.8	360	156	204	1	10	370.78
MA OPT TRI	3638.34	295	138	157	10		363.73
MA Crossovers OPT TRI	3617.2	296	138	158	1	10	361.62
MA Crossovers OPT TIME	3484.77	663	322	341	2	15	348.38
MA OPT VAR	2567.98	195	77	118	10		256.73
MA OPT TIME	1023.57	118	52	66	94		102.33
MA Crossovers OPT VAR	968.73	104	49	55	1	10	96.85

Buy/Hold return	83.66
Annual return	8.36
Observations	2529
Days in test	3651

Testing period: 1/1/91-31/12/2000

Trading Strategy	Percent Gain	Total Trades	Winning	Losing	An. return
MA OPT E	698.92	383	143	240	69.89
MA OPT S	537.43	355	129	226	53.74
MA OPT TRI	529.67	379	145	234	52.97
MA OPT W	468.73	368	134	234	46.87
MA OPT VAR	389.54	272	71	201	38.95
MA OPT TIME	74.67	218	62	156	7.47

Trading Strategy	Percent Gain	Total Trades	Winning	Losing	Annual Return
MA Crossovers OPT E	681.25	384	143	241	68.13
MA Crossovers OPT TIME	599.81	760	331	429	59.98
MA Crossovers OPT S	523.34	356	129	227	52.33
MA Crossovers OPT TRI	515.75	380	145	235	51.58
MA Crossovers OPT W	476.06	450	172	278	47.61
MA Crossovers OPT VAR	336.01	103	37	66	33.60

Buy/Hold return	563.78
Annual return	56.38
Observations	2534
Days in test	3650

The "Days in test" is the total number of calendar days tested, "Total Trades" is the total number of completed trades, the "Annual B/H return" is given by $\frac{365}{\text{Days in test}} * \text{Percent Gain}$

Abbreviations in the table:
OPT: The Moving Averages used in the strategy are optimized with the parameters (number of days) that lead to the highest return.
Types of Moving Averages: TIME: Timeseries , W: Weighted, S: Simple, TRI: Triangular, VAR: Variable. E: Exponential

Three out of twelve optimized strategies managed to outperform the Buy-and-Hold strategy. However, it is very important to note that two of the strategies that generated an excess return in the out of sample period were also the best performers in the testing period. Therefore, the investor could surely have beaten the market by applying the optimization methodology as it was described earlier. By choosing the best performer after optimization, they could have made substantial profits in the next years.

Compared to the results extracted from the Athens Stock Exchange, the performance of the technical strategies seems much weaker in the Nasdaq. The most recent period is unpredictable to a large extent and this is probably due to a lot of factors. In particular, advances in information technology and the penetration of the internet into the population have offered an easy and cheap use of the most complex technical strategies even to the majority of the individual investors.

Furthermore, the renaissance of technical analysis during the most recent period may have decreased the possibility of generating abnormal returns from its use. Even though it has been argued that technical analysis is a self fulfilling prophecy, it is logical to assume that its wider use may have made the generation of abnormal profits much more difficult.

D. Various trading strategies

In the case of the Nasdaq Composite, we employ exactly the same strategies that were used for the Athens General Index so as to be able to compare the results and extract more precise conclusions. As it is shown in Apendix IV-Tables I-III, all types of Forecast Oscillator strategies yield impressive results in all of the periods, with all main statistics being statistically significant using a two-sided test at the 0.05 level. Nevertheless, the number of trades generated by these strategies is approximately one every three working days, which creates concerns as to whether these returns can withstand the transactions costs charged for this high number of trades.

Momentum strategies provide satisfactory performance over the whole data series (1971-2000) and the first subsample, when all strategies generate abnormal returns with "Buy-Sell" differences being statistically significant using a two-sided test at the 0.05 level. In the second subsample (1986-2000), only two out of four Momentum strategies yield higher returns than the buy-and-hold return.

Regarding the MACD Oscillator, this generates very impressive returns in the full period and first subsample (1971-1985), with all main statistics being statistically significant. However, in the last period (1986-2000), when the predictive power of technical analysis seems to diminish considerably, this strategy has a very poor performance.

4.5 Conclusions

This chapter has tested the predictive power of a wide spectrum of technical trading rules on two completely different markets. The first is the Athens Stock Exchange that, during the period studied (13/10/1986-31/12/2000), moves gradually from a developing to a developed status. The second market that was chosen for the purpose of this research is the Nasdaq, which is the most technologically advanced market and has become within the last few years the heart of the investor's community. The data that is available for the Nasdaq Composite covers a long period, from the establishment of the Exchange in 1971 to 2000.

The technical trading strategies that are tested comprise a wide spectrum of technical rules, the most traditional of which have been widely researched while others are relatively new and represent a part of the contemporary thinking in Technical Analysis. Moving Average rules dominate this study to a large extent, since they have been studied by a plethora of academics and thus comparison of the results can lead to very useful conclusions. Six different types of Moving Average rules are tested, together with another traditional tool of technical trading, the momentum indicator. In addition, more advanced rules like the MACD indicator and Forecast Oscillator are employed to give a broader picture of the ability of technical analysis to capture the dynamics of the equity markets and predict their future direction.

From the results collected for both data series, technical trading rules show some evidence of superior predictive power, with a large number of strategies yielding better returns than a buy-and-hold strategy in both the ASE and the Nasdaq. However, this power weakens considerably in later years, indicating that markets seem to have become much more efficient. Although the last subsample of both data series do not cover the same periods, results are comparable for the crucial last few years of both data series.

This happens because, from 1997 to 2000, the Athens Stock Exchange witnessed its greatest phase of growth, materializing in radical structural reforms. With its institutional, regulatory and technological changes, this period is the only one that

could be comparable with the last fifteen years in the history of the Nasdaq (last subsample).

The conclusion that the ability of technical trading rules to capture the behaviour of the markets has diminished during the last years is consistent with that drawn by Mills (1997), who finds that the performance of rules studied for the FT30 index deteriorated dramatically in the period 1975 - 1994. However, Fernandez (1999) extracts the conclusion that the predictive ability of technical trading rules does not change across subperiods from 1966 to 1997 regarding the General Index of Madrid Stock Exchange. In addition, Gencay (1998) found evidence that the performance of technical trading rules is vulnerable only to different market conditions regardless of the period studied. By using the Dow Jones Industrial Average, he demonstrated that technical trading rules had "improved performance in the trendy years 1980-1988" but their performance was poor in driftless market conditions.

Ready (1997) who incorporates genetic algorithms in developing technical trading rules for intra-day use, also finds that the performance of the rules weakened in the last years and suggests that the rules must be updated periodically to face the fact that the fundamental market features of the NYSE are evolving over time.

The impressive performance of Forecast Oscillator, during all periods in both data series, suggests the need for further research into the profitability of the latest developments in technical analysis. The same conclusion can be drawn from the results of various types of Moving Average rules which demonstrate that some of the more complicated types yield much higher returns than the simple moving average which has been widely researched in previous studies. The best Moving Average rule proves to be the weighted, with the exponential, time series and triangular also leading to very satisfactory returns.

Although the methodology followed in this study leads to some useful conclusions, there are a number of issues that should be taken into consideration.

Transaction costs have not been taken into account when calculating profits and this may create a distorted picture of the profitability of the rules. Particularly in the case

of the short-term moving average and forecast oscillator, which generate a very large number of trades, their impressive returns may vanish in the presence of transaction costs.

This study assumes, like the vast majority of previous studies, that when a buy/sell signal is triggered, the investor will be able to buy or sell the stock at the closing price of that day. If we take into account that end of day data are used, it is obvious that this is not realistic since the investor will be able to execute a trade only on the next day. Thus, it may be more appropriate to account for price slippage by using next day's closing prices to calculate returns yielded by the rules.

5 Empirical Evidence - Trading Costs

5.1 Previous research

Trading costs are one of the most crucial components that determine the validity of a trading strategy. As Domowitz et al (1999) suggest, execution costs can be so large that they sometimes eliminate the notional or "paper" return to an investment strategy. The importance of transaction costs is even larger in an international context, since in some cases costs are "astronomical" and rule out any diversification benefits.

Trading costs can change entirely the conclusions extracted by the majority of the studies which test methods for the predictability of equity markets. Jones (2001) argues that asset price behaviour that initially appears to go against the efficient market hypothesis could be explained within transaction cost bounds. Furthermore, transaction costs can been seen within a "macro" context, since the findings of Domowitz et al (1999) prove that differences in transaction costs are a determining factor for order flow and mirror the relative merits of different market designs.

The importance of trading costs has been shown by a very large number of studies during the last three decades, and this research has intensified within the last few years. However, there is still a plethora of studies that deal with the predictive ability of technical analysis without including any transaction costs in the computations of returns. But even those studies that take transaction costs into account, adopt a very naïve approach to estimating them. They either just assume that the returns are too small to remain if transaction costs are taken into account or they use ex-post break-even costs to make inferences about the validity of the theoretical returns of technical trading rules.

This approach may lead to completely misguided results for a large number of reasons. The most apparent is that it is a huge mistake to compare only the percentage of ex-post break-even costs or commissions in judging whether a trading strategy is profitable even if we take into account only the explicit costs. This happens because the total costs that the trader will pay are determined by a large number of factors apart from the ex-post transaction costs in percentage terms. For example, even if we assume that the total transaction costs (in percentage terms) remain stable during a

whole time period, in upward market conditions the total costs will obviously be much higher than in a downward market for a simple reason. Normally in an upward market, the total portfolio will be much higher and thus the total explicit costs will be much higher since they will have to be calculated on a much larger sum of money.

The measurement of transaction costs has been controversial in contemporary studies and this is shown by the very large differences in the computation of transaction costs for the same market and time period by various studies. However, it is common in a large part of the studies to decompose transaction costs into two major components: explicit costs and implicit costs. Explicit costs include brokerage commissions, fees, stamp duties, etc., and their estimation is fairly easy. However, implicit costs represent all the indirect costs caused by a transaction, with its major components being the bid-ask spread, the price impact and the opportunity cost. The bid-ask spread is the difference between the buy and sell quotes and is affected by market liquidity and return volatility.

In an article in the Financial Times, Keim and Madhavan (2001) claim that in 2001 the quoted spreads in a developed market varied from 0.3% or even less for the most liquid stocks to 4%-6% for the least liquid stocks. The bid-ask spread is the main area of controversy since a number of computations have been used to determine the real cost of trading that is imposed by the spread. A number of studies have argued that the quoted spread overestimates the trading costs, since the majority of the transactions are executed within that spread. For this reason, a number of different approximations, such as the effective spread, the realized spread or the Roll spread, are used as better approximations of the transaction costs.

Market impact, which is the second major component of implicit costs, results when the price of a stock is affected by the execution of a trading order. This happens mainly in illiquid markets or stocks where the trade is so large in relation to market liquidity that it changes the price towards the direction of the trade. In addition, there is a determinant of the market impact which can last much longer and is caused by the change in the market's perception of the stock as a result of a block trade. In the same article by Keim and Madhavan (2001), it is reported that in the US the market impact of block transactions can range from 3.04 percent to 6.21 percent for illiquid stocks

and from 0.15 percent to 0.18 percent for trades in the very liquid shares that constitute the Dow Jones Industrial Average.

Finally, the third major component of implicit costs are the opportunity costs, which are attributed to missed trading opportunities by the partial filling or delay in the execution of a trading order. Almost all of the studies that research the predictive ability of technical trading rules assume that the transactions triggered by a technical signal are executed at prices quoted at the time of the creation of that signal. However, when we use end-of-day data to analyze the market, it should be expected that the trade will be executed somewhere between the low and the high price range of the next day. Even when we use intra-day data, the execution of a trade can be delayed or not fully filled for several reasons.

The level of automation of the market determines the opportunity costs to a large extent. Domowitz and Steil (1999) argue that in the U.S. markets there has been a decrease in explicit costs for listed stocks of 60 percent and a decrease of 30 percent for OTC shares due to the adoption of automation systems. Domowitz (2002) suggests that the adoption of automated trading technology has led to significant transaction cost reductions. By analyzing a large number of international markets, he reaches the conclusion that the savings from automated technology have been of the order of 40 basis points (0.40%).

The adoption of automated technology and the intensive competition between the markets has led to a gradual decrease in transaction costs worldwide. Domowitz et al (2000) analyze NYSE and Nasdaq markets from 1995 to 1998 and find that implicit and explicit costs have decreased during those years by 51 percent and 54 percent respectively. Domowitz (2002) argues that during the period 1996-1998 transaction costs declined by 10 to 53 percent word-wide, averaging about 16 percent. Jones (2001) carries out impressive research regarding the bid-ask spreads on Dow Jones stocks for the last 100 years (1898-1998) and the weighted-average commission rate for NYSE stocks since 1925 and draws the conclusion that both costs have decreased dramatically over the years. However, even though spreads decrease over the years, during periods of market turmoil we observe a sharp rise, which obviously could eliminate any returns yielded by a trading strategy.

5.2 Measurement of transaction costs for Nasdaq and Athens Stock Exchange

For the purpose of this study, we will attempt to approximate the total transactions costs during the different time periods analyzed here based on the conclusions drawn by several previous studies on the two markets. However, there are a number of obstacles in achieving a precise measurement of the total costs:

i) the measurement of implicit costs ;

ii) the fact that trading costs change over time and, although in general terms there is a downward trend, costs can increase considerably during periods of investment uncertainty ;

iii) since the liquidity of each stock determines implicit costs to a large extent, trading costs may differ significantly between different stocks even in the same market ;

iv) both explicit and implicit costs differ between a small individual investor and an institutional investor and it is not easy to define the difference of the costs between them. For example, even though the brokerage commissions may be much lower for an institutional investor, the market impact may be so large that it will eliminate any profits or even make the execution of a big trade practically impossible. The latter is more frequent in emerging and illiquid markets such as the Athens Stock Exchange.

5.2.1 Nasdaq

Eleswarapu (1997) argues that the inside quotes of Nasdaq offer a better approximation to the actual trading costs since the Nasdaq dealers do not face competition from limit orders or floor traders. He measures the average monthly spreads for 49 portfolios of Nasdaq firms for the period 1976-1990, with an average spread of 44.15 basis points. Although the spreads generally diminish through time, it is obvious from the results of the study that there are significant fluctuations because spreads seem to increase in periods of market turmoil. Dividing the results into two periods, as close as possible to the periods examined by this study, we find that the average spreads for the periods 1976-1985 and 1986-1990 are 47.15bps and 38.15bp respectively.

Sweeney (1998) suggests that large institutional investors in the NYSE could achieve one way transaction costs in the mid-1970s in the range of 0.1%-0.2%. Jones (2001) reports that total one-way transaction costs (defined as half the quoted spread on Dow Jones stocks plus average one-way commissions on NYSE stocks) begin from more than 1% in the mid 1970s and fall gradually to about 0.2% in 2000. However, both explicit and implicit costs in the Nasdaq have been much higher than those in NYSE (see Atkins and Dyl (1997), Besembinder (1998), Domowitz, Glen and Madhavan (2000)).

Domowitz (1999) estimated average one-way transaction costs to be 45bp for the period 1995-98, while he estimates explicit costs to be 20bp. Bessembinder (1999) documents that in 1997 the average realized bid-ask spread for 539 stocks listed on the Nasdaq was 34bp. McSherry (2001) finds that the total costs in the third quarter of 2000 were 35.5 basis points. Domowitz et al (2001) estimate that in the third quarter 2000, one-way transaction costs were about 35 basis points, with implicit costs representing more than ninety percent of the total costs.

Nasdaq spreads have been dramatically since 1995, after the Nasdaq stock market came under scrutiny from regulators, press and academics. Nasdaq dealers were accused of not giving quotes of odd-eigths price fractions (1/8, 3/8, 5/8, 7/8), which implied a collusion to maintain bid-ask spreads of at least 25 cents. These findings were first provided by Christie and Schultz (1994) and had a strong impact when they were published in the Los Angeles Times on May 26th 1994. The U.S. Department of Justice and U.S. Securities and Exchange Commission then started an investigation into "alleged priced fixing" in October and November 1994.

As a result, dealer spreads were tightened considerably and this was even obvious just after the beginning of investigations by the Department of Justice and SEC, as was claimed in an article in the Wall Street Journal, on 17th November 1994.

One of the main problems in estimating one-way transaction costs is the fact that the bid-ask spreads differ considerably according to the size of each firm. Bessembinder (1998) and Schultz (2000) show that bid-ask spreads of small firms are twice or even

triple those of large firms. In addition, the increase in discount brokers during the 1990s and the very low commission that they offer has created a big difference between commissions of solicited and unsolicited trades during the same time periods.

For all the above reasons, it is almost impossible to use a measure of transaction costs that would be representative of both large and small capitalization stocks and individual and institutional investors. Thus, with a view to showing the profitability of technical trading rules for a wide spectrum of investors and equities, the rules will be examined in this study under lower and higher transaction costs. These are:

i) 1976-1985 : 70 bps
1986-2000 : 45 bps
1976-2000 : 55 bps

ii) 1976-1985: 60 bps
1986-2000: 30 bps
1976-2000: 40 bps

The average for the whole period is not the arithmetic average of the transaction costs during the sub-periods, since there has been a constant appreciation in the market and the transaction costs of the last years will have a higher impact on the total amount. Therefore, the average is closer to the transaction costs of the latest period.

5.2.2 Athens Stock Exchange

The trading costs in the Athens Stock Exchange were defined by law in a scaling scheme until the first months of 1995. The commissions were defined as follows: 1% for an amount of the order of less than one million drachmas (2935 Euro), 0.75% for an amount of the order from one to three million drachmas (8804 Euro) and 0.50% for an amount of the order that exceeds 3 million drachmas. After 1995, the commissions have been negotiable between the investor and the brokerage firm, which is a member of the Athens Stock Exchange.

The studies regarding the estimation of the total trading costs in the Athens Stock Exchange are very few. Domowitz, Glen and Madhavan (1999, 2000) estimate one-way trading costs for an institutional investor during September 1996 - December 1998 for the Athens Stock Exchange to be 65.5 basis points. The explicit costs (commissions and fees) are relatively high compared to the Nasdaq and the NYSE, since they are estimated to be around 58 basis points. On the contrary, the implicit costs (7.3bps) are the second lowest among 45 equity markets examined in that study.

Since trading costs are high even for an institutional investor, an individual investor should normally pay a higher commission during the same period. However, the freely negotiable commissions, together with very strong competition among the brokerage firms, especially after 1998, has gradually led to a decrease in trading costs for individual investors.

For the purpose of this study, total one way trading costs will be defined to be 70 basis points for all of the periods. This is due to the fact that, although commissions have been gradually decreased during the last years, at the same time the Government has imposed a sales tax of 30 basis points regardless of the profitability of the trade. In addition, there are miscellaneous charges for every trade, which are in total 3 basis points. For institutional investors, the commissions are very low and range from 20 to 30 basis points. Nevertheless, the Athens Stock Exchange suffers from liquidity problems in a lot of years, a fact that increases considerably the implicit costs for institutional investors.

5.3 Results in the presence of transaction costs

5.3.1 Previous Research

Although there is an increasing number of studies regarding the profitability of technical analysis, the vast majority of them do not incorporate transaction costs in an appropriate way so as to yield realistic results. First of all, a very large number of the studies do not even take into account transaction costs before reaching a final conclusion on the use of technical trading rules as an accurate market-timing tool.

Second, the vast majority of the studies that do take transaction costs into account use ex-post breakeven costs, which will be shown in this study to be an inaccurate measure of trading costs. Bessembinder and Chan (1998), studying the forecast power of technical analysis in DJI stocks, calculate one-way breakeven cost as the differential between buy and sell annual mean excess returns divided by twice the number of trades. The same formula has been adopted by a large number of academics in computing breakeven trading costs.

Detry and Gregoire (2001) test 10 technical rules on the 15 countries of the European Union using exactly the same methodology as the previous study in computing break-even costs. For the period 4/1/88-1/1/99, they find one-way breakeven trading costs for Greece (Bank Index) to be 1.6%, the second biggest in the EU after Austria. Ito (1999) also applies ex-post breakeven trading costs in the examination of Pasific-Basin equity markets.

Chenoweth, Obradovic and Lee (1996) use breakeven costs in the same way when testing the profitability of the combination of technical analysis and Artificial Neural Networks on the S&P 500 index.

Other studies employ realistic trading costs but the methodology used is inappropriate in computing the real sum of the costs, a fact that leads to wrong or at least inaccurate results.

Hudson, Dempsey and Keasy (1996) estimate trading costs in the UK as a percentage per trade and they just compare that with the average extra return per round trip

transaction. Isakov and Hollistein (1998) estimate trading costs in the Swiss Stock Market to be between 0.3% and 1.6% and "the average costs to be deduced from the average daily return of the strategy depends on the number of trades an investor makes". For example, if a trading rule signals 150 trades out of 2000 holding days and the trading cost is 0.3%, the average trading cost is 0.003*(150/2000)=0.000225.

Some studies use the right methodology but the level of transaction costs just seems "reasonable", as is stated by Allen and Karjalainen (1999). They do not use the findings of other studies as a guide for their estimation of trading costs but just apply a percentage, which they find arbitrarily to be representative of the real costs. Ready (1997) and Allen and Karjalainen (1999) test the forecast ability of trading systems that combine Technical Analysis and Genetic Algorithms using arbitrary estimations of transaction costs which range from 10 basis points to 30 basis points. The excess return generated by each rule is reduced by a specific percentage of the transaction cost whenever a trade is made.

Neely (2001) examines the forecast power of technical trading rules which are constructed with genetic programming and he uses just a rough estimation of trading costs, which for trading the S&P 500 index is estimated to be 0.25%.

Leung, Chen and Daouk (2001) examine the profitability of a hybrid trading system that combines Probabilistic Artificial Neural Networks and Technical Trading rules in the Taiwan Stock Exchange by using alternative estimates of the transaction costs. However, the trading costs applied in that study include only commissions and there is no reference to the other implicit costs incurred in a trade.

Ahmed, Beck and Goldreyer (2000) examine the efficacy of technical analysis in three Asian markets and US. For the US markets, they use 34.1 basis points and 51.9 basis points one-way transaction costs for the NYSE and OTC markets respectively. In order to compute net returns, total "buy minus sell" returns are reduced by the transaction costs of each trade.

5.3.2 The effect of trading costs on the results

Methodology

In order to have a clear and more realistic picture of the efficacy of Technical Analysis, all steps have been taken to simulate in every realistic detail the trading process of an individual or institutional investor. First, the investor is assumed to invest 1000 Euros or US dollars at the beginning of each period. Each trading system gives a signal which is followed by the investor who opens a long or short position with all of the available capital. Trading costs are deducted whenever a trade is filled. A wide range of cumulative results is calculated to give us various aspects of the effects of trading costs on the profitability of technical trading systems.

The "Net Profit" and "Trading Costs" are first calculated in money terms. The Percentage of the Trading Costs ("Tr.Cost %) in relation to the Total Profit (the profit in money terms if the investor had not paid any trading costs) is also calculated for comparability purposes. One of the key figures for the interpretation of the results is the Total Transaction Costs in percentage terms ("Total Tr. Cost"), which is calculated as follows: (Total Profit – Net Profit) / Total Profit.

However, the most important factor for the possible success of a technical strategy seems to be the Transaction Cost Effect (Tr. Cost Effect), which is the compounding effect that the transaction costs have on the total profit. This is given in the table as just the increase in percentage terms between "Tr. Cost %" and "Total Tr. Cost". Other figures, such as the Net Annual Return and the Average Win/Average Loss ratio (Average Win (Loss) is calculated by adding all the winning (losing) trade profits and dividing by the total number of winning (losing) trades), are also computed. Finally, the Total Closed Trades ("Total Trades"), the number of Winning Closed Trades ("Winning") and the number of Losing Closed Trades ("Losing") are given since the higher the number of trades, the higher are the trading costs paid by the investor.

Athens Stock Exchange

After computing the total trading costs charged during holding periods, it is obvious that the technical trading rules fail to outperform the buy-and-hold strategy. As it is shown in Appendix V-Table I, for the whole sample (13/10/86-31/12/2000) only three rules, which is only 2% of all of the rules, manage to yield an excess return. By contrast, the percentage of the rules that yielded an abnormal return without deducting trading costs was 40% (see Appendix II).

Appendix V- Table II & Table III, show that the rate of success of technical analysis is higher in the first two subsamples (13/10/86-12/11/90 and 13/11/90-31/12/96), with 29 and 23 trading rules respectively generating higher returns than the buy-and-hold strategy. However, in the last subsample (2/1/97-31/12/2000), the results in Appendix V-Table IV are completely disappointing since none of the rules yielded a higher return than the buy-and-hold strategy.

If we focus on all of the results of Appendix II, we can extract some very useful conclusions. First of all, the rules that proved to be most successful in the absence of trading costs, which is an artificial trading environment, are a completely different set to the ones operating in a realistic world where both implicit and explicit costs are imposed on every trade. For example, the very "successful" 14 day moving average, which is the shortest of all the moving averages examined in this study, generates very poor results since they signal a very large number of trades, which inevitably lead to very high transaction costs.

The avoidance of false signals or whipsaws is beyond any doubt the most crucial aspect of a technical trading strategy, a fact that is evident only when trading costs are taken into account. Therefore, medium-term rules with a filter of 1% or one day before a trade is initiated are shown to be the most profitable in all of the subsamples.

The poor performance of the technical trading strategies is even more apparent in the case of Momentum, MACD and Forecast Oscillators (Appendix V-Table V) . These technical strategies fail to yield an abnormal return in all of the periods examined in

this study. In addition, in the subsample (13/11/90-31/12/96), all types of Momentum and Forecast Oscillators lead to substantial losses of the initial capital.

Nasdaq

The performance of technical trading strategies weakens considerably even when the lower band of trading costs are deducted (Appendix IV – Tables I-VI). For the whole sample 1971-2000, only 21 out of the 143 Moving Average strategies (14.7%) yield an excess return over the buy-and-hold strategy. However, the great impact of transaction costs on the profitability of technical analysis is made more obvious if we remember that, in the absence of trading costs, the percentage of successful strategies was more than 70%.

In the first subsample (1971-1985), where more than 90% of the rules had led to abnormal returns without deducting trading costs, the success rate is now less than 50%, since only 51 strategies perform better than the simple buy-and-hold strategy.

The difficulty of technical analysis to generate abnormal returns in a realistic trading environment is even more obvious in the last period (1986-2000). Only 3 strategies (2.1%) yield an excess return, which is a very disappointing result.

The rest of the strategies (Momentum, MACD, Forecast Oscillators) are incapable of generating a satisfactory result in any of the periods examined in this study. The Forecast Oscillator, which had a very impressive performance without transaction costs, now even leads to a loss of the initial capital invested.

The poor performance of the strategies is surely worse when the high band of transaction costs is imposed on every trade (Appendix V-Tables I-IV). The most explicit results are given for the whole sample (1971-2000), where only 3 strategies have an excess return, and in the most recent subsample (1986-2000), where none of the strategies manage to generate an abnormal return. In the first period (1971-1985) the results are a little more optimistic, since we have 39 strategies with excess returns.

5.3.3 Discussion

The final conclusion which can be extracted from the results is that the Technical Trading strategies examined in this study fail to generate a satisfactory performance when transaction costs are computed. The strategies examined in this study cannot capture the whole spectrum of technical analysis strategies, but they are still the most famous and the vast majority of investors have used them in the past few decades.

The fact that the performance of Technical Analysis is completely disappointing in the most recent periods examined for both the Athens Stock Exchange and the Nasdaq coincides with a plethora of other studies that lead to the same conclusion for various other equity markets. This deterioration of the forecasting ability of technical analysis during the last decade may be due to a lot of reasons. The globalization and introduction of other products which are linked with equity markets, such as equity derivatives, may have increased the complexity of the market since the determinants of every market movement seem to have increased considerably in numbers and complexity.

Furthermore, the easy access of every retail investor to a wide range of information, macroeconomic, fundamental or technical, may have made the market more efficient. The increasing amount of technical analysis software, or internet sites that offer technical analysis with a complete historical database and technical tools, may have made it very difficult for the user of any technical trading strategy to gain an excess return. The argument that technical analysis may be a self-fulfilling prophecy has been supported by a large number of researchers and it seems more likely with the penetration of information technology into every household.

However, one of the most important findings of the study is the very large effect of transaction costs on the performance of the trading systems. As was mentioned earlier, a very large number of studies extract conclusions about the efficacy of technical analysis without examining its performance after transaction costs are deducted. In addition, the vast majority of the rest of the studies that take trading costs

into account just use ex-post breakeven costs to justify whether their results can withstand the presence of transaction costs.

The importance of transaction costs can be illustrated from a thorough examination of the results. Transaction costs seem to have a compounding effect on the total net profit. This is supported by the fact that, although the transactions costs (column 3) represent only a percentage x (column 4) of the total profit (profit generated in the absence of transaction costs), this final effect on that profit is x+d, where d is that compounding effect.

Appendix II shows the average transaction cost effect for the Athens General Index and Nasdaq during the subperiods. That effect shows how much higher or lower in percentage terms was the final effect of transaction costs in relation to the initial transaction costs.

From a simple observation of the results, it seems that the more bullish was the market, the higher was the effect of transaction costs on the initial profit. However, even if this is true, the transaction cost effect cannot be explained only by the state of the market. Other variables, such as the total number of trades, the ratio of winning to losing trades, and the transaction costs paid during the trades, may have an influence on the effect of transaction costs.

From all of the above, we can easily extract the conclusion that most of the past and contemporary studies investigating the profitability of technical analysis have underestimated the importance of transaction costs. The preference of a very large number of researchers to use ex-post trading costs, like breakeven costs, may have led to a plethora of erroneous results. The results of this study have shown that the effect of transaction costs on the final profit can be more than double the nominal amount paid in these costs.

6. Artificial Neural Networks

An Artificial Neural Network (ANN) is a model which employs artificial intelligence in order to mimic the structure and general operation of the human brain. The cognitive ability of a biological neural network is simulated to the largest possible extent by a computer program or a machine.

6.1. The necessity for the use of Artificial Neural Networks

As it was demonstrated in the previous sections, Technical Analysis can have significant forecasting ability. However, it was also evident that the strength of its power ranges across different financial instruments and time periods. This wide variability in the efficacy of technical trading indicators is mainly due to the static nature of technical analysis, which deprives the method from adjusting to constantly changing market and economic conditions. Furthermore, each financial instrument (e.g. stock, equity index, currency, commodity) has a unique and dynamic market behaviour that mirrors a large number of factors, the interrelationship of which is often unknown.

There may be considerable differences in the market behaviour of even two stocks of the same country and sector. Several factors, such as the percentage of ownership by institutional investors or the exposure of the company to a currency or political risk, determine the type and complexity of the trading behaviour. Mendelsohn (1993) argues that the simple approach applied by the technical indicators ignores the ramifications of the interdependencies between markets. They therefore fail to utilize relevant intermarket data from related markets that could be instrumental in developing more effective trading strategies.

A solution to the problems and deficiencies of technical analysis is the use of artificial intelligence (AI), which may be the key to decrypt high velocity, information saturated, financial markets. Neural networks are a very representative form of AI since they try to mimic the human brain. A new neural network starts out with a "blank mind" and is taught about a specific problem using training, just as a child

learns to recognize the letters of the alphabet. A trained Artificial Neural Network learns like a person to generalize, which makes it capable of making a reasonable guess when given data that is different to any that it has seen before.

When the assumed reasonable guess proves to be wrong, the ANN behaves more or less like a human being and learns from its mistakes by making the necessary adjustments to the principles on which it has based its previous choice.

This learning from experience procedure finally gives the ANN the ability to adjust dynamically to the dynamic and complex nature of the financial world. They can compare existing stock-trading patterns with previous situations and eventually learn what works and what doesn't as the model digests more data. ANNs search out hidden relationships between a stock or equity index performance and many intra-market and inter-market variables, such as the price momentum, daily volume or interest rates, GDP growth, oil and gold prices.

In practice, one of the first steps during the training process is to specify the correlation between the factors, such as technical indicators, that are used to forecast the time series. In addition, the forecast ability of each factor is measured and thus more importance is given to factors that have proved to lead to more accurate forecasts. This process is dynamic and the system can reject or assign more importance to a specific factor as it encounters new data. On the contrary, in a simple technical analysis system that applies a number of technical indicators, a set of rules is defined at the beginning and remains unchanged, since there is no mechanism to adjust the set of rules in a way that leads to the more accurate forecast.

6.2 Biological Neural Networks

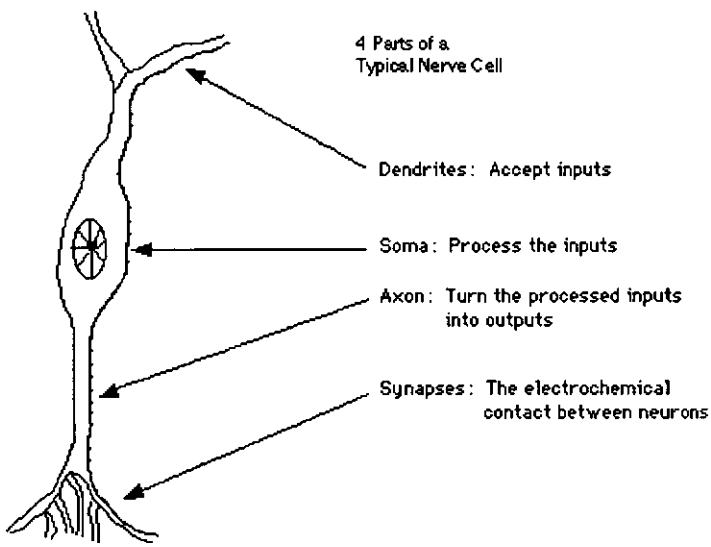
The basic building block of the human brain is the neuron, which in contrast to all other types of cells in the human body, do not die to replace themselves with new ones. This may be the main characteristic of the memory and learning process. The human brain contains approximately 10 billion neurons of more than one hundred different kinds.

The processor component of each neuron is the nucleus or soma. The inputs of the cell arrive by the dendrites, which receive signals from other neurons through axons. Axons are actually the means of sending outputs (signals) to other neurons.

Each neuron may have a large number of dendrites to receive signals. The soma collects all the signals and sums them. If the sum exceeds a threshold (activation) level the neuron sends a signal to other connected neurons. That signal may be sent intact or changed in strength by synapses. There are more than 60 billion synapses in the human brain. In that way each neuron may be interconnected to more than 1000 other neurons via a very complex network of dendrites and axons.

The structure of a biological neural network is presented below:

Figure 1. Biological Neuron



6.3 Artificial Neural Network

Artificial neural networks (ANNs) are aimed at emulating the operation of a biological neural network so as to be possible to learn, understand and make decisions in complex problems. However, the abilities of the ANNs are significantly inferior to those of the human brain even after the tremendous advances in technology of the last decades. The main reason is that, despite the extensive research in neurobiology during the last thirty years, our knowledge regarding the operation of the human brain is still very limited.

Nevertheless, the failure of traditional methods to explain very complex problems with apparent chaotic behaviour has led to a renaissance of research into neural networks during the late 1980s, 1990s, and finally the beginning of the 21st century.

Artificial Neural Networks are currently used in every aspect of science, including very important applications in medicine. Some impressive applications include[5]: Oil exploration; Geophysical and seismological problems; Agricultural experiments; Automatic estimation of the age of fish; Drug side effects prediction; Disease and psychiatric diagnosis; and Bacteria identification.

Each ANN includes a number of neurons grouped in layers that receive inputs, process these inputs and finally produce outputs.

i) Inputs are numbers, which may sometimes represent qualitative data such as "yes" or "no", "success" or "failure", etc.

ii) Outputs are numerical values that depict the expected solution to a problem. For example, if the problem is whether a company will default, the output will be 1, representing "yes", or 0, representing "no". Accordingly, the output values could be a specific return rate for an investment such as a stock or a bond.

Like the biological neural network, neurons can be connected according to a large number of different topologies or network architectures. The architecture of an ANN distinguishes its type from the others and has the following main characteristics:

[5] More information can be found in www.wardsystems.com

i) number of layers (in the most simple architecture there is an input layer, a hidden layer, and an output layer)

ii) type of connection between neurons (inter-layer and intra-layer connections)

iii) type of connection between inputs and outputs (autoassociative, where the input vector is the same as the output vector, or heteroassociative, where the input and output vectors are different). Autoassociative networks are mainly used in pattern recognition and heteroassociative networks in prediction and classification problems such as the one of this thesis.

iv) Scaling and Activation Functions

The scaling functions deal with the problem that when variables are loaded into a neural network, they must be scaled from their numeric range into a range that the neural network deals with efficiently. There are linear functions, that scale input data to the ranges of [0,1] and [-1,1], and non-linear scaling functions.

The most common non-linear functions are the sigmoid (logistic) function and tanh function. The logistic function scales data to (0, 1) according to the following formula:

f(value)=1/(1+exp(-(value-mean)/σ)).

The tanh function scales input data to (-1, 1) according to:

f(value)=tanh((value-mean)/σ)), where tanh is the hyperbolic tangent.

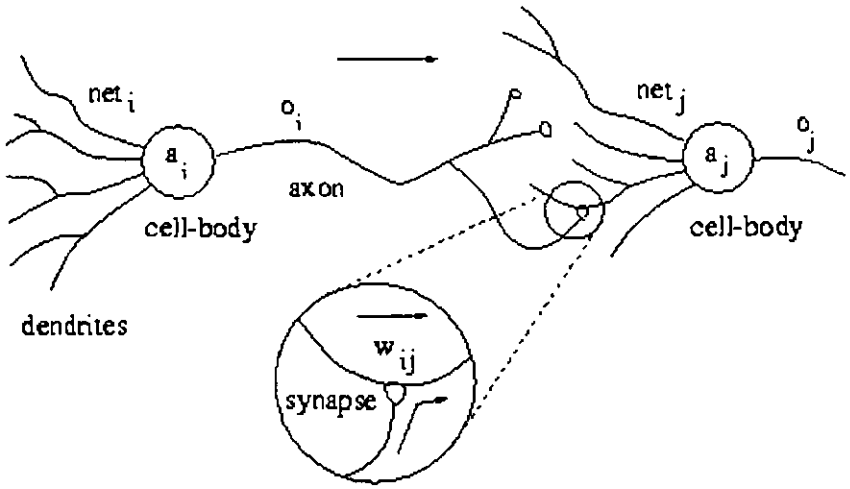
The activation (transfer) functions are used to propagate outputs from one layer to the next. The most common types of activation functions are:

Logistic (0,1): $f(x) = \frac{1}{\exp^{-x}}$

Tanh (-1,1): $f(x) = \tanh(x) = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}}$

Gaussian (0,1): $f(x) = e^{-x^2}$

Figure 2. Artificial Neural Network



v) Learning

According to Zahedi (1993), "Learning" is the process of calculating the weights among neurons in a network. The main scope of learning is to train the network to generalise and not just memorise from a large number of data. The whole thinking behind the learning process is inevitably linked with chaos theory. According to chaos theory, a part of the process in a nonlinear dynamic system, like the financial markets, is deterministic and another part is random. As a result, chaos theory aims to reveal that order does exist in apparent randomness. A neural network has the ability during the learning process to capture both the deterministic and apparent random nature of a chaotic system. By providing the ANN with inputs having no apparent interrelationships and explanatory power, the neural network is able to draw conclusions regarding how those inputs affect the outcome that it is trying to predict. There are two main types of learning :

a) Supervised learning

The main characteristic of supervised learning is that the outputs are known in the training sample. The main steps include the process by which the ANN a) receives inputs; b) assigns weights randomly; c) computes inputs; d) compares inputs with desired answers; and, finally, e) adjusts the weights and repeats the process. The

difference (distance) between the actual output (O) and the desired output (O_D) is called Δ. The objective of training is to minimize Δ by incrementally changing weights.

b) Unsupervised learning

In an unsupervised learning the actual outputs are not presented to the network and as a result the weights cannot be adjusted according to the difference Δ. This type of learning is commonly used in pattern recognition.

In both types of learning the ANN has to pass through three phases in order to generate reliable results. The available dataset has to be split into three subsamples in order to achieve the objective of each phase. The three phases are:

1) Learning (training) phase

The network incrementally adjusts the weights with the objective being to minimize Δ. A training sample with the majority of the available data is used to present the best possible picture of the problem. For example, in the case of a prediction in the stock market, the training sample must comprise a large number of market cycles in order to present to the network all the most representative phases of the market. Through the adjustment of weights, the neural network will attempt to extract general conclusions regarding the behaviour of the market and its influencial factors during bull, bear and flat market conditions or during recessions and times of economic development.

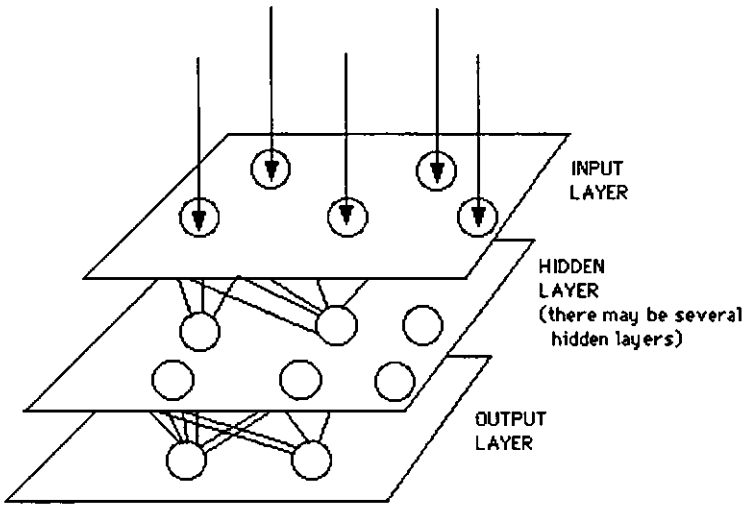
2) Testing phase

The performance of the network is tested on a testing sample with the weights being kept fixed during the process. The minimization of Δ is again one of the most important criteria for the success of the model.

3) Operative or recall phase.

The ANN is finally tested on completely new data that the model has never encountered before and therefore the outcomes are completely unknown. A production (out of sample) set is used for the implementation of this phase.

Figure 3. Artificial Neural Network Topology



6.4 Application of Artificial Neural Networks in Finance and Investment

Artificial Neural Networks have been applied to almost every financial problem. Corporate finance is one of the areas that is heavily researched by applying neural networks. Coakley and Brown (1993) applied ANNs in order to improve the quality of ratio analysis in the analytical review process of firms carried out by auditors and found that this innovative process produced superior results. Coats and Fant (1991) and Altman, Marco and Varetto (1994) developed successfully a neural network model to recognize financial distress patterns.

A large number of other studies have tried to develop a neural network model to predict corporate bankruptcy (see Raghupathi, Schkade and Raju (1991), Coleman et al (1991), Wilson and Sharda (1994), Rahimian et al (1996) and Abid and Zouari (2002)). Li et al (2000) also built a decision model of short-term liquidity analysis using Probabilistic Neural Networks with a number of fundamental ratios (debt and inventory ratios) as inputs.

Furthermore, there is a plethora of other studies that use ANNs to find solutions to problems of debt risk management. Studies by Dutta and Shekhar (1988) and Surkan and Singleton (1990) have applied artificial neural networks to assess the appropriate rating of a bond issue and the possibility of default.

However, there is currently an increasing number of studies that have focused their attention on applying ANNs to foreign exchange and mainly stock market prediction. The research of ANNs in stock market prediction can be divided into two main categories. The first is aimed at predicting stock market price levels, returns, or direction some days or even years ahead. The second category comprises studies that try to find solutions to classification problems, such as shares that are going to have an abnormal or negative performance during a specific time in the future, or the days that the market will go up or down.

The inputs for the ANNs may comprise a large number of factors, such as macroeconomic variables, foreign exchange rates, interest rates, lag data, fundamental variables, international indices, technical indicators and other qualitative variables. A very impressive example of the latter is a study by Yoon and Swales (1991), which used key phrases from president's reports to shareholders as input variables.

Since one of the purposes of this thesis is to examine whether the combination of technical analysis and ANNs can lead to superior returns and forecast accuracy, we will focus on the studies that have used technical trading indicators as inputs or as verification tools to achieve higher forecast power. Furthermore, there are some studies that attempt to predict the value of a technical indicator instead of predicting an absolute value such as the price of the share in the near future.

Some use ANNs as a means of pattern recognition in order to recognize and predict successfully technical patterns. Baek and Cho (2000) developed a neural network which operates as a "left shoulder" detector. An auto-associative neural network was trained with the "left shoulder" pattern formed in the Korea Composite Index and generated a return threefold more than that yielded by a simple buy and hold strategy. Leigh, Paz and Purvis (2002) developed a feedforward neural network with backpropagation learning to predict the formation of a "bull flag" in the NYSE Composite index. Bull flag is a technical analysis pattern which is considered to signal an increase in the price. The model predicted the five-day price change ahead and generated significant returns.

During the last few years there has been an increasing number of studies that have used technical indicators as input variables in the artificial neural networks. For example, Chenoweth, Obradovic and Lee (1996) developed a model to predict the return of the S&P 500 index using two neural networks and a filter process for forecast verification. A technical analysis indicator (MACD) was applied to confirm the signals emitted by the ANNs and reduce the number of trades. The system generated a higher return then the buy and hold strategy. A very important conclusion of that study is that "embedding some form of technical analysis knowledge into a neural network based trading system can improve its predictive capabilities".

Lawrence (1997) developed a feedforward neural network with 43 input variables, including a large number of technical indicators, in order to predict market movements of the Johannesburg Stock Exchange Index, and 92% of the time the model generated very significant profits. Mizuno et al (1998) examined the predictive ability of ANN as a prediction model for TOPIX with various technical indicators being used as inputs for the model. Although the trading system generated the same results as a Buy-and-Hold, it had a better performance in terms of the minimum loss and a considerably higher overall performance compared to a technical system.

Yao, Lan and Poh (1999) used a backpropagation neural network to forecast the Kuala Lumpur Composite Index (KLCI) level using technical indicators (moving averages, RSI, Momentum, Stochastics) as inputs for the model. The ANN generated significant abnormal returns. Scott (2000) used a recurrent neural network to predict moving average crossovers and achieved a very satisfactory return for five days ahead in the Australian All Ordinaries Index (AO) and Share Price Index (SPI)[6]. However, as the forecast horizon got longer the predictive power of the system deteriorated badly.

Some recent studies also provide very optimistic results on the forecast power of neural networks. Jasic and Wood (2004) use univariate neural networks to provide short term predictions of the S&P 500, DAX, TOPIX and FTSE stock market indices and they conclude that there was evidence of consistent predictability and significant

[6] SPI is the futures instrument for All Ordinaries Share Price Index

profits. Olson and Mossman (2004) examine a neural network with inputs from 61 accounting ratios to forecast one year returns for 2532 Canadian companies. They also found that ANNs provided superior predictive value that is translated into greater profitability.

6.5 Neural Networks for classification problems

A plethora of studies have used ANNs as a classification tool for stock market prediction. Although a large number of network architectures have been used, the Probabilistic Neural Network (PNN) seems to be the most common.

6.5.1 Probabilistic Neural Network (PNN)

The Probabilistic Neural Network is actually a classifier that was developed by Specht (1990). Due to nonparametric estimation methods used for classification, PNN architecture does not have local minima problems as do the simple feedforward networks. When an input is presented to the network, the first layer computes distances from the input vector to the training input vectors, and produces a vector whose elements indicate how close the input is to the training input.

The second layer sums these contributions for each class of inputs to produce in the network's output a vector of probabilities. Finally, a transfer function on the output of the second layer picks the maximum of these probabilities, and produces the value 1 for that class and 0 for all the other classes.

The output layer has one neuron for each category and the hidden layer usually has as many neurons as the training layers. It is very important that each processing element in the pattern layer is trained only once. The training function also includes a global smoothing factor to achieve better generalisation of classification results. Smoothing factors usually range from 0.01 to 1. If the smoothing factor is very close to 0, all produced outputs are very close to either 0 or 1. Higher smoothing factors cause more relaxed surface fits through the data.

The operation of a PNN is based on the Bayesian method of classification, which is capable of classifying a sample with the maximum possibility of accuracy using the Bayesian Classification Theorem:

$\max_i \{h_i l_i f_i(X)\}$, where :

h_i is the a priori probability for class i, which is estimated from a set of training samples using Parzen's window approximation method[7]

l_i is the loss incurred by misclassifying a sample which belongs to class i,

$X = (x_1, x_2, x_3, \ldots, x_k)$, the input vector to be classified.

Distance metrics

As was mentioned earlier, PNN networks classify patterns by comparing their distance from each other. There are three main methods of distance metric:

i) Vanilla Euclidean Distance

The Vanilla Euclidean Distance metric is simply the straight line distance and, if the pattern and the weight vectors for that neuron have coordinates (x_1, y_1) and (x_2, y_2), respectively the Vanilla Euclidian distance is given by :

$$D_{Euclidean} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

ii) City Block Distance

The City Block Distance or Manhattan distance is given by the sum of the absolute values of the differences in all dimensions, which is:

$$D_{CityBlock} = |x_2 - x_1| + |y_2 - y_1|$$

[7] see Parzen (1962)

iii) Chessboard Distance

The chessboard distance metric assumes that you can make moves as if you were a King making moves in chess. By the same principle, a diagonal move counts the same as a horizontal move. The calculation of this distance metric is given by:

$$D_{Chessboard} = \max(|x_2 - x_1|, |y_2 - y_1|)$$

Previous research using Probabilistic Neural Networks

Tan, Prokhorov and Wunsch (1995) train a probabilistic neural network to predict significant short-term price movements of the shares of Apple Corp. and achieve an accuracy rate of more than 85%. In another study by Saad, Prokhorov and Wunsch (1998), time delay, recurrent and probabilistic neural networks are used to predict significant price movements (more than 2%) for the shares of Apple Corp., Microsoft Corp, and Motorola. The results are very satisfactory since the accuracy rate is more than 80% in most of the cases.

Zekic (1999) attempts to predict daily stock returns by using several different types of neural networks (backprop, Radial Basis, PNN, etc) with a large number of different inputs (fundamental ratios, economic indicators, technical indicators, etc). The results show that the probabilistic neural networks have a very satisfactory performance in all cases.

Li et al (2000) also use a Probability Neural Network as an output analysis component in a complex model, which combines PNN with the technique of Concurrent Verbal Protocol Analysis for short-term liquidity analysis.

Furthermore, Leung, Chen and Daouk (2003) use a Probabilistic Neural Network to forecast the direction of the Taiwan Stock Exchange Index. The inputs cover macroeconomic indicators, eg. GDP, CPI, interest rates and lagged values of the

index. The PNN-guided investment strategies lead to abnormal returns, but the model is incapable of generating accurate signals when the investment horizon is more than three months. Abnormal returns hold even after transaction costs are taken into account and this gives the chance for generating real profits.

6.6 Empirical evidence

The purpose of this part of the study is to examine whether artificial neural networks can offer superior forecast ability in stock markets, especially when they are combined with technical analysis indicators. Since the efficacy of technical analysis as a market timing tool has already been proved, it would be very interesting to investigate if that predictive value can be enhanced by the use of artificial neural networks.

The model will predict next day's direction of the market: in other words, it will classify each trading day as either an upward or a downward day. The ANN was chosen to be a simple probabilistic network as this is the best possible solution to a classification problem. The software Neuroshell 2 by Ward Systems was used for the design, training and testing of the Artificial Neural Network.

Specific steps have been taken in order to ensure that the neural network will classify and generalize data successfully. These measures cover all phases of the operation of the ANN and include the following:

6.6.1 Preprocessing of input data

Normalization

The purpose of normalization is to transform data inputs to values that will be handled more easily by the neural network. Input data are scaled to a range that matches the range of the input neurons. The two main categories of scaling functions are the linear and the non-linear. The logistic function is used for the scaling of data input in the PNN since, for binary targets, it is an excellent choice (Jordan, 1995) and therefore it is considered to be ideal for Probability Neural Networks (Ward Systems Group, 1998).

The logistic scaling function scales data to (0,1) according to the following formula:

$f(x)=1/(1+\exp(-(x-\mu)/\sigma^2))$

Network Architecture

The Probabilistic Neural Network that is used has the classic PNN architecture with three layers. The input layer has as many neurons as the input variables. The hidden layer has the same number of neurons as the number of training patterns. Finally, the output layer has two neurons, one for each possible category.

Activation function

The logistic activation function has been used on each layer to propagate the outputs to the next layer. First, the input layer propagates the outputs to the hidden layer, where the weighted values are summed. The activation function in the hidden layer maps these inputs into output values and then these outputs are propagated to the next layer, which is the output layer. With the logistic activation function these values are mapped into the (0,1) range, an appropriate range for an output layer that has only two neurons.

Extraction of data sets

A very important step is to divide the full data set into three data sets, with each of them having a very important mission. The extraction method is also very important in order to ensure that the model will not just memorize, but will have the ability to generalize and make decisions based on the implicit chaotic rules found in the data set. The last 250 patterns are extracted to be the Production (out of sample) set so that decisions will be tested on data that the network has never seen before. This amount of data is believed to be sufficient for the extraction of reliable results and conclusions regarding the predictive value of the PNN. The same amount of data for the production set has also been used by a number of other studies, such as the ones by Gencay (1998) and Fernandez-Rodriguez et al (2000).

The Test set is extracted from the rest of the patterns, it represents 20% of the total observations and includes the patterns just before the production set. Finally, the remainder of the pattern file will become the training set. Li et al (2000) have selected in their PNN model 20% of the data for the testing set and 80% for the training set.

Nevertheless, it is strange that there is no reference in this study to the extraction of a production set.

6.6.2 Training

Vanilla Euclidean distance metric

After a comparison of Vanilla Euclidean and City Block distance metrics, the first is chosen since it leads to the best possible results. Furthermore, it is claimed by the Ward Systems Group (1998) that, although it is much slower, it generalizes much better when a PNN is used for classification. Zekic (1999) also claims that the Vanilla Euclidean distance metric is the most successful and is used by the vast majority of researchers.

Calibration

In order to optimize the network during the training phase, calibration is used. This technique is aimed at achieving the best generalization of the network by applying the current network to the test set during training. This takes place by computing the mean squared error between actual and predicted outputs over all patterns. Calibration computes the squared error for each output in a pattern, sums them and then calculates the mean of that number over all patterns in the test set. Furthermore, calibration is also used to optimize the smoothing factor by minimizing the probabilistic error.

Genetic Algorithms with Calibration

Genetic Algorithms (GAs) are used to achieve the optimum generalization of the PNN by optimizing the smoothing factor. The whole process is embedded in Neuroshell 2 software, which has adopted the principles explained in the work of Specht (1990) on adaptive PNN networks.

The training using genetic algorithms and calibration has two main stages:

i) The training takes place with just the data in the training set.

ii) Calibration is used to test a whole range of smoothing factors, trying to find a combination that works best on the test set. The genetic algorithm is looking for a smoothing factor multiplier for each input. This is actually

done by using a fitness measure (incorrect decisions) to determine which of the individuals in the population survive and reproduce. The survival of the fittest permits good solutions to evolve.

A genetic algorithm actually works by using selective breeding of a population of "individuals", each of which is a potential solution to the problem. In this case, a potential solution is a set of smoothing factors, and the genetic algorithm seeks to breed an individual that minimizes the mean squared error of the test set. The networks produced by every individual must be applied to the test set on every reproductive cycle. After testing all of the individuals in the pool, a new "generation" of individuals is produced for testing.

A Genetic Breeding Pool of 20 "individuals" is used in this study. Larger genetic breeding pool sizes were tried but they did not lead to substantial improvement in the accuracy of the model. In addition, larger pool sizes need much longer time for the training of the network.

Stop Training Criteria

One of the most important factors that determines the success of an artificial neural network is to achieve the optimum level of training in the system. When a neural network is overtrained, it just memorizes patterns, losing its ability to generalize and make reliable decisions. Thus, although the system may have an excellent performance during training, it performs poorly on out of sample data and during real trading, since it has failed to generalize and understand the implicit relations of the input variables.

In order to avoid overtraining, the training process stops when no further improvement is achieved after a number of iterations. The training of the networks is stopped when 10 complete generations have elapsed since the generation with the highest number of correct classifications. That number proved to work best in every data series (AGI, Nasdaq Composite) and subsample. Next, generation of the best solution involves the testing of all the "individuals" in the breeding pool. At that point the "save best procedure" takes place, where the system is saved with all the parameters that led to the best accuracy in the classification of the patterns.

6.6.3 Selection of inputs

The selection of inputs is made through a pruning procedure, where the user rejects the inputs making no contribution to an increase in the accuracy of the model. During the training procedure, a sensitivity analysis takes place according to the individual smoothing factors that are assigned to each input. When the smoothing factor of an input variable is very close to zero, that input is replaced with another and the next trial is performed. A large number of different input variables are tested and this process stops when there is no further improvement in the model.

In addition, the sensitivity analysis helps the user of the model to understand which variables have the highest explanatory value for the market movement. However, we should keep in mind that the most important factor for the success of the ANN is the right combination of all the inputs through the optimization of their weights. The addition of a new variable that is very closely related to another will not increase the accuracy of the model. In other words, if their correlation is very high, the addition of that new variable will prove to be completely useless.

The inputs include only lag values, index returns and technical analysis indicators. Although a large number of studies have shown that a plethora of factors (macroeconomic data, commodity prices, foreign exchange rates, interest rates, etc) contribute to the development of a very accurate artificial neural network, these variables are not used in this study. This happens because one of the targets of this research is to focus on whether the combination of technical analysis and ANNs can offer superior predictive ability in our trading decisions.

The learning process proved to be very time consuming as new input variables were added to the network. Even with a fast personal computer at 2.66Khz, the learning and testing phase took, in a number of cases, more than twenty minutes.

6.7 Results

6.7.1 Athens General Index

After a trial and error methodology, the input variables that provided satisfactory accuracy of the neural network were the following:

ANN for the prediction of next day's direction of the Athens General Index (AGI)

1. AGI Close : Athens General Index Daily closing price on day t
2. AGI % Change : Daily return of AGI on day t
3. Lag (3) of daily closing price of AGI
4. POSITIVE : This variable takes the value 1 when the daily change of AGI is positive
5. NEGATIVE : This variable takes the value 1 when the daily change of AGI is negative
6. DIRECTION : This variable takes the value 1 when AGI changes direction from the previous day (from positive to negative and vice versa)
7. Momentum (1)
8. LwghtMvAvgDif (1,14) : The difference between the Linear Weighted Moving Average of 1 and 14 days
9. MACD
10. Wilder's RSI (14)
11. LinRegRsq (14): The R^2 of the linear regression for the last fourteen daily close prices
12. BbandWidth% (20,2): The Bollinger Band Width is the width of the bands (two standard deviations of the daily returns for 20 days below and above the 20 day moving average) divided by the average of the price. Bollinger Bands tend to widen during sharp market moves, while during consolidations they tend to move closer together.
13. Stdev (14) : standard deviation

To avoid data snooping biases, a number of steps were taken:

i) The full sample was divided into two almost equal parts that formed the two periods under investigation.

ii) Only the most popular parameters were tried for all the technical indicators. Since the model should be capable of predicting next day's direction, only very short parameters were used (1, 2, 5, 10, 14, 20).

iii) All of the most complicated indicators (MACD, Bollinger Bands, RSI) were used in their standard forms and with exactly the same parameters that were proposed by their inventors (Appels, Bollinger and Wilder).

iv) The same inputs and parameters in the indicators were used for both the first and second period.

The data series was divided in two almost equal parts and thus the ANN was applied to two periods:

First Period: 13/10/86 – 31/12/93

ANN statistics

Training Set: 1181

Test Set: 357

Production Set: 250

Number of Inputs: 13

Number of Outputs: 2

Production set / Out of sample period: 7/1/1993 – 31/12/1993

Percentage of correct classifications	56.40%
Best Smoothing Factor	0.604
Minimum Number of Incorrect Classifications	123.04398
Smoothing Test Generations	106

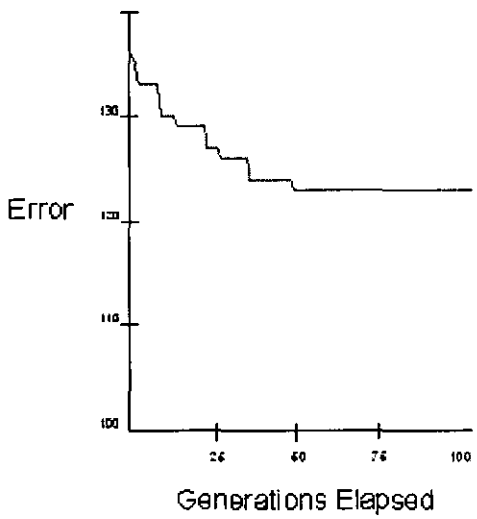
Best Smoothing Factor: the overall smoothing factor that results in the highest number of correct classifications when combined with the smoothing factor adjustments.

Minimum Number of Incorrect Classifications: the lowest number of incorrect classifications found during testing.

Smoothing Test Generations: the total number of complete generations the genetic algorithm has been through. A generation involves the testing of all of the individuals in the breeding pool.

The following graph shows the set average error against the number of generations elapsed as Calibration seeks the best smoothing factor.

Graph F



The returns generated by the ANN system during the first out of sample period (7/1/1993 – 31/12/1993) together with the standard deviation as a measure of risk have been calculated under two hypotheses: i) the trader could take both long and short positions, ii) only long positions were permitted. The last hypothesis is the more realistic one in the case of Athens Stock Exchange, since during that period there was no derivatives market and short positions were not allowed in the spot market.

The ANN results for the Athens General Index during the first out of sample period are presented in the following tables:

Long and Short Positions permitted

Average daily return	0.001692
Standard deviation	0.01660
Total return	47.22%

Only Long Positions permitted

Average daily return	0.00312
Standard deviation	0.015453
Total return	48.04%

Returns generated by a naïve buy-and-hold strategy

Average daily return	0.00159
Standard deviation	0.01661
Total return	43.49%

The difference in returns for the ANN model and the 'buy and hold' strategy are also presented to show whether the model generates abnormal returns with lower or higher risk.

Comparative results

Long and Short vs. Buy and Hold Strategy

Difference in Daily Return	0.00010
Difference in Standard Deviation	-0.00001
Difference in Total Return	3.73%

Only Long vs. Buy and Hold Strategy

Difference Average Daily Return	0.00153
Difference Standard Deviation	-0.00116
Difference in Total Return	4.55%

The accuracy of the ANN model (percentage of correct classifications) is always more than fifty percent but not impressive. However, the model manages in both cases to generate excessive returns compared to the benchmark "buy-and-hold" strategy. This could be due to the fact that the ANN system may be more accurate in days with a significant percentage change.

Furthermore, based on the calculation of standard deviations, it is shown that the higher return of the model cannot be justified as a compensation for the higher risk that an investor bears when he applies the ANN model. The volatility of daily returns of the model is not higher than that of a buy-and-hold strategy for both hypotheses (both long and short positions and only long positions).

The next step is to generate a more complete picture of the factors that have contributed to the satisfactory performance of the ANN system. During the training and test periods, the individual smoothing factor of each input is used as an adjustment to modify the overall smoothing factor of the model until the highest level of accuracy is reached. Thus, the individual smoothing factors may be used as a sensitivity tool and inputs with higher smoothing factors are considered to be more important for the predictive ability of the model. The following table presents the individual smoothing factors for each input:

Input Name	Individual Smoothing Factor
NEGATIVE	0.03529
BBandWidth%(20,2)	0.08235
POSITIVE	0.30588
LinRegRSqd(14)	0.91765
LWgtMvAvgDiff(1,14)	1.61176
Momentum (1)	1.83529
StndDev(14)	2.05882
Lag(3) of AGI	2.18824
WilderRSI(14)	2.49412
% change of AGI	2.61176
AGI close	2.72941
DIRECTION	2.75294
MACD	2.98824

The most imporant technical indicator by far is the MACD, while the change of direction of the market on day *t* proves to have significant forecast ability for the direction of day *t+1*.

Second Period : 2/1/94 – 31/12/2000

ANN statistics

Training Set: 1150

Test Set: 350

Production Set: 250

Number of Inputs: 13

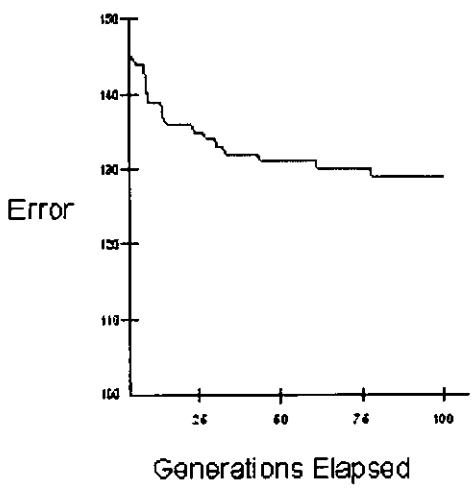
Number of Outputs: 2

Production set / Out of sample period: 5/1/2000 – 31/12/2000

Percentage of correct classifications	58.60%
Best Smoothing Factor	0.9068235
Minimum Number of Incorrect Classifications	129.02249
Smoothing Test Generations	89

The following graph shows the set average error against the number of generations elapsed as Calibration seeks the best smoothing factor.

Graph G



The returns generated by the ANN system during the second out of sample period (5/1/2000 – 31/12/2000) together with the standard deviation have been calculated

again under the same two hypotheses as the first sample (both long and short positions and only long positions).

ANN results for the Athens General Index during the second out of sample period

Long and Short Positions permitted

Average daily return	0.004192
Standard deviation	0.01970
Total return	170.33%

Only Long Positions permitted

Average daily return	0.00225
Standard deviation	0.01993
Total return	33.55%

Returns generated by a naïve buy-and-hold strategy

Average daily return	-0.00165
Standard deviation	0.02007
Total return	-36.89%

Comparative results

Long and Short vs. Buy and Hold Strategy

Difference in average daily return	0.00584
Difference in standard deviation	-0.00037
Difference in total return	207.22%

Only Long vs. Buy and Hold Strategy

Difference in average daily return	0.0042
Difference in standard deviation	-0.00014
Difference in total return	70.44%

According to the results above, the performance of the model is very impressive under both hypotheses, with the risk always being much lower. During that specific out of sample period (2000), the AGI was correcting sharply after a boom in 1998 and 1999. The fact that both long and short positions are allowed in the first case surely allows the trader to benefit from the downturn of the market, but that cannot be the only reason for the significant abnormal performance of the ANN model, since the superior

performance of the model also holds for the more realistic hypothesis that only long positions are allowed.

The following table presents the individual smoothing factors for each of the inputs:

Input name	Individual smoothing factor
% change	0.02353
Momentum (1)	0.21176
MACD	0.82353
POSITIVE	0.88235
Wilder RSI(14)	1.05882
ASE close	1.16471
Lag(3) of ASE close	1.34118
DIRECTION	1.55294
NEG	2.18824
StndDev(14)	2.44706
LWgtMvAvgDiff(1,14)	2.62353
LinRegRSqd(14)	2.88235
BBandWidth%(20,2)	2.98824

Bollinger Bands Width proves to have the highest forecast ability and this can be attributed to the high volatility of the market during this period, since it is a tool that works ideally in such an environment.

The satisfactory results of the ANN may be partly due to the fact that input variables cover all of the aspects of technical analysis and can easily be used by a technical analyst as a very well organized way of thinking, which reveals a complete picture of the market's behaviour.

i) The **R-squared** identifies whether there is a trend in the market. If there is no significant trend in the market, the trader should not use a trend following indicator such as a moving average

ii) The existence of the trend is confirmed by the **Bollinger Band Width**, which can also warn that a very strong trend is imminent even before it is indicated by the value of r-squared

iii) If there is a strong trend, the **Moving Average Crossovers** (LwghtMvAvgDif (1,14)) and **MACD** should be used to identify the type of trend and the exact time that the investor should buy (buy signal)

iv) If we assume that we have identified the existence (r-squared) and the type of trend through MAs and MACD, it is now time to use **Momentum** to give an early sign of whether the momentum of that trend increases or starts to decrease in pace and strength

v) Even if we have identified a very strong trend with very good momentum, it is always useful to know whether the market has reached extreme overbought or oversold conditions. These extreme conditions are signaled by the **RSI** when it reaches some extreme levels (usually 30 for oversold and 70 for overbought) which are often defined arbitrarily. With the use of RSI we can have a very early warning of trend reversal even when there is no other indication that the rally or trough is coming to an end.

vi) The **r-squared** can also be used once more to confirm that the conclusions of the RSI are valid, since in some extreme cases the normal overbought levels may not be considered to be overbought anymore if the trend of the market is unusually strong. For example, in strong bull markets the RSI can reach high levels but this could be justified by the unusual strength of the trend and the investor should increase the level above which the market is regarded as overbought .

6.7.2 Nasdaq Composite

The pruning methodology was also used in the case of the Nasdaq Composite in order to define the technical indicators and their parameters with the best possible predictive ability. The chosen indicators are the following:

1. Nasdaq Close : Nasdaq Composite Index daily closing price on day t
2. Nasdaq % Change : Daily return of Nasdaq Composite on day t
3. Lag (1) of daily closing price of Nasdaq Composite
4. Lag (1) of daily return
5. POSITIVE : This variable takes the value 1 when the daily change of Nasdaq Composite is positive
6. NEGATIVE : This variable takes the value 1 when the daily change of Nasdaq Composite is negative
7. DIRECTION : This variable takes the value 1 when Nasdaq Composite changes direction from the previous day (from positive to negative and vice versa)
8. Momentum (1)
9. Momentum (14)
10. LwghtMvAvgDif (1,14) : The difference between the Linear Weighted Moving Average of 1 and 14 days
11. MACD
12. Wilder's RSI (14)
13. Stdev (20) : standard deviation

First Period: 1/1/86 - 31/12/93

ANN statistics

Training Set: 1350

Test Set: 450

Production Set: 250

Number of Inputs: 13

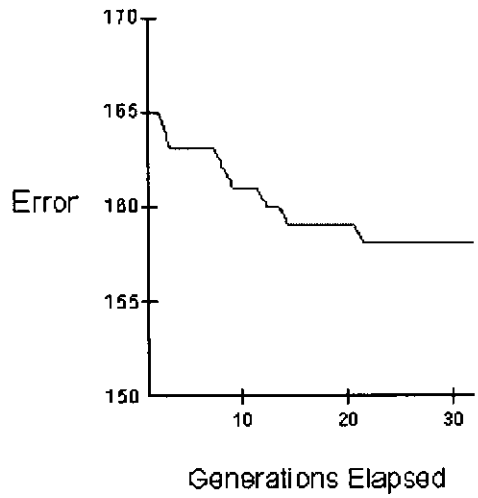
Number of Outputs: 2

Production set / Out of sample period: 7/1/1993 – 31/12/1993

Percentage of Correct Classifications	55.42%
Best Smoothing Factor	0.9572941
Minimum Number of Incorrect Classifications	158.0143
Smoothing Test Generations	31

The following graph shows the set average error against the number of generations elapsed as Calibration seeks the best smoothing factor.

Graph H



The returns generated by the ANN system during the second out of sample period (7/1/1993 – 31/12/1993), together with the standard deviations of both the returns generated by the model and the ones of a buy and hold strategy, have been calculated as follows:

ANN results for the Nasdaq Composite during the first out of sample period

Average daily return	0.00109
Standard deviation	0.00718
Total return	30.39%

Returns generated by a naïve buy-and-hold strategy

Average daily return	0.00057
Standard deviation	0.00724
Total return	14.54%

Comparative results

Long and Short vs. Buy and Hold Strategy	
Difference in Average Daily Return	0.00052
Difference in Standard deviation	-0.00006
Difference Total Return	15.85%

The model succeeds in classifying the trading days correctly in the majority of the cases. Even though the forecast accuracy is not as impressive as in the AGI, the performance of the model is more than double that of a simple Buy and Hold strategy with a much lower risk.

The following table presents the individual smoothing factors for each of the inputs:

Input name	Individual smoothing factor
POSITIVE	0.3412
DIRECTION	0.5177
Momentum (1)	0.5412
LwgtMvAvgDiff (1,14)	0.5765
NEGATIVE	0.5882
WilderRSI (14)	1.5177
Lag (1) of daily return	1.6706
MACD	1.7294
Daily return	1.9882
Momentum (14)	2.1765
Lag (1) of close	2.2588
StndDev (20)	2.7294
NASDAQ close	3.0000

Second Period: 1/1/94 - 31/12/00

ANN statistics

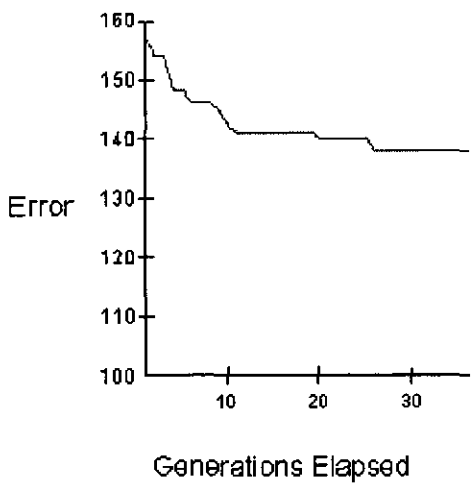
Training Set: 1350
Test Set: 401
Production Set: 250
Number of Inputs: 13
Number of Outputs: 2

Production set / Out of sample period: 7/1/2000 – 31/12/2000

Percentage of Correct Classifications	56.22%
Smoothing Factor	0.27400
Minimum Number of Incorrect Classifications	138.1317
Smoothing Test Generations	36

The following graph shows the set average error against the number of generations elapsed as Calibration seeks the best smoothing factor.

Graph I



The returns generated by the ANN system during the second out of sample period (5/1/2000 – 31/12/2000), together with the standard deviation, have been calculated as follows:

Average daily return	0.00240
Standard deviation	0.03063
Total return	61.48%

Returns generated by a naïve buy-and-hold strategy

Average daily return	-0.00134
Standard deviation	0.03069
Total return	-36.29%

Comparative results

Long and Short vs. Buy and Hold Strategy	
Difference in average daily return	0.00374
Difference in standard deviation	-0.00006
Difference in total return	97.77%

Once more, the ANN model generates a significant abnormal performance, which is even higher in the second out of sample period when the market is very bearish and decreases by 36%. Furthermore, the volatility of the returns yielded by the model is again much lower, a fact that provides evidence that the application of ANNs can generate a very good combination of higher returns with a much lower risk.

The following table presents the individual smoothing factors for each of the inputs:

Input name	Individual smoothing factor
NEGATIVE	0.12941
POSITIVE	0.15294
Mometum (1)	0.25882
MACD	0.94118
Momentum (14)	1.14118
DIRECTION	1.23529
NASDAQ	1.69412
LwgtMvAvgDiff (1,14)	1.69412
Lag (1) of Daily Return	1.74118
Daily return	1.90588
Lag (1) of close	2.25882
StndDev (20)	2.56471
WilderRSI (14)	2.71765

The standard deviation and RSI have the highest contribution to the accuracy of the model. This could be explained by the fact that the Nasdaq Composite had a much higher volatility in the second period in comparison to the first and reached extreme levels. Standard deviation and RSI are indicators that have the ability to capture the

exact time periods when the market is ready for sharp moves or reaches extreme levels. For example, the RSI is a suitable indicator to point to extreme conditions in the market, such as oversold levels in the case of the last period, and the low standard deviation of returns may signal an imminent sharp move of the market, which was apparent in this last period.

6.8 Conclusions

The ANN models tested with both the AGI and Nasdaq Composite led to abnormal returns. The superior returns were accompanied in all cases by a lower risk, as measured by the standard deviation of returns. Any data snooping biases should be minimal for a large number of reasons, so that the ANNs prove to be a very good forecast tool.

It is worth noticing that, even though the two indices used have nothing in common, almost the same ANNs give very satisfactory returns in all time periods and under all hypotheses. The ANNs used in this study are of exactly the same type (probabilistic) and architecture. In addition, exactly the same methodology has been used in all facets of the tests (preprocessing, extraction of data, activation, and training). Furthermore, the technical indicators are almost the same in both indices and with their parameters only slightly changed in some cases.

The selection of only technical indicators as inputs for all trading systems was made just for comparative reasons for this study in order to show whether the forecast ability of technical analysis can be enhanced further by the use of ANNs. However, as has been underlined by many studies, the main advantage of an ANN is the ability to reveal the hidden relationships between intermarket factors. Therefore, most researchers have used a wide spectrum of factors from completely different markets. Such inputs can be interest rates, commodity, oil and precious metal prices, macroeconomic indicators, FX rates etc.

The most impressive returns were generated in the most recent sample in 2000, a fact that is not consistent with the conclusions of many studies that the markets have

become more efficient and thus the forecast ability of forecast methodologies such as technical analysis has deteriorated badly. The adaptive nature of ANNs is obviously a very necessary characteristic for every successful trading system.

7. Final conclusions

Technical Analysis has become very popular among academics and this is obvious by the increase in the number of studies published during the last two decades. In addition, the biggest global investment houses release many research reports on technical analysis in examining all of the markets and products worldwide[8].

In order to achieve complete and detailed conclusions on the predictive power of technical analysis, a wide spectrum of rules and strategies were examined in the most realistic way. One of the main blunders that is obvious in many previous studies is the wrong methodology in estimating whether any excess returns still stand after transaction costs.

A plethora of studies use post break-even transaction costs as a threshold level to assess whether an investor would make an excess return in the real world. However, this study demonstrates that this is a wrong methodology which leads to distorted results. We have shown that there is an inflated effect of trading costs, which is similar to the compounding effect, and it is higher when the time period is longer. This effect can be more than double the nominal amount paid in these costs.

For example, if after five years an investor makes a profit of 5,000 GBP without taking trading costs into account and he calculates that these would total 2,000 GBP, this does not mean that the net real profit would be 3,000 GBP. This is made simpler if we think that the money that is paid in transaction costs in the first trade cannot be used to generate any return in the second trade. Thus the difference between an investor who pays trading costs and one that does not is the sum of these costs plus the profit that the money paid in these costs would generate in the future. To avoid problems of miscalculation, we have used a historical trading simulation to mirror what would happen in real life.

Another problem of many previous studies is that even when they apply a historical simulation, they use a completely arbitrary estimation of the average transaction cost

[8] See for example the morning, monthly and special reports of CSFB, Lehman Brothers, Societe Generale, Citigroup

per trade and thus there may still be a distortion in the results. Domowitz et al (1999, 2000 and 2001) show that total trading costs include both explicit and implicit trading costs, with the latter being higher in the emerging markets. However, there is no reference that any implicit costs are taken into account by any of the previous studies. Furthermore, it is also argued in the studies by Domowitz (1999) and Domowitz et al (1999, 2000, 2001) that trading costs have diminished over time and therefore this should be also taken into account when different time periods are used to examine the efficacy of technical analysis.

All of the aforementioned problems regarding the right calculation of transaction costs and their effect on total profits have been taken into account in this study. The estimations of trading costs for both Nasdaq and Athens Exchange by Domowitz et al (1999, 2000, 2001) are taken into account in the calculation of the returns generated by the trading strategies. Moreover, lower trading costs are used in the examination of the most recent period so that more realistic conclusions could be extracted.

The results gave evidence that technical analysis offers significant predictive ability. However, this deteriorates dramatically when transaction costs are taken into account in both the Athens Stock Exchange and Nasdaq. In addition, the results suggest that any forecast power has diminished over the most recent periods. This conclusion coincides with a plethora of previous studies. A logical explanation is that the structural changes and the advance of information technology have made the markets more efficient.

Kidd and Brorsen (2004) examine the forecast value of technical analysis on derivative markets and argue that the most likely explanation for its diminishing success over time is a reduction in price volatility. They also comment that structural changes likely caused the decreased returns rather than the increased technical trading causing the structural changes. Boswijk et al (2001) also suggest that there is a connection between the performance of technical analysis and the magnitude of the volatility of the underlying series. Yeung et al (2002), in a report released by CSFB, underline that the technical indicator results from 2000 onwards appear to be more volatile than historical levels. They also underlined that the volatility of these strategies surged after the technology bubble burst in March 2000.

An increase in the volatility as this is measured by the standard deviation, is present in the last examined period in both Nasdaq and AGI. However, further investigation is needed to reveal whether there is a link between higher volatility and the reduction in the forecast ability of technical analysis.

Obviously, institutional investors who pay lower commissions should expect to earn higher returns by the use of technical strategies. Moreover, it would be very interesting to investigate the efficacy of technical analysis in the derivatives markets where the commissions are just a fraction of that in the spot market. Rubio (2004a) examined the returns yielded by simple technical indicators on the IBEX future contracts in MEFF, but did not find any proof of excess returns, mainly because of the very poor results when the market was declining.

Another important issue that needs further investigation is that the vast majority of studies use large cap stock indices to examine the predictive power of technical indicator rules and this may lead to underestimation of their predictive ability. This is based on the assumption that indices may be more efficient instruments since more investors are focused on them.

The rationale above may be also related to the findings of Chandrashekar (2004), who supports the hypothesis that technical analysis may be more appropriate for smaller stocks in NYSE, AMEX and NASDAQ. Small stocks can earn excess returns to the extent of 1.7% per month on average, while large caps have very poor results. The results are robust even after accounting for time varying expected returns, transaction costs and nonysnchronous trading.

Bokhari et al (2005) also provide evidence that technical trading rules have progressively higher predictive ability the smaller the size of the company when examining the large, mid and small cap indices of the London Stock Exchange.

Another interesting finding of this study is that the optimization methodology, which was applied to the technical strategies, proved to be a very effective tool in generating considerable excess returns. The best performing strategies during the testing period

also offered the highest predictive power during the out of sample period and more importantly, they were able to beat the market. We could conclude that history repeats itself in the financial markets. Any data snooping effects should be minimal since only the most frequently used moving averages were examined and, even though the methodology was exactly the same for both AGI and Nasdaq and for different time periods, significant excess returns were generated in both time series.

Summers et al (2004) also found that rules derived from the data from an early period can be predictive at a later date and can even exceed the forecast power of the rules derived from more contemporary data. They made the conclusion that, in the securities markets, history tends to repeat itself due to the relative constancy of human behaviour. Trying to explain this phenomenon, they also made the hypothesis that this might be due to a decreasing signal to noise ratio in the data as the volatility of the index increases over time.

The main concept behind the optimization methodology is that technical analysis is adapted to the specific characteristics of the time series. The optimal parameters of the strategy obviously capture better the patterns and cyclical moves of the index that is examined. In other words, there is a trial to reveal some hidden characteristics of the time series and to translate this into profits.

However, the whole optimization process is only the very first step in revealing the complex nature of financial markets since it applies only to the parameters of a predetermined set of rules. In order to take a further step, the use of Artificial Neural Networks seems to be a very good alternative. This is because ANNs are capable of capturing the hidden complex relationships among many different factors and of generalising the main conclusions for making the right decision in any market conditions.

In order to investigate whether the Artificial Neural Networks can really offer an added value, three layer Probabilistic Neural Networks (PNNs) were used for both Athens General Index and Nasdaq Composite. Furthermore, genetic algorithms were applied to achieve the optimum generalization of the system. It is very important to note that exactly the same methodology was used in every stage of the creation and

testing of the ANN for both indices. The inputs included only technical indicators and lag values.

The results of both PNNs provided evidence that these have significant predictive ability in a very difficult task, which was to predict the next day's market direction. In both indices and examination periods, the percentage of correct classifications ranged from 55% to 59%. Even though the accuracy rate is not impressive, the returns achieved in all cases are significantly higher than the ones achieved by the simple Buy-and-Hold strategy.

The abnormal returns achieved by the PNNs cannot be justified as compensation for bearing a higher risk. The standard deviation of the daily returns generated by the PNN is always substantially lower than that of the buy-and-hold. The fact that significant abnormal returns are generated with a marginal rate of correct classifications implies that the system has obviously a higher classification rate in days that the market movement is bigger.

The PNNs proved to have a better performance in the second investigated period (5/1/2000-31/12/2000) than the first (7/1/1993-31/12/1993). This is not consistent with the conclusion extracted by a plethora of previous studies that the recent period is much less predictable and any abnormal returns are negligible. Moreover, the results imply that the market may not be more efficient in the most recent periods, as was argued by many other studies. The main reason for the poor results of the majority of investment methodologies may be a higher complexity in the financial markets that only very advanced systems such as ANNs may be able to capture.

Even though the performance of ANNs was very satisfactory, there is still much room for experimentation and improvement. For example, it has been argued that ANNs are instrumental in developing more effective trading strategies for today's complex markets by capturing the interdependencies between deceptively completely different markets. For this reason, many studies have used inputs for the ANNs from many markets, such as precious metals, FX rates, fixed income, energy, commodity and other equity markets.

That argument seems very obvious since the increased globalization during the last decades has also increased the correlation between different markets. The recent Russian and Latin America crises and the terrorist attack of September 11th make it very obvious that financial markets are now more interrelated than ever before.

In addition, the technical indicators could be first optimized in their parameters before being used as inputs to the ANN. This is just one more example of a lengthy investigation and significant improvement that might be achieved in a combined and almost automated trading system. The attractiveness of such an approach is obvious in a project called PLAT, which is carried out by Pennsylvania University and Lehman Brothers. This is a broad investigation of algorithms and strategies for automated trading in financial markets that is based on a simulator that merges automated client orders with real-time stock market data[9].

[9] See Kearns and Ortiz (2003), Sherstov and Stone (2004) and Feng et al (2004)

Appendices

Appendix I. Table I. Results for Moving Average Rules for the full sample of Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,14,0 W	31597.62	2221.33	248	93	155	1772	0.00347	0.5621	0.02087	1765	-0.00100	0.4640	0.00447
t-statistic							*3.76572*				*-3.77762*		*6.53272*
MA 1,14,0 EXP	25731.81	1808.96	211	70	141	1818	0.00326	0.5600	0.02008	1719	-0.00090	0.4636	0.00416
							3.44022				*-3.57718*		*6.07730*
MA 1,14 TRIANGULAR	24987.26	1756.62	196	72	124	1759	0.00334	0.5588	0.01978	1778	-0.00084	0.4679	0.00418
							3.53749				*-3.51637*		*6.10882*
MA 1,14 SIMPLE	22985.86	1615.92	192	68	124	1779	0.00326	0.5554	0.01986	1758	-0.00080	0.4704	0.00406
							3.41558				*-3.43577*		*5.93343*
MA 1,14 TIME SERIES	14401.22	1012.41	313	166	147	1795	0.00298	0.5560	0.02015	1742	-0.00055	0.4690	0.00353
							2.95090				*-3.00551*		*5.15838*
MA 1,14 W filter 1%	10118.79	711.36	130	51	79	1767	0.00282	0.5416	0.01985	1770	-0.00034	0.4847	0.00316
							2.66558				*-2.66708*		*4.61822*
MA 1,50 W filter 1%	9821.56	690.46	62	24	38	1842	0.00270	0.5489	0.02017	1695	-0.00035	0.4743	0.00305
							2.49726				*-2.64524*		*4.45361*
MA 1,50 W filter 1DAY	9670.47	679.84	71	24	47	1829	0.00271	0.5446	0.02020	1708	-0.00034	0.4795	0.00305
							2.50851				*-2.63539*		*4.45485*
MA 1,50,0 W	9355.7	657.71	108	30	78	1736	0.00283	0.5524	0.02016	1801	-0.00029	0.4753	0.00312
							2.66662				*-2.59762*		*4.55899*
MA 1,14 TRI filter 1%	9128.78	641.76	127	47	80	1770	0.00275	0.5384	0.01968	1767	-0.00028	0.4878	0.00303
							2.54892				*-2.56435*		*4.42823*
MA 1,14 VAR filter 1%	8566.49	602.23	68	25	43	1830	0.00263	0.5519	0.01958	1707	-0.00025	0.4716	0.00288
							2.37242				*-2.48479*		*4.20646*
MA 1,50 TRI filter 1%	8527.79	599.51	49	20	29	1810	0.00267	0.5508	0.02041	1727	-0.00026	0.4737	0.00293
							2.43185				*-2.51129*		*4.28090*
MA 1,50,0 TIME	8398.62	590.43	147	63	84	1839	0.00260	0.5313	0.01886	1698	-0.00023	0.4935	0.00283
							2.32497				*-2.44706*		*4.13265*
MA 1,50,0 TRI	8274.35	581.69	76	21	55	1718	0.00279	0.5541	0.02069	1819	-0.00023	0.4744	0.00302
							2.59044				*-2.50398*		*4.41181*
MA 1,14 VAR filter 1DAY	8109.81	570.12	77	27	50	1817	0.00263	0.5487	0.01994	1720	-0.00023	0.4756	0.00286
							2.36685				*-2.45771*		*4.17821*
MA 1,14,0 Variable	7887.12	554.47	63	24	39	1824	0.00259	0.5477	0.01948	1713	-0.00020	0.4764	0.00279
							2.30166				*-2.40425*		*4.07547*
MA 1,50 S filter 1%	7237.68	508.81	49	20	29	1856	0.00253	0.5496	0.02063	1681	-0.00018	0.4729	0.00271
							2.21198				*-2.35580*		*3.95571*
MA 1,14 E filter 1%	7067.9	496.88	106	42	64	1796	0.00258	0.5384	0.02009	1741	-0.00015	0.4871	0.00273
							2.27295				*-2.33344*		*3.98931*
MA 1,50,0 VAR	6607.8	464.53	57	16	41	1949	0.00238	0.5475	0.02106	1588	-0.00016	0.4710	0.00254
							1.98610				*-2.27784*		*3.69273*
MA 1,50 TRI filter 1DAY	6537.36	459.58	59	22	37	1800	0.00255	0.5467	0.02075	1737	-0.00012	0.4784	0.00267
							2.22370				*-2.28132*		*3.90148*

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Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 S filter 1DAY	6461.62	454.25	57	21	36	1830	0.00250	0.5497	0.02069	1707	-0.00011	0.4739	0.00261
							2.15054				*-2.25132*		*3.81211*
MA 5,50,0 W	6327.93	444.86	65	23	42	1739	0.00261	0.5423	0.02050	1798	-0.00008	0.4850	0.00269
							2.29898				*-2.23985*		*3.93078*
MA 1,50,0 S	6260.56	440.12	77	21	56	1731	0.00262	0.5529	0.02091	1806	-0.00008	0.4751	0.00270
							2.31218				*-2.24315*		*3.94506*
MA 5,50,0 W filter 1%	6045.34	424.99	44	20	24	1832	0.00246	0.5437	0.02030	1705	-0.00007	0.4804	0.00253
							2.08302				*-2.18375*		*3.69511*
MA 5,50 E filter 1DAY	6035.64	424.31	43	17	26	1895	0.00239	0.5430	0.02061	1642	-0.00008	0.4787	0.00247
							1.98536				*-2.17248*		*3.60056*
MA 1,14 E filter 1DAY	5839.71	410.53	138	50	88	1814	0.00246	0.5386	0.02019	1723	-0.00004	0.4864	0.00250
							2.07624				*-2.14130*		*3.65244*
MA 5,50,0 E filter 1%	5750.73	404.28	31	15	16	1881	0.00238	0.5407	0.02075	1656	-0.00006	0.4819	0.00244
							1.96335				*-2.14576*		*3.55874*
MA 1,50 E filter 1%	5685.08	399.66	59	19	40	1913	0.00233	0.5426	0.02047	1624	-0.00005	0.4784	0.00238
							1.88757				*-2.11511*		*3.46665*
MA 5,50 S filter 1DAY	5671.92	398.74	44	19	25	1829	0.00243	0.5462	0.02070	1708	-0.00004	0.4778	0.00247
							2.03070				*-2.13500*		*3.60770*
MA 5,50,0 TRI filter 1%	5655.51	397.59	41	20	21	1817	0.00244	0.5465	0.02050	1720	-0.00003	0.4779	0.00247
							2.04332				*-2.12332*		*3.60845*
MA 1,50 VAR filter 1%	5590.03	392.98	26	12	14	1950	0.00230	0.5462	0.02118	1587	-0.00006	0.4726	0.00236
							1.84703				*-2.11468*		*3.43084*
MA 1,14 S filter 1DAY	5571.57	391.68	133	48	85	1771	0.00248	0.5330	0.02018	1766	-0.00001	0.4932	0.00249
							2.09355				*-2.10844*		*3.63904*
MA 1,50 E filter 1DAY	5523.86	388.83	67	21	46	1900	0.00233	0.5421	0.02053	1637	-0.00003	0.4795	0.00236
							1.88339				*-2.08801*		*3.43950*
MA 5,50 W filter 1DAY	5500.41	366.68	64	22	42	1827	0.00241	0.5369	0.02047	1710	-0.00002	0.4877	0.00243
							1.99585				*-2.10247*		*3.54941*
MA 1,150,0 TIMESERIES	5432.48	381.91	73	25	48	1694	0.00257	0.5401	0.02017	1843	0.00001	0.4833	0.00256
							2.21225				*-2.10423*		*3.73802*
MA 1,14 S filter 1%	5368.43	377.4	120	49	71	1814	0.00240	0.5347	0.01983	1723	0.00001	0.4904	0.00239
							1.97413				*-2.05765*		*3.49174*
MA 1,14 TRI filter 1DAY	5249.06	369.01	141	51	90	1749	0.00248	0.5334	0.01995	1788	0.00003	0.4933	0.00245
							2.08483				*-2.04940*		*3.58036*
MA 1,50,0 EXP	5214.34	366.57	97	23	74	1801	0.00242	0.5464	0.02078	1736	0.00001	0.4787	0.00241
							2.00340				*-2.06285*		*3.52153*
MA 5,50,0 S filter	4701.36	330.51	34	16	18	1847	0.00231	0.5457	0.02065	1690	0.00007	0.4775	0.00224
							1.83182				*-1.94456*		*3.27045*
MA 5,50,0 VAR	4560.66	320.62	18	9	9	1956	0.00219	0.5435	0.02120	1581	0.00006	0.4756	0.00213
							1.65699				*-1.91697*		*3.09537*
MA 5,150,0 TIMESERIES	4543.78	319.43	84	30	54	1692	0.00247	0.5355	0.01997	1845	0.00011	0.4927	0.00236
							2.04509				*-1.93385*		*3.44582*

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Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 VAR filter 1DAY	4531.5	318.57	37	11	26	1947	0.00219	0.5419	0.02114	1590	0.00007	0.4780	0.00212
							1.65453				*-1.90445*		*3.08248*
MA 5,50,0 TIME filter 1%	4303.06	302.51	104	48	56	1851	0.00223	0.5219	0.01906	1686	0.00016	0.5036	0.00207
							1.69606				*-1.79354*		*3.02193*
MA 1,14 W filter 1DAY	4086.31	287.27	165	62	103	1758	0.00232	0.5324	0.01994	1779	0.00017	0.4941	0.00215
							1.81894				*-1.80924*		*3.14209*
MA 5,50 VAR filter 1DAY	4083.17	287.05	18	8	10	1956	0.00213	0.5419	0.02109	1581	0.00013	0.4775	0.00200
							1.55234				*-1.80325*		*2.90645*
MA 5,50 TRI filter 1DAY	3809.19	267.79	54	22	32	1794	0.00226	0.5385	0.02059	1743	0.00019	0.4871	0.00207
							1.72952				*-1.76335*		*3.02491*
MA 5,50,0	3648.7	256.51	48	18	30	1730	0.00232	0.5434	0.02100	1807	0.00021	0.4842	0.00211
							1.80918				*-1.75065*		*3.08295*
MA 1,150 TIME filter 1%	3554.89	249.91	42	18	24	1720	0.00230	0.5355	0.02022	1817	0.00024	0.4920	0.00206
							1.77222				*-1.70277*		*3.00948*
MA 5,50,0 TRI	3410.08	239.73	57	22	35	1702	0.00231	0.5394	0.02089	1835	0.00025	0.4888	0.00206
							1.78261				*-1.69123*		*3.00848*
MA 5,50,0 VAR filter 1%	3235.07	227.43	16	8	8	1955	0.00202	0.5381	0.02120	1582	0.00027	0.4823	0.00175
							1.36025				*-1.57616*		*2.54330*
MA 1,14 TIME filter 1%	3104.89	218.27	195	106	90	1781	0.00216	0.5255	0.02068	1756	0.00031	0.5006	0.00185
							1.55619				*-1.56571*		*2.70364*
MA 5,150 TIME filter 1DAY	3065.51	215.51	66	26	40	1686	0.00225	0.5297	0.02004	1851	0.00032	0.4981	0.00193
							1.67729				*-1.57614*		*2.81755*
MA 5,150,0 TIME filter 1%	2967.4	192.03	20	8	12	1692	0.00218	0.5296	0.02007	1845	0.00038	0.4981	0.00180
							1.56292				*-1.47178*		*2.62817*
MA 1,150 W filter 1%	2842.36	199.82	33	11	22	1822	0.00209	0.5390	0.02146	1715	0.00034	0.4857	0.00175
							1.44867				*-1.50324*		*2.55639*
MA 1,50 TIME filter 1%	2833.2	199.18	92	44	48	1848	0.00201	0.5168	0.01914	1689	0.00039	0.5092	0.00162
							1.31846				*-1.41243*		*2.36517*
MA 5,150,0 W filter 1%	2731.52	208.61	60	22	38	1806	0.00213	0.5393	0.02157	1731	0.00031	0.4858	0.00182
							1.51242				*-1.55821*		*2.65926*
MA 2,200,0 VAR	2623.58	184.44	16	5	11	2699	0.00146	0.5228	0.02195	838	0.00052	0.4821	0.00094
							0.42305				*-0.92105*		*1.16824*
MA 1,200,0 VAR	2574.14	180.96	36	9	27	2681	0.00146	0.5248	0.02189	856	0.00054	0.4766	0.00092
							0.42224				*-0.90317*		*1.15174*
MA 2,200 TIME filter 1DAY	2449.83	172.22	51	14	37	1647	0.00218	0.5325	0.02070	1890	0.00042	0.4963	0.00176
							1.54867				*-1.41443*		*2.56609*
MA 2,200,0 VAR filter 1%	2449.31	172.19	11	2	9	2703	0.00144	0.5220	0.02197	834	0.00060	0.4844	0.00084
							0.38475				*-0.81713*		*1.04224*
MA 2,200,0 TIME filter 1%	2366.4	166.36	80	28	52	1642	0.00217	0.5353	0.02069	1895	0.00044	0.4939	0.00173
							1.53061				*-1.38112*		*2.52185*
MA 5,150 W filter 1DAY	2237.12	157.27	31	11	20	1802	0.00198	0.5355	0.02161	1735	0.00047	0.4899	0.00151
							1.25660				*-1.29113*		*2.20641*

Appendix I. Table I. Results for Moving Average Rules for the full sample of Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,50 TIME filter 1DAY	2147.04	150.94	125	55	70	1853	0.00187	0.5143	0.01928	1684	0.00055	0.5119	0.00132
							1.07970				*-1.14541*		*1.92693*
MA 2,200 VAR filter 1DAY	2130.87	149.80	15	3	12	2700	0.00139	0.5200	0.02196	837	0.00076	0.4910	0.00063
							0.28847				*-0.61374*		*0.78265*
MA 1,200 VAR filter 1%	2046.73	143.89	22	7	15	2694	0.00138	0.5215	0.02183	843	0.00081	0.4864	0.00057
							0.26907				*-0.55139*		*0.70986*
MA 2,200,0 TIME	1967.96	138.35	136	56	80	1590	0.00210	0.5377	0.01965	1947	0.00054	0.4931	0.00156
							1.39985				*-1.21913*		*2.26824*
MA 1,150,0 VAR	1943.5	136.63	50	11	39	2483	0.00146	0.5264	0.02199	1054	0.00073	0.4820	0.00073
							0.41298				*-0.71426*		*0.97592*
MA 1,50 TIME filter 1DAY	1876.88	131.95	105	47	58	1832	0.00182	0.5087	0.01930	1705	0.00062	0.5179	0.00120
							0.99029				*-1.03353*		*1.75262*
MA 5,150 VAR filter 1DAY	1857.68	130.60	16	7	9	2530	0.00142	0.5245	0.02212	1007	0.00079	0.4846	0.00063
							0.33975				*-0.61919*		*0.83099*
MA 5,150,0 VAR	1734.93	121.97	17	4	13	2529	0.00140	0.5243	0.02216	1008	0.00085	0.4851	0.00055
							0.30197				*-0.53684*		*0.72569*
MA 1,150 E filter 1%	1719.17	120.86	34	12	22	1948	0.00172	0.5323	0.02156	1589	0.00065	0.4896	0.00107
							0.83611				*-0.96016*		*1.55569*
MA 1,150 S filter 1%	1642.93	115.50	23	8	15	1864	0.00177	0.5343	0.02180	1673	0.00065	0.4895	0.00112
							0.91008				*-0.97723*		*1.63445*
MA 1,200 TIME filter 1%	1605.34	112.86	39	14	25	1674	0.00191	0.5269	0.02068	1863	0.00064	0.5008	0.00127
							1.10997				*-1.03010*		*1.85340*
MA 1,150 VAR filter 1%	1582.69	111.26	26	9	17	2491	0.00137	0.5247	0.02198	1046	0.00092	0.4857	0.00045
							0.24426				*-0.44685*		*0.60027*
MA 1,150,0 W	1566.86	110.15	54	13	41	1688	0.00186	0.5350	0.01981	1849	0.00067	0.4932	0.00119
							1.03004				*-0.97617*		*1.73734*
MA 1,150 TRI filter 1%	1539.19	108.21	27	9	18	1846	0.00175	0.5325	0.02176	1691	0.00068	0.4920	0.00107
							0.87295				*-0.93091*		*1.56226*
MA 1,14 TIME filter 1DAY	1512.37	106.32	235	115	120	1798	0.00175	0.5261	0.02011	1739	0.00072	0.4997	0.00103
							0.86540				*-0.87261*		*1.50510*
MA 5,150 E filter 1DAY	1467.42	103.16	25	10	15	1921	0.00168	0.5336	0.02196	1616	0.00072	0.4889	0.00096
							0.76299				*-0.85116*		*1.39778*
MA 5,150,0 E filter 1%	1418.52	99.72	21	8	13	1936	0.00164	0.5294	0.02167	1601	0.00075	0.4934	0.00089
							0.69537				*-0.79949*		*1.29485*
MA 2,200,0 S	1413.43	99.36	24	9	15	1853	0.00169	0.5283	0.02110	1684	0.00075	0.4964	0.00094
							0.77121				*-0.81341*		*1.37220*
MA 5,150,0 VAR filter 1%	1383.95	97.29	13	4	9	2511	0.00132	0.5213	0.02210	1026	0.00105	0.4932	0.00027
							0.15067				*-0.26334*		*0.35813*
MA 2,200,0 EXP	1369.74	96.29	36	12	24	1911	0.00162	0.5228	0.02088	1626	0.00079	0.5018	0.00083
							0.65783				*-0.73814*		*1.20907*
MA 1,200,0 EXP	1360.58	95.65	47	13	34	1908	0.00162	0.5241	0.02097	1629	0.00079	0.5003	0.00083
							0.65749				*-0.73861*		*1.20923*

Appendix I. Table I. Results for Moving Average Rules for the full sample of Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,200,0 S	1347.17	94.71	33	9	24	1850	0.00166	0.5286	0.02107	1687	0.00077	0.4961	0.00089
							0.71941				*-0.78068*		*1.29932*
MA 5,150,0 W	1326.17	93.23	34	10	24	1675	0.00178	0.5301	0.01985	1862	0.00075	0.4979	0.00103
							0.89478				*-0.84110*		*1.50320*
MA 1,150,0 S	1310.81	92.15	33	8	25	1727	0.00175	0.5298	0.02107	1810	0.00075	0.4972	0.00100
							0.85384				*-0.83329*		*1.46106*
MA 5,50,0 EXP	1290.81	90.74	51	17	34	1679	0.00176	0.5319	0.01942	1858	0.00077	0.4962	0.00099
							0.86234				*-0.80620*		*1.44499*
MA 1,150,0 EXP	1283.97	90.26	55	14	41	1796	0.00166	0.5312	0.02000	1741	0.00080	0.4945	0.00086
							0.71242				*-0.73864*		*1.25670*
MA 1,200,0 TIMESERIES	1259.02	88.51	73	21	52	1587	0.00183	0.5255	0.01931	1950	0.00076	0.5031	0.00107
							0.95974				*-0.83639*		*1.55551*
MA 1,200,0 W	1249.34	87.83	48	13	35	1719	0.00172	0.5305	0.02009	1818	0.00079	0.4967	0.00093
							0.80236				*-0.76639*		*1.35863*
MA 1,200 E filter 1%	1244.41	87.48	30	12	18	1998	0.00155	0.5230	0.02242	1539	0.00084	0.5003	0.00071
							0.54440				*-0.64378*		*1.02886*
MA 1,200,0 TRI	1222.23	85.92	35	11	24	1780	0.00167	0.5275	0.02127	1757	0.00080	0.4986	0.00087
							0.72721				*-0.74091*		*1.27144*
MA 1,200 S filter 1%	1203.36	84.60	20	9	11	1937	0.00159	0.5302	0.02287	1600	0.00082	0.4925	0.00077
							0.60855				*-0.68513*		*1.12021*
MA 5,150,0 EXP	1167.58	82.08	27	10	17	1791	0.00162	0.5276	0.02001	1746	0.00085	0.4983	0.00077
							0.64397				*-0.65534*		*1.12523*
MA 2,200 W filter 1DAY	1164.59	81.87	33	10	23	1799	0.00165	0.5336	0.02177	1738	0.00082	0.4919	0.00083
							0.69584				*-0.70466*		*1.21283*
MA 5,150,0 TRI filter 1%	1141.13	80.22	18	8	10	1849	0.00160	0.5316	0.02195	1688	0.00084	0.4929	0.00076
							0.61653				*-0.66454*		*1.10956*
MA 2,200,0 W	1136.32	79.88	39	11	28	1716	0.00167	0.5303	0.02008	1821	0.00084	0.4970	0.00083
							0.71836				*-0.68160*		*1.21248*
MA 1,200 W filter 1%	1103.08	77.55	31	9	22	1797	0.00162	0.5314	0.02178	1740	0.00084	0.4943	0.00078
							0.64469				*-0.67136*		*1.13979*
MA 5,150 S filter 1DAY	1085.27	76.29	22	8	14	1865	0.00157	0.5324	0.02210	1672	0.00087	0.4916	0.00070
							0.56675				*-0.61272*		*1.02150*
MA 5,150 TRI filter 1DAY	1076.41	75.67	23	10	13	1837	0.00159	0.5308	0.02202	1700	0.00087	0.4941	0.00072
							0.59812				*-0.61617*		*1.05146*
MA 1,150,0 TRI	1042.5	73.29	40	11	29	1705	0.00163	0.5302	0.01999	1832	0.00088	0.4973	0.00075
							0.65012				*-0.61466*		*1.09539*
MA 2,200,0 W filter 1%	1022.71	71.90	28	9	19	1790	0.00159	0.5324	0.02185	1747	0.00088	0.4934	0.00071
							0.59302				*-0.60504*		*1.03756*
MA 2,200,0 S filter 1%	1018.92	71.63	19	9	10	1946	0.00150	0.5272	0.02281	1591	0.00092	0.4959	0.00058
							0.45274				*-0.52099*		*0.84337*
MA 2,200,0 TRI	969.06	68.13	30	9	21	1780	0.00155	0.5236	0.02126	1757	0.00092	0.5026	0.00063
							0.52427				*-0.53884*		*0.92070*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,200 TRI filter 1%	942.9	66.29	20	8	12	1870	0.00152	0.5283	0.02308	1667	0.00093	0.4961	0.00059
							0.48130				*-0.51284*		*0.86084*
MA 2,200 S filter 1DAY	933.02	65.59	21	8	13	1935	0.00147	0.5287	0.02296	1602	0.00096	0.4944	0.00051
							0.39977				*-0.45695*		*0.74203*
MA 2,200 TRI filter 1DAY	912.93	64.18	25	8	17	1865	0.00151	0.5249	0.02328	1672	0.00094	0.5000	0.00057
							0.46371				*-0.49680*		*0.83179*
MA 2,200,0 TRI filter 1%	877.77	61.71	20	8	12	1882	0.00148	0.5260	0.02305	1655	0.00097	0.4985	0.00051
							0.41341				*-0.44557*		*0.74381*
MA 5,150,0 S filter 1%	841.86	59.18	21	8	13	1873	0.00144	0.5302	0.02209	1664	0.00101	0.494	0.00043
							0.34397				*-0.38026*		*0.62733*
MA 5,150,0 S	816.5	53.40	22	7	15	1732	0.00148	0.5271	0.02002	1805	0.00101	0.4997	0.00047
							0.40220				*-0.39078*		*0.68674*
MA 5,150,0 TRI	766.49	53.88	24	8	16	1701	0.00147	0.5250	0.01990	1836	0.00103	0.5022	0.00044
							0.38310				*-0.35881*		*0.64257*
MA 2,200 E filter 1DAY	702.99	49.42	33	10	23	1996	0.00128	0.5195	0.02191	1541	0.00118	0.5049	0.00010
							0.07022				*-0.09661*		*0.14493*
MA 2,200,0 E filter 1%	651.09	45.77	27	9	18	2002	0.00125	0.5185	0.02182	1535	0.00123	0.5062	0.00002
							0.01757				*-0.01608*		*0.02897*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**3770.77%**
Annual Buy/Hold return	**265.09%**
Observations	**3537**
Days in test	**5192**

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,14,0 W	1742.95	426.39	62	30	32	555	0.00557	0.6144	0.02537	448	-0.00140	0.4598	0.00697
t-statistic							*2.33135*				*-2.69700*		*4.35493*
MA 1,50 TRI filter 1%	1609.94	393.85	10	7	3	605	0.00497	0.6017	0.02317	398	-0.00136	0.4598	0.00633
							1.93342				*-2.56022*		*3.89211*
MA 1,50 W filter 1DAY	1533.62	375.18	15	7	8	590	0.00501	0.5983	0.02325	413	-0.00119	0.4697	0.00620
							1.94886				*-2.47878*		*3.83491*
MA 1,50 W filter 1%	1473.12	360.38	13	7	6	600	0.00487	0.6000	0.02333	403	-0.00114	0.4640	0.00601
							1.85152				*-2.42363*		*3.70310*
MA 5,50,0 S filter 1%	1442.80	352.96	6	5	1	616	0.00473	0.6055	0.02363	387	-0.00116	0.4496	0.00589
							1.75822				*-2.40193*		*3.60349*
MA 5,50,0 TRI filter 1%	1412.17	345.57	8	7	1	613	0.00472	0.6036	0.02350	390	-0.00109	0.4538	0.00581
							1.74782				*-2.36207*		*3.55960*
MA 5,50,0 E filter 1%	1390.54	340.18	5	4	1	618	0.00467	0.5971	0.02417	385	-0.00110	0.4623	0.00577
							1.71343				*-2.35773*		*3.52666*
MA 1,14 TRIANGULAR	1379.89	337.57	45	20	25	561	0.00506	0.6078	0.02227	442	-0.00084	0.4661	0.00590
							1.95554				*-2.29519*		*3.68135*
MA 5,50 S filter 1DAY	1359.10	332.49	10	6	4	604	0.00473	0.5993	0.02386	399	-0.00098	0.4637	0.00571
							1.74750				*-2.30774*		*3.51240*
MA 5,50 E filter 1DAY	1351.73	330.68	9	5	4	634	0.00451	0.5946	0.02384	369	-0.00107	0.4607	0.00558
							1.60182				*-2.30208*		*3.38185*
MA 1,50 TRI filter 1DAY	1338.93	327.55	13	7	6	592	0.00480	0.6014	0.02390	411	-0.00091	0.4647	0.00571
							1.79015				*-2.28480*		*3.52923*
MA 1,14 SIMPLE	1319.85	322.88	44	20	24	572	0.00490	0.6049	0.02238	431	-0.00078	0.4664	0.00568
							1.84652				*-2.23378*		*3.53385*
MA 5,50,0 W filter 1%	1308.25	320.05	10	6	4	608	0.00462	0.5938	0.02304	395	-0.00087	0.4709	0.00549
							1.66617				*-2.22594*		*3.37121*
MA 5,50 W filter 1DAY	1300.23	318.08	15	7	8	596	0.00471	0.5923	0.02351	407	-0.00084	0.4767	0.00555
							1.72488				*-2.22961*		*3.42512*
MA 1,14,0 Variable	1265.87	309.68	17	9	8	617	0.00447	0.5883	0.02124	386	-0.00076	0.4767	0.00523
							1.55744				*-2.13467*		*3.19816*
MA 1,50 S filter 1DAY	1249.32	305.63	12	6	6	612	0.00455	0.5997	0.02395	391	-0.00081	0.4604	0.00536
							1.61541				*-2.17788*		*3.28542*
MA 1,14,0 EXP	1246.96	305.05	50	20	30	592	0.00467	0.6081	0.02311	411	-0.00072	0.4550	0.00539
							1.69061				*-2.15606*		*3.33145*
MA 1,14 VAR filter 1DAY	1246.90	305.04	20	10	10	617	0.00447	0.5916	0.02236	386	-0.00076	0.4715	0.00523
							1.55744				*-2.13467*		*3.19816*
MA 1,14 VAR filter 1%	1216.93	297.71	19	8	11	617	0.00442	0.5932	0.02188	386	-0.00068	0.4689	0.00510
							1.51866				*-2.08167*		*3.11867*
MA 1,50 S filter 1%	1151.19	281.62	12	7	5	607	0.00446	0.5947	0.02392	396	-0.00060	0.4697	0.00506
							1.54184				*-2.04742*		*3.10853*
MA 5,50 TRI filter 1DAY	1147.13	280.63	12	7	5	593	0.00455	0.5953	0.02394	410	-0.00057	0.4732	0.00512
							1.59958				*-2.05264*		*3.16338*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 E filter 1%	1129.26	276.26	15	6	9	636	0.00423	0.5881	0.02363	367	-0.00061	0.4714	0.00484
							1.38416				*-1.99829*		*2.93001*
MA 1,50,0 VAR	1118.55	273.64	15	5	10	682	0.00397	0.5924	0.02445	321	-0.00076	0.4455	0.00473
							1.20575				*-1.99387*		*2.77312*
MA 1,14 W filter 1%	1111.05	271.80	36	15	21	573	0.00461	0.5899	0.02229	430	-0.00041	0.4860	0.00502
							1.62779				*-1.97724*		*3.12232*
MA 1,14 TRI filter 1%	1081.80	264.65	35	14	21	575	0.00454	0.5896	0.02184	428	-0.00034	0.4860	0.00488
							1.57648				*-1.92590*		*3.03346*
MA 5,50,0 VAR	1071.03	262.02	4	2	2	686	0.00390	0.5889	0.02493	317	-0.00067	0.4511	0.00457
							1.15178				*-1.92898*		*2.67036*
MA 1,50,0 TRI	1066.44	260.89	16	7	9	504	0.00518	0.6071	0.02437	499	-0.00029	0.4830	0.00547
							1.97548				*-1.99355*		*3.43728*
MA 1,50 E filter 1DAY	1063.66	260.21	16	6	10	628	0.00420	0.5924	0.02393	375	-0.00046	0.4667	0.00466
							1.35540				*-1.91573*		*2.83364*
MA 1,14 E filter 1DAY	1044.66	255.56	34	15	19	591	0.00440	0.5888	0.02336	412	-0.00033	0.4830	0.00473
							1.48309				*-1.89343*		*2.92460*
MA 5,50 VAR filter 1DAY	1028.17	251.53	4	2	2	686	0.00385	0.5860	0.02496	317	-0.00055	0.4574	0.00440
							1.11173				*-1.85507*		*2.57103*
MA 1,50 VAR filter 1%	1026.48	251.12	6	2	4	685	0.00285	0.5912	0.02463	318	-0.00053	0.4465	0.00338
							0.31064				*-1.84496*		*1.97669*
MA 1,50,0 W	980.78	239.94	21	7	14	504	0.00502	0.6071	0.02387	499	-0.00012	0.4830	0.00514
							1.85919				*-1.87040*		*3.22992*
MA 1,14 TRI filter 1DAY	961.55	235.23	33	16	17	558	0.00449	0.5860	0.02245	445	-0.00009	0.4944	0.00458
							1.52387				*-1.77803*		*2.85973*
MA 5,50,0 W	941.45	230.31	14	6	8	506	0.00493	0.5929	0.02429	497	-0.00006	0.4970	0.00499
							1.79614				*-1.82449*		*3.13557*
MA 1,50 VAR filter 1DAY	929.44	227.38	8	2	6	685	0.00371	0.5854	0.02463	318	-0.00024	0.4591	0.00395
							0.99917				*-1.66614*		*2.31004*
MA 5,50,0 VAR filter 1%	919.65	224.98	4	2	2	675	0.00376	0.5822	0.02513	328	-0.00022	0.4695	0.00398
							1.03465				*-1.67329*		*2.34658*
MA 1,150,0 TIMESERIES	872.11	213.35	9	6	3	470	0.00515	0.6000	0.02470	533	0.00008	0.4972	0.00507
							1.90827				*-1.76349*		*3.17968*
MA 1,14 E filter 1%	870.22	212.89	31	11	20	585	0.00416	0.5778	0.02314	418	0.00008	0.5000	0.00408
							1.29525				*-1.62367*		*2.52807*
MA 1,150 TIME filter 1%	854.84	209.13	5	3	2	482	0.00499	0.5975	0.02443	521	0.00012	0.4971	0.00487
							1.81009				*-1.72098*		*3.05798*
MA 1,50,0 S	843.63	206.38	15	6	9	514	0.00469	0.6070	0.02509	489	0.00011	0.4806	0.00458
							1.62992				*-1.69228*		*2.87716*
MA 1,14 TIME SERIES	804.24	196.75	83	54	29	482	0.00493	0.6100	0.02697	521	0.00018	0.4856	0.00475
							1.76713				*-1.67689*		*2.98263*
MA 5,50,0	801.13	195.99	9	6	3	508	0.00465	0.5984	0.02508	495	0.00021	0.4909	0.00444
							1.59445				*-1.62697*		*2.78985*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,14 W filter 1DAY	790.47	193.38	39	20	19	555	0.00421	0.5892	0.02292	448	0.00029	0.4911	0.00392
							1.31120				*-1.51680*		*2.44926*
MA 1,14 S filter 1%	787.66	192.69	33	14	19	580	0.00403	0.5810	0.02262	423	0.00031	0.4965	0.00372
							1.19284				*-1.47305*		*2.30882*
MA 5,50,0 TRI	752.43	184.07	12	6	6	500	0.00461	0.5960	0.02506	503	0.00032	0.4950	0.00429
							1.55705				*-1.55580*		*2.69581*
MA 1,14 S filter 1DAY	733.10	179.34	33	14	19	574	0.00395	0.5767	0.02249	429	0.00046	0.5035	0.00349
							1.12825				*-1.37716*		*2.17006*
MA 5,150,0 TIMESERIES	713.75	174.61	16	7	9	472	0.00474	0.5911	0.02419	531	0.00043	0.5047	0.00431
							1.61954				*-1.50253*		*2.70370*
MA 1,200,0 VAR	713.29	174.50	3	2	1	965	0.00250	0.5472	0.02561	38	0.00152	0.5000	0.00098
							0.03344				*-0.22619*		*0.23515*
MA 1,200 VAR filter 1%	700.33	171.33	2	2	0	968	0.00247	0.5444	0.02557	35	0.00213	0.5714	0.00034
							0.00705				*-0.07662*		*0.07842*
MA 2,200,0 VAR filter 1%	695.35	170.11	0	0	0	976	0.00245	0.5441	0.02548	27	0.00292	0.5926	-0.00047
							-0.01059				*0.09319*		*-0.09560*
MA 2,200,0 VAR	694.77	169.97	1	1	0	966	0.00247	0.5445	0.02561	37	0.00215	0.5676	0.00032
							0.00704				*-0.07396*		*0.07581*
MA 5,150 VAR filter 1DAY	677.02	165.62	1	1	0	925	0.00256	0.5470	0.02612	78	0.00132	0.5256	0.00124
							0.08531				*-0.38554*		*0.41735*
MA 5,150,0 TIME filter 1%	676.22	165.43	11	5	6	477	0.00460	0.5870	0.02414	526	0.00052	0.5076	0.00408
							1.52546				*-1.43153*		*2.56080*
MA 2,200 VAR filter 1DAY	675.98	165.37	1	1	0	965	0.00245	0.5430	0.02562	38	0.00272	0.6053	-0.00027
							-0.01056				*0.06195*		*-0.06479*
MA 5,150,0 VAR	673.71	164.81	2	2	0	925	0.00255	0.5481	0.02612	78	0.00139	0.5128	0.00116
							0.07661				*-0.36190*		*0.39043*
MA 1,50,0 EXP	670.95	164.14	27	6	21	530	0.00417	0.5906	0.02500	473	0.00054	0.4947	0.00363
							1.26217				*-1.36743*		*2.27739*
MA 5,150,0 VAR filter 1%	661.96	161.94	2	2	0	919	0.00255	0.5462	0.02619	84	0.00148	0.5357	0.00107
							0.07648				*-0.34308*		*0.37252*
MA 1,150,0 VAR	645.82	157.99	6	3	3	921	0.00251	0.5505	0.02569	82	0.00192	0.4878	0.00059
							0.04174				*-0.18726*		*0.20317*
MA 1,150 VAR filter 1%	641.62	156.96	4	3	1	921	0.00250	0.5494	0.02569	82	0.00199	0.5000	0.00051
							0.03304				*-0.16308*		*0.17562*
MA 1,50,0 TIME	638.12	156.11	41	24	17	520	0.00409	0.5519	0.02170	483	0.00071	0.5383	0.00338
							1.19556				*-1.25534*		*2.12253*
MA 5,150,0 W filter 1%	636.97	155.83	4	2	2	555	0.00396	0.5874	0.02666	448	0.00060	0.4933	0.00336
							1.12367				*-1.30032*		*2.09936*
MA 5,150 TIME filter 1DAY	627.30	153.46	13	7	6	471	0.00451	0.5817	0.02422	532	0.00064	0.5132	0.00387
							1.45497				*-1.34807*		*2.42739*
MA 1,150 W filter 1%	626.52	153.27	6	2	4	559	0.00390	0.5921	0.02620	444	0.00065	0.4865	0.00325
							1.08115				*-1.26148*		*2.02882*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,150 W filter 1DAY	571.40	139.79	7	3	4	555	0.00380	0.5856	0.02677	448	0.00081	0.4955	0.00299
							1.00365				*-1.15366*		*1.86818*
MA 5,50,0 TIME filter 1%	533.63	130.55	30	13	17	525	0.00376	0.5524	0.02162	478	0.00104	0.5377	0.00272
							0.95622				*-1.01531*		*1.70736*
MA 1,50 TIME filter 1%	438.07	107.17	26	14	12	525	0.00345	0.5505	0.02191	478	0.00137	0.5397	0.00208
							0.72784				*-0.77969*		*1.30563*
MA 2,200 TIME filter 1DAY	431.47	105.56	13	3	10	436	0.00417	0.5711	0.02592	567	0.00114	0.5256	0.00303
							1.18158				*-0.99847*		*1.88773*
MA 2,200,0 TIMESERIES filter	391.50	95.77	19	6	13	434	0.00400	0.5760	0.02546	569	0.00129	0.5220	0.00271
							1.06227				*-0.88618*		*1.68746*
MA 5,150 S filter 1DAY	376.76	92.17	6	2	4	543	0.00331	0.5820	0.02903	460	0.00146	0.5022	0.00185
							0.63162				*-0.70614*		*1.15855*
MA 1,14 TIME filter 1%	374.20	91.54	57	36	21	478	0.00364	0.5669	0.02807	525	0.00138	0.5257	0.00226
							0.84110				*-0.79709*		*1.41862*
MA 1,150 S filter 1%	360.64	88.23	7	2	5	544	0.00321	0.5772	0.02835	459	0.00157	0.5076	0.00164
							0.55747				*-0.62815*		*1.02686*
MA 1,200 TIME filter 1%	353.98	86.60	9	3	6	435	0.00382	0.5678	0.02596	568	0.00142	0.5282	0.00240
							0.93870				*-0.78744*		*1.49483*
MA 1,150 TRI filter 1%	335.37	82.04	8	3	5	545	0.00309	0.5761	0.02785	458	0.00171	0.5087	0.00138
							0.46831				*-0.52916*		*0.86392*
MA 5,150,0 E filter 1%	334.47	81.82	6	2	4	619	0.00273	0.5622	0.02664	384	0.00203	0.5182	0.00070
							0.20807				*-0.28568*		*0.42763*
MA 1,150 E filter 1%	333.27	81.53	11	3	8	626	0.00269	0.5639	0.02637	377	0.00208	0.5146	0.00061
							0.17763				*-0.25093*		*0.37132*
MA 5,50 TIME filter 1DAY	330.96	80.97	37	18	19	522	0.00304	0.5326	0.02172	481	0.00189	0.5593	0.00115
							0.42500				*-0.40928*		*0.72205*
MA 5,150,0 TRI filter 1%	327.67	80.16	5	2	3	549	0.00306	0.5738	0.02860	454	0.00173	0.5110	0.00133
							0.44700				*-0.51354*		*0.83201*
MA 5,150 TRI filter 1DAY	323.74	79.20	6	2	4	549	0.00305	0.5719	0.02860	454	0.00175	0.5132	0.00130
							0.43952				*-0.49951*		*0.81324*
MA 5,150 E filter 1DAY	322.52	78.90	7	3	4	617	0.00271	0.5689	0.02734	386	0.00206	0.5078	0.00065
							0.19235				*-0.26634*		*0.39748*
MA 1,200,0 S	312.29	76.40	4	2	2	493	0.00321	0.5639	0.02637	510	0.00173	0.5275	0.00148
							0.53966				*-0.53412*		*0.92989*
MA 1,50 TIME filter 1DAY	307.65	75.26	32	17	15	523	0.00293	0.5296	0.02194	480	0.00195	0.5625	0.00098
							0.34434				*-0.36609*		*0.61526*
MA 2,200,0 S	297.83	72.86	4	2	2	492	0.00315	0.5610	0.02640	511	0.00180	0.5303	0.00135
							0.49604				*-0.48336*		*0.84818*
MA 1,200,0 TRI	294.86	72.13	8	4	4	447	0.00344	0.5638	0.02747	556	0.00167	0.5306	0.00177
							0.68245				*-0.59443*		*1.10567*
MA 5,150,0 S filter 1%	280.07	68.52	6	2	4	553	0.00284	0.5714	0.02887	450	0.00200	0.5133	0.00084
							0.28321				*-0.32313*		*0.52506*

Appendix I. Table II. Results for Moving Average Rules for the period 13/10/86-12/11/90 for Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,50,0 EXP	277.32	67.84	11	5	6	420	0.00340	0.5786	0.02152	583	0.00179	0.5214	0.00161
							0.64046				*-0.51205*		*0.99827*
MA 1,200 S filter 1%	269.15	65.84	4	2	2	576	0.00273	0.5642	0.03045	427	0.00210	0.5199	0.00063
							0.20343				*-0.24861*		*0.39150*
MA 2,200 TRI filter 1DAY	263.45	64.45	7	3	4	532	0.00293	0.5583	0.03200	471	0.00193	0.5308	0.00100
							0.34627				*-0.37795*		*0.62723*
MA 5,150,0 W	259.36	63.45	6	1	5	426	0.00326	0.5728	0.02253	577	0.00187	0.5251	0.00139
							0.54759				*-0.44962*		*0.86352*
MA 1,200,0 EXP	256.33	62.71	9	3	6	547	0.00263	0.5466	0.02497	456	0.00226	0.5439	0.00037
							0.12543				*-0.14193*		*0.23155*
MA 2,200,0 TRI	253.83	62.10	7	3	4	446	0.00320	0.5583	0.02748	557	0.00187	0.5350	0.00133
							0.51458				*-0.44458*		*0.83063*
MA 1,150,0 W	252.22	61.70	10	1	9	427	0.00320	0.5831	0.02229	576	0.00191	0.5174	0.00129
							0.50683				*-0.41901*		*0.80164*
MA 2,200,0 TRI filter 1%	248.86	60.88	6	3	3	531	0.00285	0.5631	0.03162	472	0.00203	0.5254	0.00082
							0.28690				*-0.30713*		*0.51439*
MA 2,200,0 TIME	246.66	60.34	29	15	14	381	0.00352	0.5748	0.02249	622	0.00181	0.5273	0.00171
							0.69766				*-0.50697*		*1.04308*
MA 2,200,0 S filter 1%	244.92	59.92	4	2	2	574	0.00261	0.5627	0.03038	429	0.00226	0.5221	0.00035
							0.11222				*-0.13895*		*0.21763*
MA 1,200 E filter 1%	243.42	59.55	8	3	5	632	0.00235	0.5427	0.02840	371	0.00265	0.5499	-0.00030
							-0.08751				*0.12278*		*-0.18202*
MA 2,200 S filter 1DAY	240.58	58.85	4	2	2	575	0.00259	0.5617	0.03050	428	0.00229	0.5234	0.00030
							0.09711				*-0.11822*		*0.18648*
MA 1,200 TRI filter 1%	236.30	57.81	6	3	3	528	0.00279	0.5644	0.03161	475	0.00209	0.5242	0.00070
							0.24208				*-0.26504*		*0.43926*
MA 2,200,0 EXP	233.46	57.11	8	3	5	549	0.00250	0.5446	0.02496	454	0.00242	0.5463	0.00008
							0.02840				*-0.02947*		*0.05005*
MA 1,200,0 TIMESERIES	227.01	55.54	15	4	11	370	0.00344	0.5622	0.02148	633	0.00189	0.5355	0.00155
							0.63807				*-0.44717*		*0.93993*
MA 1,150,0 S	223.35	54.64	11	2	9	413	0.00322	0.5617	0.02781	590	0.00193	0.5339	0.00129
							0.51449				*-0.40691*		*0.79791*
MA 5,150,0 TRI	204.18	49.95	5	1	4	415	0.00296	0.5639	0.02356	588	0.00211	0.5323	0.00085
							0.33859				*-0.26894*		*0.52613*
MA 2,200 W filter 1DAY	202.21	49.47	12	2	10	517	0.00253	0.5706	0.02801	486	0.00238	0.5185	0.00015
							0.04984				*-0.05888*		*0.09421*
MA 5,150,0 EXP	194.36	47.55	8	2	6	486	0.00248	0.5556	0.02268	517	0.00244	0.5358	0.00004
							0.01292				*-0.01613*		*0.02512*
MA 1,200,0 W	184.25	45.08	13	4	9	439	0.00266	0.5695	0.02342	564	0.00231	0.5266	0.00035
							0.13730				*-0.11461*		*0.21822*
MA 1,200 W filter 1%	179.41	43.89	10	2	8	517	0.00238	0.5667	0.02777	486	0.00255	0.5226	-0.00017
							-0.06010				*0.06319*		*-0.10678*

Appendix I. Table II. Results for Moving Average Rules for the period 13/10/86-12/11/90 for Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,150,0 S	175.86	43.02	6	1	5	410	0.00277	0.5659	0.02420	593	0.00225	0.5312	0.00052
							0.20851				*-0.16241*		*0.32128*
MA 2,200,0 W filter 1%	173.99	42.57	9	2	7	515	0.00235	0.5689	0.02788	488	0.00258	0.5205	-0.00023
							-0.08199				*0.08484*		*-0.14448*
MA 1,150,0 TRI	168.08	41.12	9	2	7	416	0.00265	0.5649	0.02361	587	0.00233	0.5315	0.00032
							0.12793				*-0.10080*		*0.19814*
MA 1,150,0 EXP	161.95	39.62	16	2	14	486	0.00224	0.5597	0.02271	517	0.00267	0.5319	-0.00043
							-0.15940				*0.15246*		*-0.27008*
MA 2,200,0 W	149.99	36.39	13	3	10	435	0.00238	0.5632	0.02335	568	0.00252	0.5317	-0.00014
							-0.05668				*0.04383*		*-0.08720*
MA 1,14 TIME filter 1DAY	146.05	35.73	69	39	30	480	0.00223	0.5625	0.02709	523	0.00267	0.5296	-0.00044
							-0.16588				*0.15304*		*-0.27624*
MA 2,200 E filter 1DAY	127.36	31.16	8	1	7	631	0.00167	0.5420	0.02697	372	0.00381	0.5511	-0.00214
							-0.61855				*0.88120*		*-1.29916*
MA 2,200,0 E filter 1%	115.42	28.24	8	1	7	633	0.00158	0.5371	0.02691	370	0.00398	0.5595	-0.00240
							-0.68951				*0.99038*		*-1.45538*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**759.10%**
Annual Buy/Hold return	**185.70%**
Observations	**1003**
Days in test	**1492**

Appendix I. Table III. Results for Moving Average Rules for the period 13/11/90-31/12/96 for Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,14 TRIANGULAR	155.99	25.41	91	26	65	643	0.00159	0.5148	0.01555	890	-0.00076	0.4663	0.00235
t-statistic							*1.95870*				*-1.57585*		*3.06116*
MA 1,14,0 W	140.40	22.87	115	36	79	659	0.00145	0.5159	0.01556	874	-0.00070	0.4645	0.00215
							1.77304				*-1.47136*		*2.80966*
MA 1,14 TIME SERIES	137.86	22.45	142	66	76	803	0.00119	0.5230	0.01464	730	-0.00083	0.4466	0.00202
							1.49351				*-1.58173*		*2.66310*
MA 1,14 SIMPLE	136.99	22.31	90	26	64	647	0.00146	0.5085	0.01557	886	-0.00067	0.4707	0.00213
							1.77603				*-1.42982*		*2.77694*
MA 1,14,0 EXP	135.81	22.12	105	25	80	653	0.00144	0.5100	0.01560	880	-0.00067	0.4693	0.00211
							1.75294				*-1.42674*		*2.75422*
MA 1,50,0 W	133.93	21.81	48	12	36	627	0.00147	0.5136	0.01524	906	-0.00064	0.4680	0.00211
							1.77066				*-1.39166*		*2.73841*
MA 1,50,0 TRI	120.72	19.66	32	9	23	613	0.00141	0.5171	0.01543	920	-0.00057	0.4663	0.00198
							1.67184				*-1.28520*		*2.56039*
MA 1,50,0 S	118.19	19.25	31	11	20	624	0.00137	0.5176	0.01561	909	-0.00056	0.4653	0.00193
							1.62567				*-1.26427*		*2.50293*
MA 1,50,0 TIME	115.99	18.89	60	18	42	759	0.00112	0.5086	0.01433	774	-0.00065	0.4651	0.00177
							1.35955				*-1.33787*		*2.33605*
MA 5,50,0 W	111.23	18.12	28	10	18	623	0.00132	0.5024	0.01538	910	-0.00052	0.4758	0.00184
							1.55379				*-1.20026*		*2.38561*
MA 1,50 S filter 1DAY	109.13	17.77	21	10	11	623	0.00131	0.5104	0.01545	910	-0.00051	0.4703	0.00182
							1.53960				*-1.18415*		*2.35968*
MA 1,50,0 EXP	107.17	17.45	39	10	29	654	0.00123	0.5153	0.01543	879	-0.00053	0.4653	0.00176
							1.45074				*-1.20313*		*2.29781*
MA 1,50 S filter 1%	105.49	17.18	17	9	8	641	0.00124	0.5148	0.01519	892	-0.00050	0.4664	0.00174
							1.45487				*-1.16071*		*2.26557*
MA 1,14 W filter 1%	99.18	16.15	52	18	34	645	0.00121	0.4868	0.01666	888	-0.00049	0.4865	0.00170
							1.41497				*-1.14308*		*2.21540*
MA 1,50 W filter 1%	99.16	16.15	23	8	15	635	0.00120	0.5024	0.01514	898	-0.00046	0.4755	0.00166
							1.39291				*-1.09900*		*2.15849*
MA 1,14,0 Variable	96.42	15.70	26	10	16	627	0.00119	0.5056	0.01497	906	-0.00044	0.4735	0.00163
							1.37244				*-1.06989*		*2.11545*
MA 1,50 TRI filter 1%	96.38	15.70	18	8	10	608	0.00123	0.5115	0.01527	925	-0.00043	0.4703	0.00166
							1.41374				*-1.06067*		*2.14362*
MA 5,50 W filter 1DAY	96.26	15.68	27	10	17	621	0.00120	0.4944	0.01528	912	-0.00044	0.4814	0.00164
							1.38193				*-1.07211*		*2.12522*
MA 5,50,0	91.63	14.92	18	8	10	620	0.00117	0.5032	0.01536	913	-0.00042	0.4754	0.00159
							1.33864				*-1.04022*		*2.05990*
MA 1,14 VAR filter 1DAY	91.60	14.92	30	9	21	615	0.00117	0.5041	0.01491	918	-0.00041	0.4749	0.00158
							1.33479				*-1.02585*		*2.04425*
MA 5,50,0 W filter 1%	91.59	14.92	16	9	7	618	0.00117	0.5032	0.01528	915	-0.00041	0.4754	0.00158
							1.33711				*-1.02480*		*2.04588*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 W filter 1DAY	91.42	14.89	31	10	21	627	0.00115	0.4976	0.01509	906	-0.00042	0.4790	0.00157
							1.31555				*-1.03771*		*2.03758*
MA 5,50,0 TRI	89.36	14.55	24	11	13	602	0.00118	0.4983	0.01536	931	-0.00039	0.4791	0.00157
							1.33864				*-0.99791*		*2.02391*
MA 1,14 E filter 1%	88.74	14.45	38	15	23	663	0.00109	0.4977	0.01649	870	-0.00044	0.4782	0.00153
							1.25463				*-1.05624*		*2.00090*
MA 1,50 E filter 1DAY	87.68	14.28	28	10	18	656	0.00108	0.5000	0.01518	877	-0.00041	0.4766	0.00149
							1.23553				*-1.01117*		*1.94606*
MA 5,50 S filter 1DAY	85.00	13.84	16	8	8	621	0.00111	0.5056	0.01538	912	-0.00038	0.4737	0.00149
							1.25437				*-0.97538*		*1.93084*
MA 5,50,0 TRI filter 1%	83.97	13.68	16	8	8	612	0.00111	0.5016	0.01526	921	-0.00037	0.4767	0.00148
							1.24786				*-0.96221*		*1.91331*
MA 5,50,0 TIME filter 1%	80.48	13.11	39	16	23	761	0.00088	0.4901	0.01440	772	-0.00042	0.4832	0.00130
							0.99586				*-0.98535*		*1.71578*
MA 1,14 TRI filter 1%	80.14	13.05	54	16	38	663	0.00102	0.4796	0.01650	870	-0.00038	0.4920	0.00140
							1.15310				*-0.96094*		*1.83089*
MA 5,50 TIME filter 1DAY	75.97	12.37	50	17	33	762	0.00084	0.4856	0.01428	771	-0.00039	0.4877	0.00123
							0.93545				*-0.93912*		*1.62341*
MA 1,14 E filter 1DAY	75.90	12.36	66	20	46	657	0.00099	0.4932	0.01582	876	-0.00035	0.4817	0.00134
							1.10607				*-0.91530*		*1.75048*
MA 1,50 TRI filter 1DAY	74.93	12.20	25	10	15	611	0.00104	0.4992	0.01541	922	-0.00031	0.4783	0.00135
							1.14849				*-0.86547*		*1.74477*
MA 1,14 S filter 1DAY	73.55	11.98	62	18	44	642	0.00098	0.4798	0.01579	891	-0.00032	0.4916	0.00130
							1.08279				*-0.87223*		*1.69304*
MA 5,50,0 S filter 1%	69.91	11.39	13	7	6	632	0.00096	0.5032	0.01552	901	-0.00029	0.4750	0.00125
							1.04828				*-0.82712*		*1.62423*
MA 1,50 TIME filter 1%	67.73	11.03	33	15	18	758	0.00079	0.4868	0.01432	775	-0.00032	0.4865	0.00111
							0.85789				*-0.83366*		*1.46496*
MA 5,50 E filter 1DAY	65.29	10.63	17	8	9	642	0.00091	0.5000	0.01561	891	-0.00027	0.4770	0.00118
							0.98240				*-0.79220*		*1.53676*
MA 1,14 S filter 1%	64.37	10.48	48	16	32	671	0.00087	0.4888	0.01635	862	-0.00028	0.4849	0.00115
							0.93945				*-0.79975*		*1.50602*
MA 1,14 VAR filter 1%	63.93	10.41	25	8	17	635	0.00089	0.5055	0.01508	898	-0.00025	0.4733	0.00114
							0.95003				*-0.76208*		*1.48234*
MA 5,50 TRI filter 1DAY	62.31	10.15	23	10	13	600	0.00092	0.4950	0.01522	933	-0.00022	0.4812	0.00114
							0.97303				*-0.72254*		*1.46872*
MA 1,50 TIME filter 1DAY	61.51	10.02	42	15	27	754	0.00074	0.4788	0.01449	779	-0.00027	0.4942	0.00101
							0.78058				*-0.75847*		*1.33289*
MA 5,50,0 EXP	59.00	9.61	22	8	14	642	0.00084	0.5000	0.01544	891	-0.00022	0.4770	0.00106
							0.88201				*-0.71218*		*1.38048*
MA 2,200,0 TIME	56.32	9.17	54	23	31	668	0.00077	0.5105	0.01411	865	-0.00020	0.4682	0.00097
							0.79256				*-0.67380*		*1.26965*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 E filter 1%	54.49	8.88	21	8	13	662	0.00078	0.5015	0.01541	871	-0.00019	0.4753	0.00097
							0.80457				*-0.65940*		*1.26832*
MA 1,14 TRI filter 1DAY	54.41	8.86	69	18	51	650	0.00079	0.4754	0.01587	883	-0.00019	0.4949	0.00098
							0.81384				*-0.66228*		*1.27844*
MA 5,50,0 E filter 1%	44.76	7.29	13	7	6	638	0.00070	0.4937	0.01554	895	-0.00011	0.4816	0.00081
							0.67973				*-0.53690*		*1.05396*
MA 1,14 W filter 1DAY	41.10	6.69	80	23	57	659	0.00065	0.4750	0.01573	874	-0.00009	0.4954	0.00074
							0.61514				*-0.50106*		*0.96705*
MA 1,14 TIME filter 1DAY	36.96	6.02	104	41	63	807	0.00049	0.4870	0.01418	726	-0.00007	0.4862	0.00056
							0.41080				*-0.44146*		*0.73809*
MA 2,200 TIME filter 1DAY	36.41	5.93	19	6	13	666	0.00056	0.5030	0.01344	867	-0.00003	0.4740	0.00059
							0.48666				*-0.40458*		*0.77200*
MA 1,14 TIME filter 1%	30.16	4.91	80	35	45	792	0.00044	0.4861	0.01465	741	-0.00001	0.4872	0.00045
							0.33124				*-0.35411*		*0.59361*
MA 2,200,0 TIMESERIES filter	28.49	4.64	30	10	20	670	0.00047	0.4985	0.01413	863	0.00003	0.4774	0.00044
							0.35666				*-0.30893*		*0.57612*
MA 5,150 TIME filter 1DAY	27.91	4.55	25	10	15	645	0.00048	0.4853	0.01382	888	0.00004	0.4876	0.00044
							0.36631				*-0.29576*		*0.57340*
MA 1,200,0 TIMESERIES	24.61	4.01	30	8	22	671	0.00043	0.4978	0.01397	862	0.00007	0.4780	0.00036
							0.29859				*-0.24547*		*0.47145*
MA 5,150,0 TIMESERIES	23.74	3.87	36	11	25	653	0.00043	0.4855	0.01417	880	0.00007	0.4875	0.00036
							0.29576				*-0.24709*		*0.46991*
MA 1,150,0 S	22.06	3.59	15	3	12	641	0.00041	0.4930	0.01406	892	0.00009	0.4821	0.00032
							0.26517				*-0.21613*		*0.41666*
MA 1,200 TIME filter 1%	16.60	2.70	16	6	10	697	0.00031	0.4950	0.01358	836	0.00015	0.4797	0.00016
							0.12544				*-0.11761*		*0.21031*
MA 5,50,0 VAR	16.02	2.61	9	5	4	639	0.00034	0.4867	0.01489	894	0.00014	0.4866	0.00020
							0.16466				*-0.13618*		*0.26030*
MA 1,150,0 TIMESERIES	15.75	2.56	34	10	24	674	0.00032	0.4896	0.01435	859	0.00015	0.4843	0.00017
							0.13858				*-0.11864*		*0.22274*
MA 1,50 VAR filter 1DAY	14.90	2.43	21	7	14	634	0.00033	0.4826	0.01490	899	0.00015	0.4894	0.00018
							0.14992				*-0.12037*		*0.23400*
MA 1,50,0 VAR	11.50	1.87	31	8	23	639	0.00029	0.4914	0.01547	894	0.00018	0.4832	0.00011
							0.09307				*-0.07210*		*0.14316*
MA 1,200 E filter 1%	9.60	1.56	10	5	5	601	0.00025	0.4892	0.01382	932	0.00021	0.4850	0.00004
							0.03502				*-0.02435*		*0.05155*
MA 2,200 W filter 1DAY	8.36	1.36	14	5	9	613	0.00023	0.4878	0.01413	920	0.00022	0.4859	0.00001
							0.00705				*-0.00808*		*0.01293*
MA 1,150 S filter 1%	7.48	1.22	9	3	6	648	0.00021	0.4877	0.01403	885	0.00024	0.4859	-0.00003
							-0.02158				*0.02395*		*-0.03912*
MA 1,150,0 W	7.35	1.20	30	8	22	595	0.00022	0.4891	0.01455	938	0.00022	0.4851	0.00000
							-0.00698				*-0.00813*		*0.00000*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 VAR filter 1%	7.23	1.18	14	7	7	643	0.00023	0.4868	0.01534	890	0.00022	0.4865	0.00001
							0.00717				*-0.00800*		*0.01303*
MA 1,150,0 TRI	7.03	1.15	23	6	17	629	0.00021	0.4897	0.01420	904	0.00024	0.4845	-0.00003
							-0.02136				*0.02412*		*-0.03895*
MA 2,200,0 S	6.88	1.12	13	4	9	621	0.00021	0.4879	0.01413	912	0.00024	0.4857	-0.00003
							-0.02126				*0.02418*		*-0.03888*
MA 5,150,0 W	6.80	1.11	17	5	12	582	0.00022	0.4863	0.01442	951	0.00023	0.4869	-0.00001
							-0.00692				*0.00817*		*-0.01281*
MA 5,150,0 TIME filter 1%	6.14	1.00	22	9	13	661	0.00019	0.4796	0.01408	872	0.00025	0.4920	-0.00006
							-0.05071				*0.03974*		*-0.07844*
MA 1,150 TIME filter 1%	5.95	0.97	19	8	11	679	0.00019	0.4860	0.01424	854	0.00025	0.4871	-0.00006
							-0.05119				*0.03947*		*-0.07867*
MA 1,200,0 TRI	4.74	0.77	16	3	13	633	0.00017	0.4866	0.01416	900	0.00026	0.4867	-0.00009
							-0.07849				*0.05619*		*-0.11697*
MA 2,200,0 W	4.49	0.73	19	5	14	613	0.00017	0.4845	0.01412	920	0.00026	0.4880	-0.00009
							-0.07760				*0.05658*		*-0.11638*
MA 1,150 E filter 1%	4.21	0.69	12	5	7	613	0.00016	0.4894	0.01389	920	0.00027	0.4848	-0.00011
							-0.09170				*0.07275*		*-0.14224*
MA 5,150,0 W filter 1%	4.13	0.67	9	3	6	590	0.00017	0.4881	0.01408	943	0.00026	0.4857	-0.00009
							-0.07654				*0.05702*		*-0.11560*
MA 1,200,0 EXP	4.12	0.67	21	7	14	595	0.00017	0.4908	0.01406	938	0.00026	0.4840	-0.00009
							-0.07677				*0.05692*		*-0.11578*
MA 1,150,0 EXP	3.54	0.58	26	7	19	607	0.00016	0.4893	0.01432	926	0.00027	0.4849	-0.00011
							-0.09138				*0.07290*		*-0.14201*
MA 1,200,0 W	3.36	0.55	25	6	19	612	0.00015	0.4820	0.01411	921	0.00027	0.4897	-0.00012
							-0.10575				*0.07277*		*-0.15513*
MA 2,200 E filter 1DAY	3.01	0.49	15	5	10	594	0.00014	0.4764	0.01377	939	0.00028	0.4931	-0.00014
							-0.11857				*0.08948*		*-0.18004*
MA 5,150,0 S	2.28	0.37	10	3	7	645	0.00013	0.4837	0.01403	888	0.00029	0.4887	-0.00016
							-0.13647				*0.10392*		*-0.20851*
MA 1,200,0 S	2.19	0.36	19	4	15	619	0.00013	0.4863	0.01406	914	0.00029	0.4869	-0.00016
							-0.13450				*0.10486*		*-0.20723*
MA 5,150 W filter 1DAY	1.91	0.31	15	4	11	579	0.00013	0.4836	0.01414	954	0.00028	0.4885	-0.00015
							-0.13130				*0.08992*		*-0.19197*
MA 2,200,0 EXP	1.61	0.26	18	5	13	594	0.00013	0.4865	0.01406	939	0.00029	0.4867	-0.00016
							-0.13252				*0.10575*		*-0.20576*
MA 5,50,0 VAR filter 1%	1.50	0.24	7	4	3	646	0.00013	0.4845	0.01477	887	0.00029	0.4882	-0.00016
							-0.13654				*0.10388*		*-0.20855*
MA 1,200 S filter 1%	1.44	0.23	9	4	5	624	0.00012	0.4888	0.01394	909	0.00030	0.4851	-0.00018
							-0.14908				*0.12079*		*-0.23343*
MA 5,150,0 E filter 1%	0.58	0.09	8	3	5	599	0.00010	0.4858	0.01379	934	0.00030	0.4872	-0.00020
							-0.17490				*0.12182*		*-0.25759*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,150,0 EXP	0.56	0.09	12	5	7	601	0.00010	0.4809	0.01374	932	0.00030	0.4903	-0.00020
							-0.17511				*0.12174*		*-0.25775*
MA 2,200,0 E filter 1%	-0.36	-0.06	10	3	7	604	0.00009	0.4785	0.01384	929	0.00031	0.4919	-0.00022
							-0.18946				*0.13783*		*-0.28377*
MA 1,200 TRI filter 1%	-2.48	-0.40	8	2	6	637	0.00006	0.4835	0.01406	896	0.00034	0.4888	-0.00028
							-0.23598				*0.18437*		*-0.36425*
MA 5,50 VAR filter 1DAY	-2.50	-0.41	10	4	6	643	0.00007	0.4852	0.01480	800	0.00034	0.4876	-0.00027
							-0.22242				*0.17776*		*-0.34369*
MA 2,200,0 TRI	-3.77	-0.61	15	3	12	631	0.00004	0.4802	0.01414	902	0.00035	0.4911	-0.00031
							-0.26370				*0.20083*		*-0.40271*
MA 1,150 W filter 1%	-4.08	-0.66	16	4	12	599	0.00003	0.4841	0.01441	934	0.00035	0.4882	-0.00032
							-0.27284				*0.20303*		*-0.41215*
MA 2,200 S filter 1DAY	-4.31	-0.70	11	3	8	620	0.00003	0.4839	0.01401	913	0.00036	0.4885	-0.00033
							-0.27623				*0.21772*		*-0.42753*
MA 2,200,0 S filter 1%	-4.37	-0.71	9	4	5	629	0.00002	0.4817	0.01389	904	0.00036	0.4900	-0.00034
							-0.29188				*0.21705*		*-0.44147*
MA 1,150 TRI filter 1%	-4.50	-0.73	12	3	9	642	0.00003	0.4813	0.01410	801	0.00037	0.4905	-0.00034
							-0.27966				*0.22423*		*-0.43273*
MA 5,150,0 TRI filter 1%	-5.59	-0.91	8	3	5	644	0.00001	0.4829	0.01400	889	0.00038	0.4893	-0.00037
							-0.30868				*0.24789*		*-0.48207*
MA 5,150 S filter 1DAY	-6.18	-1.01	10	3	7	644	0.00000	0.4829	0.01398	889	0.00039	0.4893	-0.00039
							-0.32304				*0.26388*		*-0.50813*
MA 2,200,0 W filter 1%	-7.33	-1.19	13	4	9	604	-0.00003	0.4851	0.01418	929	0.00039	0.4876	-0.00042
							-0.35786				*0.26755*		*-0.54174*
MA 5,150 E filter 1DAY	-7.42	-1.21	12	4	8	600	-0.00004	0.4800	0.01368	933	0.00039	0.4909	-0.00043
							-0.37101				*0.26791*		*-0.55399*
MA 2,200,0 TRI filter 1%	-7.73	-1.26	8	2	6	647	-0.00003	0.4807	0.01404	886	0.00041	0.4910	-0.00044
							-0.36671				*0.29555*		*-0.57364*
MA 1,200 W filter 1%	-7.99	-1.30	14	4	10	613	-0.00004	0.4829	0.01417	920	0.00040	0.4891	-0.00044
							-0.37387				*0.28291*		*-0.56898*
MA 5,150,0 TRI	-8.03	-1.31	13	4	9	626	-0.00003	0.4808	0.01414	907	0.00040	0.4906	-0.00043
							-0.36246				*0.28165*		*-0.55793*
MA 1,150,0 VAR	-8.93	-1.45	23	4	19	621	-0.00005	0.4831	0.01449	912	0.00041	0.4890	-0.00046
							-0.38978				*0.29826*		*-0.59610*
MA 2,200 TRI filter 1DAY	-9.75	-1.59	12	2	10	629	-0.00006	0.4785	0.01407	904	0.00043	0.4923	-0.00049
							-0.40579				*0.32959*		*-0.63624*
MA 5,150 TRI filter 1DAY	-10.16	-1.66	11	5	6	627	-0.00007	0.4833	0.01402	906	0.00043	0.4890	-0.00050
							-0.41955				*0.32982*		*-0.64891*
MA 5,150,0 S filter 1%	-14.97	-2.44	9	3	6	643	-0.00016	0.4821	0.01399	890	0.00050	0.4899	-0.00066
							-0.55245				*0.43996*		*-0.85973*
MA 1,200,0 VAR	-15.21	-2.48	24	4	20	636	-0.00016	0.4780	0.01405	897	0.00050	0.4928	-0.00066
							-0.55033				*0.44105*		*-0.85839*

Appendix I. Table III. Results for Moving Average Rules for the period 13/11/90-31/12/96 for Athens General Index

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,150 VAR filter 1%	-21.09	-3.43	13	3	10	624	-0.00028	0.4760	0.01448	909	0.00057	0.4939	-0.00085
							-0.71700				*0.55563*		*-1.10233*
MA 1,200 VAR filter 1%	-27.10	-4.41	14	3	11	649	-0.00039	0.4746	0.01423	884	0.00067	0.4955	-0.00106
							-0.88538				*0.71041*		*-1.38252*
MA 2,200,0 VAR	-35.69	-5.81	13	2	11	654	-0.00058	0.4694	0.01417	879	0.00082	0.4994	-0.00140
							-1.16204				*0.94816*		*-1.82780*
MA 5,150,0 VAR	-40.46	-6.59	11	0	11	646	-0.00070	0.4690	0.01445	887	0.00090	0.4994	-0.00160
							-1.32950				*1.07874*		*-2.08553*
MA 2,200,0 VAR filter 1%	-41.09	-6.69	9	0	9	646	-0.00072	0.4709	0.01426	887	0.00091	0.4983	-0.00163
							-1.35825				*1.09472*		*-2.12463*
MA 5,150,0 VAR filter 1%	-42.57	-6.93	7	0	7	634	-0.00077	0.4700	0.01427	899	0.00093	0.4983	-0.00170
							-1.42069				*1.13148*		*-2.20999*
MA 5,150 VAR filter 1DAY	-44.20	-7.20	11	2	9	648	-0.00080	0.4707	0.01440	885	0.00097	0.4983	-0.00177
							-1.47483				*1.18976*		*-2.30808*
MA 2,200 VAR filter 1DAY	-48.49	-7.90	13	0	13	658	-0.00091	0.4666	0.01427	875	0.00107	0.5017	-0.00198
							-1.64190				*1.34460*		*-2.58702*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**19.36%**
Annual Buy/Hold return	**3.15%**
Observations	**1533**
Days in test	**2241**

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,14,0 EXP	452.16	113.20	52	23	29	517	0.00351	0.5551	0.02001	484	-0.00063	0.4814	0.00414
t-statistic							*1.67253*				*-1.75238*		*2.96611*
MA 1,14 TIME SERIES	436.5	109.27	86	44	42	492	0.00362	0.5508	0.01964	509	-0.00052	0.4892	0.00414
							1.73573				*-1.69057*		*2.96729*
MA 1,14,0 W	381.16	95.42	68	25	43	501	0.00334	0.5509	0.02013	500	-0.00033	0.4880	0.00367
							1.51443				*-1.52335*		*2.63080*
MA 1,14 SIMPLE	356.03	89.13	55	20	35	501	0.00324	0.5449	0.02030	500	-0.00022	0.4940	0.00346
							1.43163				*-1.43233*		*2.48027*
MA 1,14 TRIANGULAR	352.36	88.21	57	24	33	497	0.00324	0.5473	0.02024	504	-0.00020	0.4921	0.00344
							1.42781				*-1.41955*		*2.46587*
MA 1,14 TIME filter 1%	328.52	82.24	56	33	23	495	0.00315	0.5434	0.02008	506	-0.00009	0.4960	0.00324
							1.35166				*-1.33003*		*2.32242*
MA 1,14 TIME filter 1DAY	308.43	77.21	60	33	27	493	0.00306	0.5497	0.02009	508	0.00001	0.4902	0.00305
							1.27571				*-1.24859*		*2.18612*
MA 1,14 TRI filter 1%	290.45	72.71	37	17	20	512	0.00288	0.5527	0.02075	489	0.00008	0.4847	0.00280
							1.14175				*-1.17531*		*2.00662*
MA 1,14 W filter 1%	278.17	69.64	42	18	24	517	0.00279	0.5455	0.02073	484	0.00014	0.4917	0.00265
							1.07012				*-1.12215*		*1.89859*
MA 1,50 VAR filter 1%	271.42	67.95	7	3	4	604	0.00243	0.5513	0.02244	397	0.00012	0.4710	0.00231
							0.80826				*-1.06273*		*1.62011*
MA 1,50 VAR filter 1DAY	253.52	63.47	7	3	4	606	0.00234	0.5495	0.02246	395	0.00024	0.4734	0.00210
							0.72985				*-0.96929*		*1.47154*
MA 1,14 E filter 1%	238.31	59.66	36	16	20	532	0.00250	0.5414	0.02052	469	0.00038	0.4947	0.00212
							0.83528				*-0.91589*		*1.51669*
MA 5,50 VAR filter 1DAY	234.08	58.60	5	3	2	612	0.00222	0.5490	0.02238	389	0.00039	0.4730	0.00183
							0.62612				*-0.85021*		*1.27885*
MA 1,50,0 TIME	224.68	56.25	41	17	24	491	0.00260	0.5255	0.01997	510	0.00046	0.5137	0.00214
							0.89565				*-0.87540*		*1.53376*
MA 1,14 S filter 1%	222.19	55.62	39	19	20	541	0.00237	0.5360	0.02046	460	0.00049	0.5000	0.00188
							0.72946				*-0.82136*		*1.34324*
MA 1,14 W filter 1DAY	195.8	49.02	45	19	26	524	0.00230	0.5401	0.02117	477	0.00065	0.4969	0.00165
							0.66307				*-0.70126*		*1.18148*
MA 1,14 S filter 1DAY	192.65	48.23	38	15	23	532	0.00225	0.5432	0.02138	469	0.00067	0.4925	0.00158
							0.62414				*-0.68105*		*1.13036*
MA 2,200,0 W	190.93	47.80	5	2	3	412	0.00289	0.5485	0.02428	589	0.00054	0.4992	0.00235
							1.06757				*-0.84729*		*1.65803*
MA 1,14 VAR filter 1%	188.47	47.18	25	9	16	534	0.00221	0.5431	0.02122	467	0.00071	0.4925	0.00150
							0.59108				*-0.64771*		*1.07285*
MA 1,14 TRI filter 1DAY	184.18	46.11	38	17	21	520	0.00224	0.5442	0.02152	481	0.00072	0.4927	0.00152
							0.61111				*-0.64607*		*1.08877*
MA 1,200,0 W	182.32	45.64	8	2	6	412	0.00281	0.5461	0.02423	589	0.00060	0.5008	0.00221
							1.00563				*-0.79493*		*1.55925*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,50,0 VAR filter 1%	181.78	45.51	5	3	2	614	0.00194	0.5423	0.02228	387	0.00083	0.4832	0.00111
							0.37923				*-0.51554*		*0.77496*
MA 2,200 VAR filter 1DAY	177.17	44.35	4	3	1	862	0.00143	0.5290	0.02239	139	0.00199	0.4604	-0.00056
							-0.07899				*0.23980*		*-0.27763*
MA 1,50 W filter 1%	175.82	44.01	23	9	14	533	0.00212	0.5385	0.02065	468	0.00082	0.4979	0.00130
							0.51466				*-0.55917*		*0.92993*
MA 2,200,0 VAR filter 1%	173.61	43.46	3	2	1	866	0.00141	0.5289	0.02235	135	0.00215	0.4593	-0.00074
							-0.09862				*0.31581*		*-0.36239*
MA 1,14 E filter 1DAY	172.87	43.28	37	15	22	548	0.00206	0.5365	0.02110	453	0.00085	0.4989	0.00121
							0.46815				*-0.52896*		*0.86346*
MA 1,50,0 VAR	172.24	43.12	12	2	10	428	0.00263	0.5397	0.02406	573	0.00067	0.5044	0.00196
							0.87799				*-0.72748*		*1.39019*
MA 2,200,0 EXP	167.57	41.95	8	2	6	495	0.00226	0.5273	0.02338	506	0.00077	0.5119	0.00149
							0.61769				*-0.61559*		*1.06803*
MA 1,150,0 EXP	166.66	41.72	11	3	8	452	0.00245	0.5376	0.02373	549	0.00073	0.5046	0.00172
							0.75085				*-0.66638*		*1.22716*
MA 5,150,0 VAR filter 1%	164.71	41.23	3	2	1	826	0.00143	0.5303	0.02250	175	0.00188	0.4686	-0.00045
							-0.07808				*0.20408*		*-0.24504*
MA 1,150,0 TRI	162.6	40.71	6	2	4	396	0.00273	0.5455	0.02411	605	0.00071	0.5025	0.00202
							0.93048				*-0.70484*		*1.41610*
MA 1,50,0 W	161.62	40.46	33	9	24	471	0.00227	0.5265	0.02110	530	0.00084	0.5132	0.00143
							0.61553				*-0.56601*		*1.02330*
MA 1,200 W filter 1%	157.51	39.43	6	2	4	417	0.00256	0.5396	0.02423	584	0.00076	0.5051	0.00180
							0.81556				*-0.65356*		*1.27223*
MA 5,150,0 EXP	155.2	38.85	6	2	4	447	0.00238	0.5391	0.02385	554	0.00081	0.5036	0.00157
							0.69222				*-0.59987*		*1.11899*
MA 1,150,0 W	153.64	38.46	12	2	10	450	0.00234	0.5311	0.02328	551	0.00083	0.5100	0.00151
							0.66188				*-0.58174*		*1.07691*
MA 1,200,0 TRI	152.01	38.06	7	3	4	437	0.00241	0.5400	0.02420	564	0.00081	0.5035	0.00160
							0.71052				*-0.60333*		*1.13768*
MA 1,150 VAR filter 1%	151.96	38.04	8	3	5	776	0.00145	0.5322	0.02260	225	0.00173	0.4756	-0.00028
							-0.05779				*0.13451*		*-0.16757*
MA 1,150,0 S	151.1	37.83	5	2	3	411	0.00253	0.5426	0.02404	590	0.00080	0.5034	0.00173
							0.78819				*-0.62074*		*1.22015*
MA 1,50 W filter 1DAY	149.4	37.40	22	7	15	536	0.00193	0.5299	0.02101	465	0.00103	0.5075	0.00090
							0.35474				*-0.38838*		*0.64353*
MA 1,200,0 EXP	147.79	37.00	13	2	11	497	0.00210	0.5252	0.02359	504	0.00092	0.5139	0.00118
							0.48640				*-0.49033*		*0.84585*
MA 2,200,0 S	147.63	36.96	4	2	2	479	0.00218	0.5365	0.02371	522	0.00090	0.5038	0.00128
							0.54565				*-0.51284*		*0.91671*
MA 1,150 TRI filter 1%	147.14	36.84	6	2	4	451	0.00228	0.5366	0.02331	550	0.00088	0.5055	0.00140
							0.61445				*-0.53871*		*0.99866*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,150,0 TIMESERIES	145.54	36.44	27	9	18	386	0.00257	0.5207	0.02188	615	0.00085	0.5187	0.00172
							0.80095				*-0.58462*		*1.20027*
MA 5,50,0 TIME filter 1%	144.04	36.06	33	17	16	497	0.00200	0.5191	0.02047	504	0.00102	0.5198	0.00098
							0.40382				*-0.40736*		*0.70249*
MA 2,200,0 W filter 1%	142.2	35.60	5	2	3	419	0.00241	0.5370	0.02425	582	0.00086	0.5069	0.00155
							0.70012				*-0.56592*		*1.09627*
MA 2,200,0 TRI	139.92	35.03	5	2	3	439	0.00228	0.5376	0.02408	562	0.00091	0.5053	0.00137
							0.60874				*-0.51667*		*0.97463*
MA 1,50,0 S	139.86	35.01	25	3	22	458	0.00215	0.5240	0.02189	543	0.00097	0.5157	0.00118
							0.51328				*-0.45997*		*0.84282*
MA 1,200,0 S	139.02	34.80	6	2	4	482	0.00209	0.5353	0.02380	519	0.00097	0.5048	0.00112
							0.47324				*-0.45322*		*0.80231*
MA 5,150 VAR filter 1DAY	138.57	34.69	6	3	3	799	0.00135	0.5282	0.02267	202	0.00217	0.4851	-0.00082
							-0.15379				*0.38715*		*-0.47183*
MA 1,50 E filter 1%	138.19	34.60	21	5	16	561	0.00177	0.5276	0.02108	440	0.00118	0.5091	0.00059
							0.22253				*-0.26223*		*0.41983*
MA 1,50 S filter 1%	137.61	34.45	18	4	14	531	0.00186	0.5348	0.02138	470	0.00112	0.5021	0.00074
							0.29457				*-0.31686*		*0.52948*
MA 1,50,0 EXP	137	34.30	26	6	20	499	0.00197	0.5210	0.02170	502	0.00106	0.5179	0.00091
							0.37955				*-0.37368*		*0.65232*
MA 1,150 W filter 1%	136.57	34.19	10	3	7	463	0.00213	0.5292	0.02336	538	0.00097	0.5112	0.00116
							0.49907				*-0.45859*		*0.82920*
MA 5,50,0 E filter 1%	136.27	34.11	12	4	8	572	0.00173	0.5245	0.02111	429	0.00122	0.5128	0.00051
							0.18933				*-0.22851*		*0.36184*
MA 1,150 S filter 1%	135.04	33.81	6	2	4	466	0.00211	0.5343	0.02326	535	0.00099	0.5065	0.00112
							0.48401				*-0.44083*		*0.80095*
MA 5,50,0 VAR	132.45	33.16	4	2	2	428	0.00226	0.5397	0.02396	573	0.00095	0.5044	0.00131
							0.58768				*-0.48528*		*0.92916*
MA 5,150,0 TRI	131.33	32.88	4	2	2	393	0.00243	0.5394	0.02416	608	0.00092	0.5066	0.00151
							0.69957				*-0.52085*		*1.05717*
MA 1,50,0 TRI	131.27	32.86	24	4	20	462	0.00206	0.5260	0.02212	539	0.00104	0.5139	0.00102
							0.44231				*-0.39949*		*0.72901*
MA 5,150,0 W filter 1%	130.18	32.59	6	2	4	457	0.00210	0.5317	0.02333	544	0.00102	0.5092	0.00108
							0.47277				*-0.41770*		*0.77126*
MA 1,14 VAR filter 1DAY	129.99	32.54	27	7	20	545	0.00177	0.5376	0.02180	456	0.00120	0.4978	0.00057
							0.22047				*-0.24944*		*0.40698*
MA 1,200 VAR filter 1%	129.97	32.54	9	3	6	850	0.00123	0.5271	0.02230	151	0.00311	0.4768	-0.00188
							-0.27300				*0.82997*		*-0.96466*
MA 2,200 W filter 1DAY	128.77	32.24	6	2	4	418	0.00228	0.5359	0.02433	583	0.00096	0.5077	0.00132
							0.59838				*-0.47925*		*0.93329*
MA 2,200,0 TIMESERIES filter 1%	127.58	31.94	26	9	17	360	0.00258	0.5278	0.02415	641	0.00091	0.5148	0.00167
							0.78823				*-0.53836*		*1.14899*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,150 E filter 1DAY	126.29	31.61	6	2	4	507	0.00188	0.5306	0.02338	494	0.00113	0.5081	0.00075
							0.30675				*-0.31399*		*0.53759*
MA 1,150,0 VAR	125.51	31.42	10	2	8	590	0.00166	0.5254	0.02367	411	0.00130	0.5109	0.00036
							0.13009				*-0.16321*		*0.25390*
MA 5,150,0 S	124.58	31.19	4	2	2	413	0.00225	0.5400	0.02418	588	0.00099	0.5051	0.00126
							0.57259				*-0.45438*		*0.88931*
MA 2,200,0 VAR	122.83	30.75	4	2	2	666	0.00147	0.5225	0.02314	335	0.00159	0.5134	-0.00012
							-0.03715				*0.05672*		*-0.08118*
MA 5,150,0 W	122.83	30.75	9	2	7	451	0.00205	0.5277	0.02326	550	0.00107	0.5127	0.00098
							0.43067				*-0.37650*		*0.69906*
MA 1,150,0 TIMESERIES	122.73	30.72	28	7	21	370	0.00241	0.5189	0.02202	631	0.00098	0.5198	0.00143
							0.66957				*-0.47337*		*0.98962*
MA 1,50 TRI filter 1%	122.07	30.56	18	5	13	520	0.00176	0.5288	0.02133	481	0.00124	0.5094	0.00052
							0.20873				*-0.22135*		*0.37247*
MA 2,200,0 TIME	121.91	30.52	44	13	31	364	0.00249	0.5220	0.02412	637	0.00095	0.5181	0.00154
							0.72480				*-0.50157*		*1.06209*
MA 1,150 E filter 1%	120.68	30.21	10	2	8	512	0.00181	0.5254	0.02303	489	0.00120	0.5133	0.00061
							0.24937				*-0.25543*		*0.43716*
MA 2,200 TIME filter 1DAY	120.56	30.18	16	4	12	369	0.00244	0.5176	0.02413	632	0.00097	0.5206	0.00147
							0.69123				*-0.48252*		*1.01673*
MA 1,50 TRI filter 1DAY	118.61	29.69	19	5	14	520	0.00174	0.5308	0.02172	481	0.00126	0.5073	0.00048
							0.19197				*-0.20501*		*0.34382*
MA 5,150,0 E filter 1%	116.5	29.16	6	2	4	514	0.00177	0.5253	0.02330	487	0.00123	0.5133	0.00054
							0.21629				*-0.23047*		*0.38695*
MA 5,150 TRI filter 1DAY	115.83	29.00	5	2	3	451	0.00198	0.5299	0.02339	550	0.00113	0.5109	0.00085
							0.37474				*-0.32528*		*0.60633*
MA 2,200,0 S filter 1%	114.08	28.56	4	2	2	492	0.00183	0.5285	0.02393	509	0.00120	0.5108	0.00063
							0.26254				*-0.25887*		*0.45154*
MA 5,150,0 TRI filter 1%	113.42	28.39	4	2	2	448	0.00197	0.5335	0.02334	553	0.00114	0.5081	0.00083
							0.36591				*-0.31730*		*0.59170*
MA 1,50 S filter 1DAY	112.72	28.22	21	5	16	521	0.00168	0.5317	0.02135	480	0.00133	0.5063	0.00035
							0.14176				*-0.14773*		*0.25068*
MA 1,14,0 Variable	108.53	27.17	19	5	14	508	0.00167	0.5295	0.02198	493	0.00134	0.5091	0.00033
							0.13226				*-0.14083*		*0.23653*
MA 1,200 S filter 1%	106.96	26.78	5	2	3	490	0.00177	0.5265	0.02395	511	0.00126	0.5127	0.00051
							0.21287				*-0.20920*		*0.36551*
MA 1,50 TIME filter 1%	106.7	26.71	31	13	18	495	0.00168	0.5071	0.02057	506	0.00134	0.5316	0.00034
							0.13937				*-0.14206*		*0.24371*
MA 1,200 TRI filter 1%	105.38	26.38	5	2	3	448	0.00190	0.5335	0.02420	553	0.00119	0.5081	0.00071
							0.31010				*-0.27453*		*0.50615*
MA 5,150 W filter 1DAY	105.12	26.32	8	3	5	464	0.00182	0.5237	0.02322	537	0.00124	0.5158	0.00058
							0.24932				*-0.22958*		*0.41466*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 1,50 E filter 1DAY	103.23	25.84	22	5	17	560	0.00149	0.5232	0.02120	441	0.00154	0.5147	-0.00005
							-0.01803				*0.02299*		*-0.03559*
MA 1,200,0 VAR	103.08	25.81	12	3	9	654	0.00135	0.5214	0.02306	347	0.00182	0.5159	-0.00047
							-0.14510				*0.22477*		*-0.32068*
MA 5,150,0 VAR	102.74	25.72	5	2	3	603	0.00145	0.5207	0.02353	398	0.00160	0.5176	-0.00015
							-0.05362				*0.06806*		*-0.10525*
MA 5,50 TIME filter 1DAY	101.41	25.39	35	18	17	497	0.00163	0.5191	0.02108	504	0.00139	0.5198	0.00024
							0.09827				*-0.10039*		*0.17204*
MA 1,200 TIME filter 1%	101.39	25.38	12	4	8	367	0.00221	0.5123	0.02428	634	0.00111	0.5237	0.00110
							0.51906				*-0.35800*		*0.75996*
MA 5,50 E filter 1DAY	100.13	25.07	16	4	12	567	0.00145	0.5238	0.02109	434	0.00160	0.5138	-0.00015
							-0.05259				*0.07017*		*-0.10657*
MA 5,150,0 S filter 1%	97.51	24.41	5	2	3	470	0.00172	0.5298	0.02335	531	0.00132	0.5104	0.00040
							0.16937				*-0.16121*		*0.28620*
MA 2,200,0 E filter 1%	97.49	24.41	7	2	5	503	0.00163	0.5189	0.02372	498	0.00139	0.5201	0.00024
							0.09866				*-0.09999*		*0.17204*
MA 1,200,0 TIMESERIES	96.77	24.22	25	7	18	371	0.00212	0.5094	0.02401	630	0.00115	0.5254	0.00097
							0.45402				*-0.32166*		*0.67166*
MA 1,200 E filter 1%	96.63	24.19	8	2	6	507	0.00161	0.5187	0.02366	494	0.00140	0.5202	0.00021
							0.08230				*-0.09148*		*0.15052*
MA 2,200,0 TRI filter 1%	93.11	23.31	5	2	3	448	0.00176	0.5290	0.02413	553	0.00131	0.5118	0.00045
							0.19850				*-0.17190*		*0.32080*
MA 1,50 TIME filter 1DAY	91.05	22.79	29	13	16	486	0.00155	0.5123	0.02091	515	0.00147	0.5262	0.00008
							0.03197				*-0.03426*		*0.05732*
MA 5,50,0 W	90.1	22.56	19	6	13	475	0.00159	0.5158	0.02173	526	0.00144	0.5228	0.00015
							0.06425				*-0.05974*		*0.10739*
MA 2,200 E filter 1DAY	89.92	22.51	8	2	6	509	0.00155	0.5167	0.02395	492	0.00147	0.5224	0.00008
							0.03246				*-0.03374*		*0.05734*
MA 2,200 TRI filter 1DAY	89.54	22.42	5	2	3	447	0.00172	0.5280	0.02419	554	0.00134	0.5126	0.00038
							0.16648				*-0.14633*		*0.27084*
MA 5,150 S filter 1DAY	87.26	21.85	5	2	3	471	0.00161	0.5265	0.02341	530	0.00143	0.5132	0.00018
							0.08029				*-0.06833*		*0.12881*
MA 5,150,0 TIME filter 1%	84.29	21.10	23	5	18	370	0.00191	0.5108	0.02261	631	0.00128	0.5246	0.00063
							0.29717				*-0.20593*		*0.43599*
MA 5,50 S filter 1DAY	81.14	20.31	17	5	12	523	0.00136	0.5258	0.02137	478	0.00167	0.5126	-0.00031
							-0.12682				*0.12959*		*-0.22200*
MA 2,200 S filter 1DAY	79.18	19.82	5	2	3	492	0.00148	0.5264	0.02421	509	0.00154	0.5128	-0.00006
							-0.02551				*0.02414*		*-0.04300*
MA 5,50,0 W filter 1%	77.22	19.33	17	5	12	531	0.00131	0.5217	0.02136	470	0.00174	0.5170	-0.00043
							-0.16965				*0.18558*		*-0.30767*
MA 1,150 TIME filter 1%	75.62	18.93	16	5	11	377	0.00175	0.5119	0.02252	624	0.00137	0.5240	0.00038
							0.17922				*-0.12527*		*0.26398*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
MA 5,50,0 EXP	70.15	17.56	16	3	13	501	0.00130	0.5130	0.02166	500	0.00173	0.5260	-0.00043
							-0.17471				*0.18121*		*-0.30824*
MA 5,50,0 TRI filter 1%	66.96	16.76	16	5	11	517	0.00122	0.5222	0.02142	484	0.00182	0.5165	-0.00060
							-0.24348				*0.25291*		*-0.42987*
MA 5,150 TIME filter 1DAY	62.95	15.76	25	6	19	386	0.00151	0.5078	0.02238	615	0.00151	0.5268	0.00000
							-0.00076				*-0.00088*		*0.00000*
MA 5,50,0	61.62	15.43	18	3	15	458	0.00130	0.5175	0.02230	543	0.00169	0.5212	-0.00039
							-0.16949				*0.15219*		*-0.27856*
MA 5,50 W filter 1DAY	60.51	15.15	20	5	15	537	0.00111	0.5121	0.02137	464	0.00198	0.5280	-0.00087
							-0.33971				*0.37841*		*-0.62199*
MA 5,50 TRI filter 1DAY	58.99	14.77	18	5	13	526	0.00111	0.5133	0.02126	475	0.00196	0.5263	-0.00085
							-0.33742				*0.36518*		*-0.60852*
MA 5,50,0 S filter 1%	57.89	14.49	14	4	10	519	0.00111	0.5202	0.02136	482	0.00195	0.5187	-0.00084
							-0.33594				*0.35881*		*-0.60173*
MA 5,50,0 TRI	47.87	11.98	19	4	15	462	0.00109	0.5065	0.02220	539	0.00187	0.5306	-0.00078
							-0.33918				*0.30450*		*-0.55748*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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-Self" 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).

Buy/Hold return	**255.03%**
Annual Buy/Hold return	**63.84%**
Observations	**1001**
Days in test	**1458**

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14,0 W	1162028.10	38837.13	924	392	532	4450	0.00150	0.6238	0.00841	3075	-0.00101	0.4836	0.01306	0.00251
t-statistic							*5.07309*				*-6.55735*			*10.06894*
MA 1,14,0 EXP	900245.60	30087.87	778	325	453	4514	0.00145	0.6181	0.00836	2979	-0.00102	0.4871	0.01325	0.00247
							4.84583				*-6.52700*			*9.84342*
MA 1,14 SIMPLE	470816.05	15735.54	746	300	446	4486	0.00139	0.6159	0.00839	3038	-0.00087	0.4937	0.01315	0.00226
							4.53693				*-5.91608*			*9.04833*
MA 1,14 TRIANGULAR	303076.30	10129.37	762	307	455	4482	0.00134	0.6156	0.00843	3042	-0.00080	0.4944	0.01312	0.00214
							4.28617				*-5.61218*			*8.56970*
MA 1,50,0 W	129467.19	4327.03	432	143	289	4635	0.00122	0.6065	0.00842	2852	-0.00074	0.5000	0.01343	0.00196
							3.72621				*-5.22663*			*7.74752*
MA 1,50,0 EXP	114719.17	3834.13	370	132	238	4804	0.00115	0.6030	0.00850	2877	-0.00074	0.4998	0.01362	0.00189
							3.41064				*-5.24319*			*7.54198*
MA 1,50,0 TRI	111722.76	3733.98	316	112	204	4632	0.00120	0.6028	0.00847	2854	-0.00070	0.5063	0.01338	0.00190
							3.62464				*-5.05669*			*7.51105*
MA 1,50,0 S	74994.31	2506.45	350	109	241	4703	0.00114	0.5992	0.00858	2782	-0.00064	0.5101	0.01337	0.00178
							3.33782				*-4.75533*			*7.00085*
MA 2,200,0 TIME	44364.39	1482.74	553	219	334	3758	0.00132	0.6107	0.00848	3589	-0.00039	0.5208	0.01258	0.00171
							3.95411				*-4.04186*			*6.89234*
MA 1,14 E filter 1DAY	36900.06	1233.27	515	195	320	4568	0.00109	0.6003	0.00844	2974	-0.00045	0.5155	0.01323	0.00154
							3.05686				*-4.04595*			*6.14854*
MA 1,14 TRI filter 1%	34401.13	1149.75	399	173	226	4417	0.00112	0.6061	0.00856	3122	-0.00043	0.5109	0.01294	0.00155
							3.17381				*-4.02814*			*6.23614*
MA 1,14 VAR filter 1DAY	32595.67	1089.41	346	129	217	4708	0.00105	0.5975	0.00859	2825	-0.00047	0.5147	0.01329	0.00152
							2.88292				*-4.05681*			*6.00825*
MA 1,14 W filter 1%	31424.92	1050.28	387	169	218	4484	0.00110	0.6010	0.00852	3054	-0.00043	0.5160	0.01306	0.00153
							3.08907				*-3.99678*			*6.13467*
MA 1,50 E filter 1%	30701.54	1026.10	157	69	88	4800	0.00101	0.5940	0.00858	2707	-0.00049	0.5161	0.01349	0.00150
							2.69622				*-4.07794*			*5.87061*
MA 1,14,0 Variable	27635.17	923.62	273	107	166	4694	0.00103	0.5974	0.00863	2838	-0.00044	0.5152	0.01329	0.00147
							2.77903				*-3.93540*			*5.81568*
MA 5,50,0 W	27283.78	911.87	282	94	188	4626	0.00105	0.5958	0.00859	2860	-0.00045	0.5178	0.01327	0.00150
							2.86730				*-3.98930*			*5.93216*
MA 1,14 VAR filter 1%	26047.84	870.57	225	99	126	4667	0.00104	0.5952	0.00845	2861	-0.00044	0.5190	0.01339	0.00148
							2.82462				*-3.94695*			*5.86355*
MA 1,50,0 VAR	23169.65	774.37	217	65	152	5187	0.00091	0.5926	0.00883	2345	-0.00049	0.5083	0.01374	0.00140
							2.23820				*-3.86425*			*5.29253*
MA 1,50 W filter 1%	22848.61	763.64	209	86	123	4618	0.00103	0.5951	0.00856	2889	-0.00042	0.5192	0.01326	0.00145
							2.76503				*-3.87489*			*5.75038*
MA 1,14 E filter 1%	22716.20	759.22	309	129	180	4534	0.00105	0.5977	0.00856	3004	-0.00039	0.5196	0.01308	0.00144
							2.84943				*-3.79884*			*5.75819*
MA 1,14 W filter 1DAY	21224.84	709.37	649	255	394	4482	0.00105	0.5968	0.00859	3060	-0.00035	0.5229	0.01299	0.00140
							2.83915				*-3.64835*			*5.61620*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14 TIME SERIES	20544.14	688.62	1269	658	611	3520	0.00134	0.6054	0.01014	4014	-0.00028	0.5324	0.01097	0.00162
							3.95994				*-3.66542*			*6.59968*
MA 1,200,0 TIMESERIES	20468.37	684.09	287	91	196	3721	0.00124	0.6025	0.00853	3624	-0.00030	0.5301	0.01252	0.00154
							3.56526				*-3.63614*			*6.20740*
MA 1,50 E filter 1DAY	20188.05	674.72	249	85	164	4845	0.00096	0.5934	0.00868	2661	-0.00042	0.5160	0.01346	0.00138
							2.44834				*-3.76010*			*5.38028*
MA 1,150,0 TIMESERIES	18557.14	620.21	310	100	210	3739	0.00123	0.5996	0.00857	3665	-0.00029	0.5321	0.01244	0.00152
							3.52397				*-3.60323*			*6.15157*
MA 1,50 W filter 1DAY	18550.41	619.99	311	102	209	4670	0.00100	0.5944	0.00857	2836	-0.00039	0.5190	0.01333	0.00139
							2.62302				*-3.72080*			*5.49266*
MA 5,150,0 TIMESERIES	18232.91	609.38	328	118	210	3789	0.00121	0.5980	0.00853	3615	-0.00029	0.5328	0.01251	0.00150
							3.44512				*-3.58656*			*6.06925*
MA 1,150,0 W	17490.57	584.57	230	75	155	4794	0.00095	0.5970	0.00878	2601	-0.00039	0.5102	0.01349	0.00134
							2.38950				*-3.60429*			*5.17626*
MA 1,150,0 EXP	16300.75	544.80	184	54	130	5206	0.00087	0.5920	0.00898	2172	-0.00045	0.5055	0.01396	0.00132
							2.03171				*-3.59734*			*4.86124*
MA 5,50,0 EXP	14879.02	497.28	202	71	131	4816	0.00093	0.5936	0.00869	2664	-0.00035	0.5161	0.01346	0.00128
							2.29080				*-3.46942*			*4.98690*
MA 1,50 S filter 1DAY	14365.50	480.12	229	75	154	4736	0.00095	0.5914	0.00873	2770	-0.00035	0.5224	0.01325	0.00130
							2.38059				*-3.51957*			*5.11264*
MA 1,50 TRI filter 1%	13771.91	460.28	181	76	105	4596	0.00098	0.5903	0.00865	2911	-0.00033	0.5273	0.01315	0.00131
							2.50948				*-3.49740*			*5.20247*
MA 2,200,0 TIMESERIES filt. 1%	13617.41	455.12	226	84	142	3687	0.00120	0.5999	0.00858	3670	-0.00023	0.5338	0.01246	0.00143
							3.36698				*-3.32435*			*5.76921*
MA 1,50,0 TIME	12787.43	427.38	645	258	387	3729	0.00119	0.6028	0.00926	3777	-0.00024	0.5295	0.01181	0.00143
							3.33279				*-3.40371*			*5.82723*
MA 1,50 S filter 1%	11988.21	400.67	167	67	100	4644	0.00095	0.5900	0.00872	2863	-0.00031	0.5267	0.01314	0.00126
							2.36623				*-3.39070*			*4.98833*
MA 1,200,0 W	11791.82	394.10	177	50	127	4988	0.00088	0.5924	0.00893	2356	-0.00035	0.5123	0.01372	0.00123
							2.05748				*-3.31300*			*4.62861*
MA 1,14 S filter 1%	11670.34	390.04	371	153	218	4491	0.00099	0.5974	0.00852	3047	-0.00027	0.5212	0.01308	0.00126
							2.54137				*-3.29213*			*5.05023*
MA 1,50 TRI filter 1DAY	11448.13	382.62	237	81	156	4665	0.00095	0.5908	0.00869	2841	-0.00031	0.5252	0.01320	0.00126
							2.36953				*-3.38121*			*4.98068*
MA 5,150,0 TIME filter 1%	10527.26	351.84	167	70	97	3752	0.00116	0.5946	0.00862	3855	-0.00022	0.5365	0.01242	0.00138
							3.19834				*-3.33185*			*5.66079*
MA 5,150,0 W	9835.27	328.71	124	49	75	4792	0.00089	0.5939	0.00893	2602	-0.00028	0.5158	0.01332	0.00117
							2.08354				*-3.14955*			*4.51980*
MA 1,150,0 S	9818.00	328.14	154	41	113	4999	0.00086	0.5923	0.00893	2380	-0.00031	0.5122	0.01367	0.00117
							1.95565				*-3.16572*			*4.41955*
MA 1,14 TRI filter 1DAY	9318.55	311.44	577	228	349	4514	0.00095	0.5937	0.00858	3028	-0.00022	0.5268	0.01305	0.00117
							2.34540				*-3.06610*			*4.68557*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14 S filter 1DAY	9294.53	310.64	557	214	343	4524	0.00094	0.5939	0.00848	3018	-0.00021	0.5262	0.01317	0.00115
							2.29698				*-3.01879*			*4.60295*
MA 1,150 TIME filter 1%	9186.27	307.02	130	61	69	3710	0.00116	0.5965	0.00863	3685	-0.00020	0.5362	0.01240	0.00136
							3.18631				*-3.18845*			*5.50093*
MA 2,200,0 W	9140.66	305.50	143	45	98	4991	0.00085	0.5911	0.00896	2353	-0.00030	0.5151	0.01369	0.00115
							1.90313				*-3.11215*			*4.32610*
MA 1,150 W filter 1%	8303.23	277.51	103	43	60	4774	0.00088	0.5913	0.00885	2633	-0.00025	0.5199	0.01337	0.00113
							2.03025				*-3.03872*			*4.37910*
MA 5,50,0	7886.89	263.59	210	69	141	4666	0.00090	0.5898	0.00880	2816	-0.00023	0.5266	0.01313	0.00113
							2.11706				*-3.02949*			*4.45471*
MA 1,50 VAR filter 1DAY	7674.93	256.51	150	49	101	5197	0.00081	0.5875	0.00892	2336	-0.00026	0.5197	0.01364	0.00107
							1.71745				*-2.94460*			*4.04086*
MA 1,50 VAR filter 1%	7311.08	244.35	111	42	69	5152	0.00081	0.5873	0.00889	2378	-0.00024	0.5206	0.01362	0.00105
							1.71302				*-2.88465*			*3.98425*
MA 2,200,0 W filter 1%	6987.02	233.52	72	32	40	4951	0.00084	0.5908	0.00900	2406	-0.00022	0.5179	0.01355	0.00106
							1.84707				*-2.81713*			*4.01246*
MA 2,200 TIME filter 1DAY	6888.29	230.22	246	83	163	3762	0.00108	0.5960	0.00862	3594	-0.00013	0.5367	0.01251	0.00121
							2.82402				*-2.83667*			*4.88004*
MA 5,50 E filter 1DAY	6843.85	228.73	189	63	126	4844	0.00085	0.5890	0.00877	2662	-0.00021	0.5240	0.01336	0.00106
							1.88597				*-2.88412*			*4.13303*
MA 1,150,0 TRI	6666.51	222.81	156	44	112	4868	0.00084	0.5914	0.00893	2527	-0.00022	0.5184	0.01343	0.00106
							1.83763				*-2.86972*			*4.06701*
MA 1,200,0 EXP	6514.58	217.73	161	38	123	5377	0.00076	0.5888	0.00915	1970	-0.00025	0.5069	0.01412	0.00101
							1.47110				*-2.71837*			*3.60770*
MA 1,200 W filter 1%	6216.92	207.78	84	33	51	4926	0.00083	0.5911	0.00901	2431	-0.00020	0.5181	0.01350	0.00103
							1.79287				*-2.74749*			*3.90919*
MA 5,150 TIME filter 1DAY	6098.55	203.82	279	101	178	3787	0.00106	0.5902	0.00862	3619	-0.00014	0.5409	0.01246	0.00120
							2.73576				*-2.88987*			*4.85615*
MA 2,200 W filter 1DAY	5784.47	193.33	110	35	75	4994	0.00081	0.5889	0.00901	2362	-0.00019	0.5210	0.01361	0.00100
							1.69714				*-2.67771*			*3.76707*
MA 1,150 E filter 1%	5723.03	191.27	89	33	56	5220	0.00077	0.5866	0.00904	2187	-0.00021	0.5169	0.01382	0.00098
							1.51062				*-2.67713*			*3.61931*
MA 1,200 TIME filter 1%	5704.00	190.64	126	55	71	3660	0.00109	0.5937	0.00865	3697	-0.00011	0.5406	0.01240	0.00120
							2.84482				*-2.77009*			*4.84124*
MA 5,50,0 W filter 1%	5657.54	189.09	165	64	101	4625	0.00088	0.5870	0.00872	2882	-0.00018	0.5321	0.01312	0.00106
							2.01050				*-2.84024*			*4.20181*
MA 5,50,0 E filter 1%	5656.95	189.07	113	50	63	4750	0.00084	0.5901	0.00881	2757	-0.00016	0.5243	0.01319	0.00100
							1.82390				*-2.71018*			*3.92910*
MA 5,50,0 TRI	5549.57	185.48	232	81	151	4632	0.00088	0.5887	0.00882	2852	-0.00018	0.5293	0.01307	0.00106
							2.01145				*-2.82948*			*4.18947*
MA 1,150 S filter 1%	5275.95	176.33	77	30	47	5011	0.00079	0.5871	0.00895	2396	-0.00018	0.5219	0.01360	0.00097
							1.59560				*-2.65218*			*3.67381*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,150,0 VAR	4679.94	156.41	117	25	92	5865	0.00067	0.5823	0.00973	1667	-0.00021	0.5108	0.01329	0.00088
							1.02170				*-2.40227*			*2.98257*
MA 1,150 TRI filter 1%	4506.30	150.61	75	32	43	4855	0.00080	0.5893	0.00897	2552	-0.00014	0.5218	0.01334	0.00094
							1.63155				*-2.55160*			*3.61662*
MA 5,150,0 EXP	4434.42	148.21	98	32	66	5213	0.00075	0.5876	0.00916	2163	-0.00015	0.5157	0.01372	0.00090
							1.40552				*-2.43422*			*3.31028*
MA 5,50 S filter 1DAY	4404.38	147.20	209	69	140	4690	0.00083	0.5855	0.00888	2816	-0.00013	0.5336	0.01304	0.00096
							1.76617				*-2.60340*			*3.78818*
MA 5,150 W filter 1DAY	4118.45	137.65	117	42	75	4805	0.00081	0.5898	0.00899	2601	-0.00013	0.5223	0.01325	0.00094
							1.67739				*-2.52838*			*3.63257*
MA 1,200,0 TRI	4115.19	137.54	111	35	76	5098	0.00076	0.5896	0.00922	2244	-0.00014	0.5145	0.01350	0.00090
							1.44813				*-2.42998*			*3.34201*
MA 5,50 W filter 1DAY	4074.18	136.17	273	86	187	4648	0.00084	0.5876	0.00881	2858	-0.00013	0.5310	0.01306	0.00097
							1.81173				*-2.61745*			*3.83877*
MA 5,50,0 S filter 1%	3858.03	128.94	139	55	84	4641	0.00083	0.5861	0.00890	2866	-0.00011	0.5333	0.01295	0.00094
							1.76044				*-2.53434*			*3.72220*
MA 1,200,0 S	3819.94	127.67	135	39	96	5188	0.00074	0.5892	0.00942	2156	-0.00013	0.5128	0.01332	0.00087
							1.35134				*-2.35410*			*3.19402*
MA 5,50,0 TRI filter 1%	3725.85	124.52	153	59	94	4585	0.00084	0.5850	0.00884	2922	-0.00011	0.5361	0.01296	0.00095
							1.80407				*-2.55213*			*3.77538*
MA 5,50 TRI filter 1DAY	3697.64	123.58	221	76	145	4653	0.00082	0.5854	0.00886	2853	-0.00010	0.5344	0.01302	0.00092
							1.71137				*-2.48735*			*3.63967*
MA 5,150,0 S	3544.50	118.46	94	30	64	4981	0.00076	0.5868	0.00911	2397	-0.00010	0.5246	0.01341	0.00086
							1.43808				*-2.33156*			*3.25448*
MA 2,200,0 EXP	3376.84	112.86	123	31	92	5360	0.00070	0.5882	0.00928	1987	-0.00010	0.5091	0.01385	0.00080
							1.15367				*-2.16793*			*2.86535*
MA 5,150,0 W filter 1%	3257.75	108.88	85	35	50	4781	0.00078	0.5873	0.00900	2626	-0.00008	0.5272	0.01320	0.00086
							1.52210				*-2.32974*			*3.33077*
MA 5,150,0 TRI	3165.65	105.80	94	37	57	4846	0.00078	0.5904	0.00915	2547	-0.00008	0.5208	0.01313	0.00086
							1.52839				*-2.30338*			*3.30564*
MA 2,200,0 TRI	3019.89	100.93	91	29	62	5104	0.00073	0.5880	0.00930	2238	-0.00008	0.5181	0.01338	0.00081
							1.29287				*-2.19294*			*3.00555*
MA 2,200,0 E filter 1%	2982.18	99.67	68	24	44	5355	0.00069	0.5867	0.00931	2002	-0.00005	0.5142	0.01378	0.00074
							1.10069				*-1.98727*			*2.65738*
MA 1,200,0 VAR	2865.75	95.78	89	19	70	6023	0.00061	0.5811	0.00995	1509	-0.00006	0.5080	0.01296	0.00067
							0.70256				*-1.80497*			*2.18943*
MA 5,50,0 VAR	2520.77	84.25	97	38	59	5203	0.00070	0.5847	0.00910	2328	-0.00003	0.5256	0.01340	0.00073
							1.14362				*-2.02796*			*2.75407*
MA 5,150 TRI filter 1DAY	2241.68	74.92	91	35	56	4860	0.00073	0.5877	0.00935	2546	-0.00001	0.5250	0.01286	0.00074
							1.27393				*-2.01568*			*2.84543*
MA 2,200,0 S	2039.92	68.18	105	29	76	5185	0.00068	0.5873	0.00947	2158	0.00001	0.5174	0.01324	0.00067
							1.03811				*-1.81535*			*2.46036*

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,200 E filter 1%	1948.62	65.13	88	25	63	5355	0.00066	0.5860	0.00933	2002	0.00004	0.5162	0.01374	0.00062
							0.94270				*-1.65044*			*2.22645*
MA 1,150 VAR filter 1%	1937.69	64.76	57	15	42	5870	0.00060	0.5802	0.00988	1660	0.00005	0.5172	0.01292	0.00055
							0.64345				*-1.49579*			*1.86123*
MA 1,200 VAR filter 1%	1912.51	63.92	49	13	36	6010	0.00058	0.5797	0.01002	1520	0.00007	0.5135	0.01275	0.00051
							0.53885				*-1.37540*			*1.67106*
MA 5,150,0 E filter 1%	1842.26	61.57	63	27	36	5219	0.00066	0.5871	0.00920	2188	0.00003	0.5158	0.01358	0.00063
							0.93559				*-1.74761*			*2.32701*
MA 1,200 TRI filter 1%	1837.68	61.42	68	26	42	5102	0.00069	0.5864	0.00935	2255	0.00004	0.5231	0.01330	0.00065
							1.08506				*-1.72889*			*2.41806*
MA 5,150,0 VAR	1758.88	58.79	45	14	31	5871	0.00059	0.5807	0.00991	1660	0.00008	0.5160	0.01285	0.00051
							0.58940				*-1.39168*			*1.72590*
MA 2,200,0 VAR	1732.71	57.91	49	13	36	6013	0.00057	0.5792	0.01004	1518	0.00010	0.5155	0.01266	0.00047
							0.48449				*-1.27430*			*1.53927*
MA 5,150 S filter 1DAY	1727.37	57.73	95	30	65	5010	0.00069	0.5832	0.00921	2396	0.00004	0.5303	0.01325	0.00065
							1.07916				*-1.76946*			*2.46175*
MA 5,50,0 VAR filter 1%	1725.75	57.68	59	28	31	5288	0.00065	0.5834	0.00912	2228	0.00005	0.5258	0.01357	0.00060
							0.88675				*-1.68186*			*2.23471*
MA 5,150 E filter 1DAY	1657.46	55.40	99	30	69	5244	0.00065	0.5839	0.00940	2162	0.00006	0.5229	0.01330	0.00059
							0.88457				*-1.62381*			*2.17160*
MA 5,150,0 TRI filter 1%	1606.19	53.68	65	28	37	4905	0.00070	0.5849	0.00935	2502	0.00005	0.5290	0.01290	0.00065
							1.12358				*-1.75784*			*2.48895*
MA 2,200 TRI filter 1DAY	1427.89	47.72	78	26	52	5105	0.00067	0.5859	0.00943	2251	0.00008	0.5244	0.01317	0.00059
							0.98140				*-1.57100*			*2.19370*
MA 5,50,0 TIME filter 1%	1423.85	47.59	400	159	241	3828	0.00089	0.5874	0.00930	3679	0.00004	0.5436	0.01186	0.00085
							1.93945				*-2.06364*			*3.46336*
MA 2,200,0 TRI filter 1%	1409.92	47.12	62	25	37	5099	0.00067	0.5852	0.00944	2258	0.00009	0.5259	0.01313	0.00058
							0.98105				*-1.53366*			*2.15845*
MA 5,50 VAR filter 1DAY	1345.91	44.98	96	32	64	5202	0.00064	0.5827	0.00930	2331	0.00011	0.5305	0.01311	0.00053
							0.83025				*-1.47308*			*2.00036*
MA 2,200,0 VAR filter 1%	1246.67	41.67	37	11	26	6007	0.00055	0.5790	0.01007	1521	0.00020	0.5164	0.01260	0.00035
							0.37551				*-0.94061*			*1.14705*
MA 2,200 E filter 1DAY	1237.21	41.35	108	29	79	5364	0.00062	0.5848	0.00953	1992	0.00014	0.5193	0.01339	0.00048
							0.73240				*-1.27367*			*1.72096*
MA 2,200 VAR filter 1DAY	1228.93	41.07	50	12	38	6013	0.00055	0.5784	0.01020	1550	0.00019	0.5194	0.01215	0.00036
							0.37561				*-0.98176*			*1.18885*
MA 5,150,0 VAR filter 1%	1207.14	40.34	31	11	20	5855	0.00056	0.5790	0.01006	1662	0.00017	0.5220	0.01244	0.00039
							0.42685				*-1.07987*			*1.32002*
MA 1,200 S filter 1%	1205.92	40.30	78	25	53	5159	0.00064	0.5854	0.00945	2198	0.00013	0.5239	0.01322	0.00051
							0.82821				*-1.36252*			*1.88355*
MA 2,200,0 S filter 1%	1171.91	39.17	70	24	46	5132	0.00065	0.5850	0.00956	2225	0.00011	0.5256	0.01299	0.00054
							0.87893				*-1.44697*			*2.00130*

Appendix II. Table I. Results for Moving Average Rules for the full sample of Nasdaq Composite

Trading Strategy	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 2,200 S filter 1DAY	1087.04	36.33	98	25	73	5185	0.00063	0.5846	0.00969	2171	0.00015	0.5253	0.01283	0.00048
							0.77728				*-1.27874*			*1.76639*
MA 5,150,0 S filter 1%	1069.29	35.74	67	27	40	4982	0.00065	0.5845	0.00919	2425	0.00013	0.5281	0.01324	0.00052
							0.87115				*-1.41478*			*1.97561*
MA 5,50 TIME filter 1DAY	1052.99	35.19	572	205	367	3872	0.00083	0.5831	0.00937	3634	0.00009	0.5479	0.01183	0.00074
							1.66121				*-1.82209*			*3.01404*
MA 1,50 TIME filter 1DAY	1011.20	33.80	457	178	279	3722	0.00087	0.5837	0.00930	3783	0.00009	0.5488	0.01180	0.00078
							1.82742				*-1.84682*			*3.17824*
MA 5,150 VAR filter 1DAY	837.24	27.98	46	13	33	5871	0.00054	0.5784	0.01004	1662	0.00027	0.5244	0.01248	0.00027
							0.31903				*-0.73264*			*0.91414*
MA 1,50 TIME filter 1%	778.24	26.01	327	138	189	3661	0.00085	0.5855	0.00937	3833	0.00011	0.5474	0.01173	0.00074
							1.72387				*-1.76002*			*3.01235*
MA 1,14 TIME filter 1DAY	230.67	7.71	954	469	485	3516	0.00076	0.5696	0.01012	4026	0.00023	0.5646	0.01103	0.00053
							1.28568				*-1.21014*			*2.16000*
MA 1,14 TIME filter 1%	119.68	4.00	574	296	278	3361	0.00077	0.5634	0.01043	4177	0.00024	0.5693	0.01076	0.00053
							1.31128				*-1.17588*			*2.15167*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**2370.52%**
Annual Buy/Hold return	**79.23%**
Observations	**7557**
Days in test	**10921**

Appendix II. Table II. Results for Moving Average Rules for the period 5/2/71-31/12/85 for Nasdaq Composite

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14,0 W	31843.67	2135.00	407	194	213	2127	0.00170	0.6402	0.00628	1607	-0.00148	0.4605	0.00851	0.00318
							6.69547				*-8.16687*			*12.85694*
MA 1,14,0 EXP	23713.73	1589.92	321	149	172	2128	0.00162	0.6347	0.00633	1574	-0.00144	0.4632	0.00856	0.00306
							6.30228				*-7.92943*			*12.29978*
MA 1,14 SIMPLE	15224.79	1020.77	335	147	188	2140	0.00152	0.6307	0.00636	1593	-0.00126	0.4721	0.00852	0.00278
							5.81996				*-7.15819*			*11.22630*
MA 1,14 TRIANGULAR	14251.11	955.48	343	149	194	2137	0.00150	0.6287	0.00638	1596	-0.00123	0.4749	0.00851	0.00273
							5.71868				*-7.02871*			*11.02702*
MA 1,50,0 EXP	4556.8	305.52	153	65	88	2221	0.00119	0.6149	0.00629	1469	-0.00098	0.4820	0.00890	0.00217
							4.24056				*-5.73854*			*8.62259*
MA 1,50,0 W	4505.15	302.05	199	73	126	2135	0.00125	0.6157	0.00642	1561	-0.00094	0.4875	0.00863	0.00219
							4.48380				*-5.68664*			*8.78789*
MA 1,14 W filter 1%	4488.43	300.93	158	80	78	2158	0.00124	0.6152	0.00639	1589	-0.00089	0.4921	0.00859	0.00213
							4.44963				*-5.49903*			*8.61056*
MA 1,14 TRI filter 1%	4449.12	298.30	172	85	87	2119	0.00126	0.6190	0.00650	1629	-0.00086	0.4905	0.00844	0.00212
							4.52224				*-5.41195*			*8.59742*
MA 1,14 E filter 1DAY	4363.52	292.56	224	95	129	2170	0.00122	0.6150	0.00654	1581	-0.00087	0.4927	0.00845	0.00209
							4.35831				*-5.40009*			*8.44646*
MA 1,50,0 TRI	3463.12	232.19	143	55	88	2130	0.00118	0.6111	0.00638	1565	-0.00084	0.4946	0.00869	0.00202
							4.13542				*-5.24746*			*8.10769*
MA 2,200,0 TIME	2994.59	200.78	260	111	149	1881	0.00128	0.6144	0.00657	1675	-0.00072	0.5057	0.00839	0.00200
							4.44424				*-4.82758*			*7.95531*
MA 1,50,0 S	2992.36	200.63	167	53	114	2159	0.00113	0.6061	0.00638	1535	-0.00081	0.4997	0.00874	0.00194
							3.90576				*-5.07922*			*7.76497*
MA 1,14 W filter 1DAY	2889.28	193.72	296	128	168	2144	0.00114	0.6094	0.00657	1607	-0.00073	0.5022	0.00842	0.00187
							3.94650				*-4.80325*			*7.57346*
MA 1,50,0 TIME	2419.79	162.24	292	131	161	1829	0.00127	0.6025	0.00681	1886	-0.00060	0.5220	0.00801	0.00187
							4.35581				*-4.45765*			*7.61458*
MA 1,14 E filter 1%	2374.28	159.19	130	59	71	2136	0.00110	0.6042	0.00647	1611	-0.00068	0.5084	0.00853	0.00178
							3.74446				*-4.58300*			*7.20829*
MA 1,14 TIME SERIES	2357.36	158.05	577	327	250	1746	0.00133	0.6109	0.00748	1997	-0.00054	0.5208	0.00737	0.00187
							4.56468				*-4.25292*			*7.62691*
MA 1,50 W filter 1%	2285.11	153.21	88	43	45	2130	0.00109	0.6036	0.00641	1586	-0.00071	0.5050	0.00865	0.00180
							3.69181				*-4.69183*			*7.25240*
MA 1,14 TRI filter 1DAY	2139.83	143.47	260	111	149	2149	0.00107	0.6061	0.00654	1602	-0.00064	0.5062	0.00847	0.00171
							3.60342				*-4.39481*			*6.92274*
MA 1,14 S filter 1%	2071.87	138.91	168	74	94	2137	0.00107	0.6063	0.00650	1610	-0.00064	0.5056	0.00851	0.00171
							3.59699				*-4.40249*			*6.92429*
MA 1,14,0 Variable	2010.58	134.80	148	54	94	2135	0.00105	0.6050	0.00641	1606	-0.00062	0.5062	0.00862	0.00167
							3.49726				*-4.30898*			*6.75617*
MA 1,14 VAR filter 1%	1920.09	128.73	104	50	54	2142	0.00105	0.6035	0.00639	1595	-0.00064	0.5072	0.00865	0.00169
							3.50092				*-4.38806*			*6.82844*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14 S filter 1DAY	1891.09	126.79	254	106	148	2157	0.00104	0.6048	0.00658	1594	-0.00060	0.5075	0.00845	0.00164
							3.45921				*-4.20821*			*6.63507*
MA 1,14 VAR filter 1DAY	1708.26	114.53	171	66	105	2158	0.00100	0.6055	0.00653	1584	-0.00058	0.5044	0.00853	0.00158
							3.26174				*-4.10967*			*6.38138*
MA 1,50,0 VAR	1568.44	105.16	108	34	74	2397	0.00090	0.6014	0.00622	1344	-0.00067	0.4933	0.00923	0.00157
							2.85888				*-4.25193*			*6.15666*
MA 1,50 E filter 1%	1516.51	101.68	72	32	40	2261	0.00092	0.5965	0.00633	1455	-0.00062	0.5072	0.00894	0.00154
							2.90820				*-4.16030*			*6.12309*
MA 1,200,0 TIMESERIES	1387.58	93.03	146	53	93	1884	0.00109	0.6012	0.00668	1670	-0.00050	0.5204	0.00835	0.00159
							3.54686				*-3.82262*			*6.32183*
MA 1,50 E filter 1DAY	1368.65	91.76	120	39	81	2241	0.00091	0.5987	0.00639	1474	-0.00058	0.5054	0.00886	0.00149
							2.85004				*-4.00580*			*5.93721*
MA 5,50,0 W	1359.6	91.16	143	45	98	2117	0.00098	0.5988	0.00653	1578	-0.00055	0.5120	0.00859	0.00153
							3.14346				*-3.97049*			*6.14758*
MA 1,150,0 W	1348.44	90.41	103	37	66	2150	0.00095	0.6059	0.00640	1454	-0.00058	0.4986	0.00890	0.00153
							3.01071				*-3.98614*			*6.02152*
MA 2,200,0 TIMESERIES filt 1%	1322.15	88.65	89	40	49	1858	0.00110	0.5999	0.00672	1708	-0.00047	0.5240	0.00830	0.00157
							3.57757				*-3.71500*			*6.25867*
MA 1,150,0 EXP	1297.78	87.01	77	26	51	2315	0.00088	0.6054	0.00632	1272	-0.00064	0.4851	0.00933	0.00152
							2.72724				*-4.04231*			*5.81973*
MA 1,50 W filter 1DAY	1272.63	85.33	156	48	108	2154	0.00095	0.5996	0.00651	1561	-0.00054	0.5093	0.00861	0.00149
							3.01249				*-3.91095*			*5.99014*
MA 1,50 TRI filter 1%	1202.71	80.64	84	38	46	2069	0.00095	0.5934	0.00652	1617	-0.00050	0.5201	0.00854	0.00145
							2.97388				*-3.77994*			*5.83756*
MA 1,200,0 W	1202.35	80.61	70	25	45	2196	0.00091	0.6050	0.00637	1357	-0.00059	0.4952	0.00907	0.00150
							2.83190				*-3.92938*			*5.80505*
MA 1,50 TRI filter 1DAY	1170.05	78.45	114	39	75	2153	0.00093	0.5957	0.00651	1562	-0.00051	0.5147	0.00862	0.00144
							2.91313				*-3.77863*			*5.78964*
MA 1,50 S filter 1%	1164.32	78.06	78	33	45	2140	0.00092	0.5942	0.00651	1576	-0.00050	0.5171	0.00861	0.00142
							2.85815				*-3.74600*			*5.71665*
MA 5,50,0 EXP	1129.22	75.71	97	34	63	2217	0.00088	0.5997	0.00642	1472	-0.00051	0.5048	0.00885	0.00139
							2.69066				*-3.69953*			*5.52463*
MA 1,50 S filter 1DAY	1124.52	75.40	120	36	84	2182	0.00090	0.5928	0.00649	1533	-0.00050	0.5173	0.00868	0.00140
							2.77651				*-3.70951*			*5.61375*
MA 2,200,0 W	1029.69	69.04	60	21	39	2199	0.00088	0.6028	0.00639	1354	-0.00053	0.4985	0.00907	0.00141
							2.68375				*-3.67315*			*5.45443*
MA 1,150,0 S	1024.47	68.69	63	20	43	2198	0.00087	0.6054	0.00639	1390	-0.00051	0.4950	0.00905	0.00138
							2.63358				*-3.62349*			*5.38121*
MA 5,50,0 TIME filter 1%	976.89	65.50	177	78	99	1885	0.00101	0.5915	0.00684	1831	-0.00039	0.5306	0.00807	0.00140
							3.16858				*-3.42870*			*5.70159*
MA 5,150,0 TIMESERIES	941.74	63.14	165	68	97	1811	0.00104	0.5923	0.00677	1802	-0.00038	0.5316	0.00819	0.00142
							3.26650				*-3.36364*			*5.70292*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 5,50,0 W filter 1%	910.3	61.03	78	32	46	2146	0.00087	0.5902	0.00648	1570	-0.00043	0.5223	0.00866	0.00130
							2.61366				*-3.42959*			*5.23090*
MA 1,200,0 EXP	883.89	59.26	64	22	42	2351	0.00078	0.6060	0.00639	1205	-0.00052	0.4797	0.00936	0.00130
							2.23186				*-3.47633*			*4.90330*
MA 5,50,0	842.1	56.46	111	31	80	2127	0.00086	0.5927	0.00654	1564	-0.00040	0.5198	0.00862	0.00126
							2.55699				*-3.29169*			*5.05483*
MA 1,150 W filter 1%	827.22	55.46	46	21	25	2137	0.00085	0.5988	0.00637	1479	-0.00043	0.5078	0.00891	0.00128
							2.51148				*-3.35747*			*5.05694*
MA 1,50 VAR filter 1%	819.68	54.96	50	21	29	2387	0.00077	0.5964	0.00630	1352	-0.00045	0.5022	0.00916	0.00122
							2.19122				*-3.33396*			*4.78964*
MA 5,150,0 W	795.53	53.34	65	24	41	2142	0.00084	0.6002	0.00642	1461	-0.00041	0.5072	0.00890	0.00125
							2.46397				*-3.25600*			*4.92287*
MA 1,150,0 TIMESERIES	787.9	52.83	153	55	98	1785	0.00101	0.5908	0.00678	1828	-0.00033	0.5339	0.00816	0.00134
							3.11104				*-3.14554*			*5.38126*
MA 5,50,0 TRI	768.84	51.55	115	39	76	2121	0.00085	0.5929	0.00656	1572	-0.00038	0.5197	0.00859	0.00123
							2.50546				*-3.20862*			*4.93876*
MA 2,200 TIME filter 1DAY	762.23	51.10	129	45	84	1886	0.00095	0.5947	0.00673	1679	-0.00032	0.5289	0.00835	0.00127
							2.88492				*-3.01005*			*5.05797*
MA 1,50 TIME filter 1%	757.15	50.76	142	66	76	1802	0.00099	0.5860	0.00690	1901	-0.00032	0.5384	0.00799	0.00131
							3.02774				*-3.13951*			*5.32438*
MA 1,200 W filter 1%	756.94	50.75	33	15	18	2178	0.00083	0.6031	0.00638	1388	-0.00040	0.5014	0.00906	0.00123
							2.42742				*-3.15346*			*4.78568*
MA 5,50 TIME filter 1DAY	745.46	49.98	267	105	162	1881	0.00094	0.5885	0.00676	1834	-0.00031	0.5341	0.00815	0.00125
							2.83504				*-3.05515*			*5.09015*
MA 1,50 VAR filter 1DAY	743.98	49.88	75	25	50	2401	0.00075	0.5938	0.00629	1341	-0.00041	0.5071	0.00919	0.00116
							2.09280				*-3.15586*			*4.54697*
MA 1,150,0 TRI	738.02	49.48	75	21	54	2167	0.00082	0.6016	0.00644	1437	-0.00040	0.5038	0.00891	0.00122
							2.37396				*-3.19349*			*4.79216*
MA 5,50 W filter 1DAY	737.57	49.45	140	44	96	2135	0.00084	0.5914	0.00655	1580	-0.00037	0.5215	0.00857	0.00121
							2.46140				*-3.16979*			*4.87236*
MA 2,200 W filter 1DAY	736.97	49.41	49	17	32	2200	0.00082	0.6016	0.00641	1365	-0.00040	0.5026	0.00907	0.00122
							2.38535				*-3.13422*			*4.73166*
MA 5,150,0 TIME filter 1%	688.93	46.19	80	38	42	1787	0.00097	0.5879	0.00682	1829	-0.00030	0.5358	0.00813	0.00127
							2.92614				*-3.00546*			*5.10228*
MA 2,200,0 W filter 1%	661.12	44.33	33	15	18	2178	0.00080	0.6022	0.00640	1388	-0.00036	0.5029	0.00905	0.00116
							2.27850				*-2.98323*			*4.51333*
MA 1,200 TIME filter 1%	659.61	44.22	61	28	33	1858	0.00093	0.5897	0.00676	1708	-0.00028	0.5351	0.00830	0.00121
							2.77627				*-2.84465*			*4.82356*
MA 1,200,0 S	653.19	43.79	66	21	45	2287	0.00075	0.6045	0.00644	1266	-0.00040	0.4882	0.00919	0.00115
							2.06166				*-3.04797*			*4.38688*
MA 1,200,0 TRI	640.3	42.93	48	16	32	2225	0.00077	0.6039	0.00647	1326	-0.00038	0.4940	0.00904	0.00115
							2.14397				*-3.01723*			*4.42961*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,150 S filter 1%	637.42	42.74	32	14	18	2226	0.00076	0.5982	0.00640	1390	-0.00037	0.5029	0.00903	0.00113
							2.09429				*-3.02738*			*4.41713*
MA 2,200,0 EXP	636.03	42.64	50	17	33	2348	0.00072	0.6050	0.00646	1208	-0.00040	0.4818	0.00928	0.00112
							1.92607				*-2.99464*			*4.22694*
MA 5,50 E filter 1DAY	620.93	41.63	92	28	64	2242	0.00075	0.5904	0.00648	1473	-0.00033	0.5180	0.00880	0.00108
							2.04891				*-2.91773*			*4.30298*
MA 5,150,0 EXP	604.45	40.53	49	16	33	2318	0.00072	0.6003	0.00638	1267	-0.00036	0.4933	0.00930	0.00108
							1.91844				*-2.88429*			*4.13076*
MA 5,150 W filter 1DAY	581.06	38.96	60	19	41	2153	0.00077	0.5971	0.00642	1462	-0.00033	0.5096	0.00889	0.00110
							2.12178				*-2.90988*			*4.33751*
MA 1,150 E filter 1%	574.11	38.49	38	15	23	2329	0.00070	0.5984	0.00640	1287	-0.00036	0.4949	0.00921	0.00106
							1.81986				*-2.90121*			*4.07823*
MA 5,50 TRI filter 1DAY	571.74	38.33	110	35	75	2142	0.00078	0.5880	0.00655	1573	-0.00030	0.5257	0.00859	0.00108
							2.16770				*-2.85324*			*4.34635*
MA 5,150,0 S	567.64	38.06	45	16	29	2200	0.00076	0.5994	0.00643	1387	-0.00033	0.5047	0.00903	0.00109
							2.08656				*-2.85481*			*4.24831*
MA 1,50 TIME filter 1DAY	566.37	37.97	218	92	126	1826	0.00091	0.5827	0.00687	1888	-0.00025	0.5416	0.00803	0.00116
							2.66640				*-2.80064*			*4.72274*
MA 1,150 TIME filter 1%	540.18	36.22	61	32	29	1782	0.00094	0.5867	0.00683	1822	-0.00026	0.5390	0.00815	0.00120
							2.78393				*-2.81428*			*4.81308*
MA 1,150 TRI filter 1%	533.11	35.74	34	14	20	2162	0.00075	0.5993	0.00645	1454	-0.00031	0.5055	0.00888	0.00106
							2.02555				*-2.81757*			*4.17645*
MA 5,50,0 TRI filter 1%	522.39	35.02	76	29	47	2124	0.00077	0.5836	0.00656	1592	-0.00028	0.5320	0.00856	0.00105
							2.11263				*-2.77593*			*4.23259*
MA 1,150,0 VAR	511.94	34.32	54	14	40	2556	0.00063	0.5965	0.00635	1185	-0.00031	0.4895	0.00944	0.00094
							1.50694				*-2.61180*			*3.57421*
MA 2,200,0 TRI	509.21	34.14	42	15	27	2223	0.00072	0.6017	0.00647	1328	-0.00031	0.4977	0.00905	0.00103
							1.89356				*-2.72582*			*3.96859*
MA 5,150,0 W filter 1%	495.01	33.19	42	16	26	2140	0.00075	0.5933	0.00644	1476	-0.00028	0.5156	0.00886	0.00103
							2.01897				*-2.70229*			*4.06798*
MA 5,50,0 E filter 1%	493.46	33.08	58	23	35	2231	0.00070	0.5915	0.00653	1485	-0.00026	0.5165	0.00873	0.00096
							1.79566				*-2.62097*			*3.83047*
MA 2,200,0 S	492.76	33.04	54	17	37	2280	0.00070	0.6020	0.00650	1272	-0.00030	0.4929	0.00912	0.00100
							1.80790				*-2.64131*			*3.81839*
MA 5,150,0 TRI	490.02	32.85	53	18	35	2149	0.00074	0.5996	0.00648	1453	-0.00028	0.5072	0.00887	0.00102
							1.97224				*-2.68706*			*4.01315*
MA 5,50,0 VAR	476.33	31.94	54	20	34	2403	0.00066	0.5933	0.00630	1337	-0.00026	0.5071	0.00920	0.00092
							1.63270				*-2.52275*			*3.60330*
MA 1,200 E filter 1%	448.09	30.04	35	13	22	2347	0.00066	0.6006	0.00645	1219	-0.00026	0.4922	0.00931	0.00092
							1.62094				*-2.43719*			*3.48226*
MA 5,150 TIME filter 1DAY	442.88	29.69	140	50	90	1808	0.00085	0.5800	0.00686	1807	-0.00020	0.5434	0.00813	0.00105
							2.37728				*-2.52626*			*4.21812*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 2,200,0 E filter 1%	432.94	29.03	31	13	18	2353	0.00066	0.6008	0.00644	1213	-0.00024	0.4913	0.00934	0.00090
							1.62221				*-2.35170*			*3.40251*
MA 1,200,0 VAR	416.84	27.95	44	13	31	2598	0.00058	0.5953	0.00640	1143	-0.00023	0.4882	0.00948	0.00081
							1.25227				*-2.25948*			*3.04958*
MA 5,50 S filter 1DAY	409.1	27.43	110	32	78	2150	0.00071	0.5849	0.00659	1565	-0.00021	0.5297	0.00857	0.00092
							1.82422				*-2.44822*			*3.69991*
MA 1,150 VAR filter 1%	406.75	27.27	22	8	14	2541	0.00059	0.5957	0.00636	1198	-0.00023	0.4917	0.00941	0.00082
							1.29609				*-2.30035*			*3.12660*
MA 2,200 E filter 1DAY	394.72	26.46	45	15	30	2346	0.00065	0.6000	0.00647	1219	-0.00022	0.4938	0.00929	0.00087
							1.56992				*-2.27498*			*3.29277*
MA 2,200 TRI filter 1DAY	393.9	26.41	39	14	25	2222	0.00069	0.6011	0.00650	1343	-0.00021	0.5019	0.00903	0.00090
							1.74342				*-2.31669*			*3.47960*
MA 5,150,0 E filter 1%	393.66	26.39	28	14	14	2303	0.00064	0.6003	0.00644	1313	-0.00023	0.4935	0.00912	0.00087
							1.51045				*-2.38081*			*3.36194*
MA 5,150 S filter 1DAY	389.47	26.11	46	16	30	2228	0.00067	0.5950	0.00648	1387	-0.00023	0.5083	0.00895	0.00090
							1.64491				*-2.42935*			*3.51633*
MA 5,50,0 VAR filter 1%	384.98	25.81	30	14	16	2464	0.00060	0.5911	0.00633	1261	-0.00022	0.5059	0.00933	0.00082
							1.33574				*-2.30416*			*3.16471*
MA 1,200 TRI filter 1%	384.66	25.79	27	13	14	2225	0.00068	0.6003	0.00653	1341	-0.00020	0.5026	0.00900	0.00088
							1.69419				*-2.27339*			*3.40155*
MA 1,200 S filter 1%	378.89	25.40	33	14	19	2263	0.00066	0.6008	0.00650	1303	-0.00020	0.4988	0.00909	0.00086
							1.60272				*-2.24934*			*3.30467*
MA 5,150 TRI filter 1DAY	378.63	25.39	52	20	32	2161	0.00069	0.5968	0.00650	1454	-0.00021	0.5096	0.00884	0.00090
							1.72815				*-2.38476*			*3.54572*
MA 5,50 VAR filter 1DAY	352.56	23.64	53	18	35	2401	0.00061	0.5917	0.00632	1341	-0.00017	0.5108	0.00918	0.00078
							1.37644				*-2.14733*			*3.05745*
MA 5,50,0 S filter 1%	351.98	23.60	70	27	43	2141	0.00068	0.5832	0.00665	1575	-0.00017	0.5321	0.00850	0.00085
							1.67367				*-2.27560*			*3.42165*
MA 5,150 E filter 1DAY	341.69	22.91	50	16	34	2348	0.00061	0.5952	0.00645	1267	-0.00019	0.4996	0.00920	0.00080
							1.36705				*-2.18482*			*3.06676*
MA 2,200,0 TRI filter 1%	325.77	21.84	27	13	14	2227	0.00065	0.5988	0.00655	1339	-0.00015	0.5049	0.00898	0.00080
							1.54469				*-2.06215*			*3.09140*
MA 5,150,0 TRI filter 1%	319.97	21.45	32	15	17	2156	0.00066	0.5940	0.00648	1460	-0.00016	0.5137	0.00885	0.00082
							1.57844				*-2.17158*			*3.23301*
MA 5,150,0 VAR	308.92	20.71	20	8	12	2527	0.00056	0.5954	0.00638	1213	-0.00014	0.4938	0.00936	0.00070
							1.13806				*-1.94693*			*2.67794*
MA 2,200 S filter 1DAY	307.3	20.60	51	15	36	2279	0.00063	0.5979	0.00655	1286	-0.00013	0.5031	0.00907	0.00076
							1.45518				*-1.94875*			*2.91194*
MA 2,200,0 S filter 1%	305.69	20.50	31	13	18	2244	0.00065	0.6005	0.00651	1322	-0.00016	0.5008	0.00906	0.00081
							1.54838				*-2.09424*			*3.12196*
MA 5,150,0 S filter 1%	304.63	20.42	32	14	18	2221	0.00063	0.5964	0.00650	1395	-0.00015	0.5061	0.00893	0.00078
							1.44349				*-2.09338*			*3.05104*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,200 VAR filter 1%	297.01	19.91	24	8	16	2585	0.00053	0.5929	0.00644	1154	-0.00012	0.4939	0.00939	0.00065
							0.98882				*-1.83091*			*2.45344*
MA 2,200,0 VAR	292.03	19.58	26	8	18	2592	0.00053	0.5928	0.00643	1148	-0.00011	0.4939	0.00943	0.00064
							0.98961				*-1.78762*			*2.41234*
MA 2,200 VAR filter 1DAY	244.23	16.37	27	8	19	2591	0.00050	0.5919	0.00644	1151	-0.00005	0.4970	0.00940	0.00055
							0.83244				*-1.55135*			*2.07486*
MA 2,200,0 VAR filter 1%	221.81	14.87	20	6	14	2570	0.00049	0.5917	0.00647	1167	-0.00003	0.4979	0.00934	0.00052
							0.77820				*-1.47979*			*1.96857*
MA 5,150,0 VAR filter 1%	200.33	13.43	18	7	11	2505	0.00050	0.5923	0.00643	1221	-0.00002	0.5012	0.00930	0.00052
							0.82410				*-1.46484*			*1.99090*
MA 5,150 VAR filter 1DAY	190.4	12.77	21	8	13	2526	0.00049	0.5925	0.00642	1216	0.00000	0.5008	0.00931	0.00049
							0.77420				*-1.38155*			*1.87600*
MA 1,14 TIME filter 1DAY	90.99	6.10	460	234	226	1751	0.00061	0.5657	0.00762	2000	0.00010	0.5615	0.00734	0.00051
							1.24277				*-1.16397*			*2.08238*
MA 1,14 TIME filter 1%	74.4	4.99	251	138	113	1653	0.00064	0.5638	0.00765	2094	0.00010	0.5624	0.00733	0.00054
							1.35424				*-1.18142*			*2.19322*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**225.22%**
Annual Buy/Hold return	**15.10%**
Observations	**3766**
Days in test	**5444**

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14,0 EXP	3690.56	245.99	454	174	280	2374	0.00131	0.6036	0.00984	1403	-0.00055	0.5136	0.01704	0.00186
							2.02795				*-2.88003*			*4.24879*
MA 1,14,0 W	3638.93	242.55	514	197	317	2313	0.00134	0.6096	0.00997	1464	-0.00051	0.5079	0.01668	0.00185
							2.09917				*-2.82486*			*4.26102*
MA 1,14 SIMPLE	2992.31	199.45	408	151	257	2335	0.00128	0.6030	0.00989	1442	-0.00045	0.5170	0.01685	0.00173
							1.92989				*-2.66026*			*3.97334*
MA 1,50,0 TRI	2512.7	167.48	172	56	116	2373	0.00120	0.5912	0.01009	1289	-0.00053	0.5210	0.01745	0.00173
							1.70443				*-2.74363*			*3.84609*
MA 1,50,0 W	2242.29	149.46	232	69	163	2371	0.00118	0.5943	0.00998	1291	-0.00050	0.5155	0.01756	0.00168
							1.64523				*-2.67361*			*3.73625*
MA 1,14 TRIANGULAR	2071.61	138.08	416	157	259	2334	0.00121	0.6045	0.00995	1442	-0.00033	0.5149	0.01681	0.00154
							1.72498				*-2.36192*			*3.53667*
MA 1,50,0 EXP	1952.66	130.15	216	66	150	2454	0.00110	0.5884	0.01018	1208	-0.00045	0.5220	0.01774	0.00155
							1.42510				*-2.49120*			*3.39234*
MA 1,50,0 S	1921.65	128.09	182	55	127	2415	0.00112	0.5888	0.01026	1247	-0.00044	0.5233	0.01746	0.00156
							1.47726				*-2.49772*			*3.44123*
MA 1,14 VAR filter 1DAY	1640.38	109.34	175	63	112	2527	0.00108	0.5900	0.01005	1241	-0.00034	0.5282	0.01758	0.00142
							1.37786				*-2.25798*			*3.15122*
MA 1,150,0 TIMESERIES	1600.47	106.68	153	42	111	1876	0.00142	0.6039	0.01009	1706	-0.00024	0.5255	0.01603	0.00166
							2.18003				*-2.26913*			*3.81687*
MA 1,50 E filter 1%	1573.24	104.86	85	37	48	2490	0.00106	0.5884	0.01025	1252	-0.00033	0.5268	0.01735	0.00139
							1.31211				*-2.24189*			*3.08618*
MA 5,50,0 W	1451	96.72	138	48	90	2379	0.00109	0.5885	0.01019	1282	-0.00034	0.5254	0.01740	0.00143
							1.38225				*-2.28568*			*3.17493*
MA 5,150,0 TIMESERIES	1379.65	91.96	157	47	110	1898	0.00136	0.6001	0.01003	1685	-0.00020	0.5291	0.01614	0.00156
							2.02440				*-2.15435*			*3.58514*
MA 1,50,0 VAR	1144.47	76.28	106	29	77	2651	0.00093	0.5820	0.01075	1006	-0.00027	0.5274	0.01808	0.00120
							0.94187				*-1.93036*			*2.49275*
MA 1,14 VAR filter 1%	1135.36	75.68	121	49	72	2500	0.00102	0.5872	0.00990	1266	-0.00019	0.5344	0.01764	0.00121
							1.19427				*-1.91950*			*2.69829*
MA 1,50 E filter 1DAY	1108.24	73.87	129	46	83	2554	0.00097	0.5854	0.01033	1187	-0.00021	0.5295	0.01757	0.00118
							1.05171				*-1.91959*			*2.58393*
MA 1,50 W filter 1DAY	1088.41	72.55	155	54	101	2466	0.00101	0.5864	0.01007	1275	-0.00021	0.5314	0.01746	0.00122
							1.15961				*-1.97212*			*2.72066*
MA 1,150 TIME filter 1%	1081.68	72.10	68	28	40	1846	0.00133	0.6013	0.01017	1796	-0.00013	0.5331	0.01570	0.00146
							1.92435				*-2.01400*			*3.38851*
MA 5,150,0 TIME filter 1%	997.35	66.48	86	31	55	1883	0.00129	0.5964	0.01014	1759	-0.00012	0.5370	0.01582	0.00141
							1.82805				*-1.97311*			*3.27087*
MA 1,14,0 Variable	990.15	66.00	124	52	72	2428	0.00099	0.5865	0.01030	1232	-0.00020	0.5272	0.01751	0.00119
							1.09496				*-1.92341*			*2.61693*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 2,200,0 TIME	989.4	65.95	287	104	183	1775	0.00133	0.6023	0.01025	1784	-0.00007	0.5311	0.01576	0.00140
							1.89898				*-1.84866*			*3.21231*
MA 1,200,0 TIMESERIES	961.28	64.07	137	35	102	1735	0.00138	0.5988	0.01031	1823	-0.00009	0.5357	0.01562	0.00147
							2.01693				*-1.91624*			*3.37143*
MA 1,50 S filter 1DAY	933.23	62.20	109	39	70	2504	0.00096	0.5867	0.01035	1237	-0.00015	0.5291	0.01731	0.00111
							1.01562				*-1.80889*			*2.45690*
MA 5,50,0 EXP	929.91	61.98	104	36	68	2466	0.00096	0.5843	0.01042	1192	-0.00016	0.5306	0.01756	0.00112
							1.01094				*-1.80684*			*2.44224*
MA 1,150,0 EXP	927.51	61.82	103	26	77	2738	0.00087	0.5785	0.01084	899	-0.00018	0.5334	0.01865	0.00105
							0.76677				*-1.65889*			*2.10122*
MA 1,150,0 W	896.85	59.78	125	36	89	2510	0.00094	0.5861	0.01049	1027	-0.00012	0.5214	0.01854	0.00106
							0.95657				*-1.61814*			*2.20124*
MA 5,150 TIME filter 1DAY	862.47	57.49	136	49	87	1899	0.00123	0.5961	0.01011	1742	-0.00006	0.5370	0.01589	0.00129
							1.66905				*-1.80712*			*2.99104*
MA 1,50 TRI filter 1%	835.09	55.66	97	38	59	2448	0.00097	0.5842	0.01018	1294	-0.00011	0.5367	0.01726	0.00108
							1.03836				*-1.74413*			*2.41714*
MA 5,150,0 W	823.52	54.89	57	23	34	2514	0.00092	0.5847	0.01072	1021	-0.00011	0.5235	0.01826	0.00103
							0.89721				*-1.59260*			*2.13498*
MA 1,50 VAR filter 1DAY	804.1	53.60	73	24	49	2770	0.00085	0.5816	0.01072	998	-0.00005	0.5366	0.01796	0.00090
							0.70781				*-1.44861*			*1.87521*
MA 1,14 E filter 1%	801.57	53.43	179	70	109	2380	0.00101	0.5916	0.01009	1393	-0.00005	0.5330	0.01688	0.00106
							1.14712				*-1.64495*			*2.41704*
MA 1,14 TIME SERIES	759.63	50.63	688	330	358	1765	0.00136	0.6009	0.01223	2010	-0.00003	0.5433	0.01365	0.00139
							1.97541				*-1.81215*			*3.27781*
MA 5,50,0 E filter 1%	751.86	50.12	55	27	28	2470	0.00093	0.5854	0.01051	1272	-0.00005	0.5334	0.01698	0.00098
							0.92219				*-1.59055*			*2.18435*
MA 1,50 W filter 1%	744.92	49.65	121	43	78	2439	0.00095	0.5843	0.01012	1303	-0.00008	0.5369	0.01728	0.00103
							0.97793				*-1.67677*			*2.30898*
MA 5,50 E filter 1DAY	742.45	49.49	97	35	62	2552	0.00090	0.5842	0.01043	1189	-0.00006	0.5320	0.01744	0.00096
							0.84117				*-1.57369*			*2.10313*
MA 1,50 S filter 1%	739.59	49.30	89	34	55	2455	0.00094	0.5829	0.01032	1287	-0.00007	0.5389	0.01713	0.00101
							0.95019				*-1.64523*			*2.25757*
MA 2,200,0 W filter 1%	735.93	49.05	36	16	20	2610	0.00088	0.5793	0.01082	982	-0.00003	0.5331	0.01822	0.00091
							0.78633				*-1.39639*			*1.86985*
MA 1,14 E filter 1DAY	728.53	48.56	288	98	190	2385	0.00095	0.5874	0.00987	1391	0.00002	0.5410	0.01712	0.00093
							0.97127				*-1.47231*			*2.12047*
MA 1,50 VAR filter 1%	726.23	48.41	59	21	38	2724	0.00085	0.5793	0.01069	1042	-0.00001	0.5437	0.01776	0.00086
							0.70438				*-1.38548*			*1.81615*
MA 1,200,0 W	706.53	47.09	103	23	80	2631	0.00086	0.5792	0.01072	905	-0.00004	0.5321	0.01902	0.00090
							0.72756				*-1.37226*			*1.79650*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,50 TRI filter 1DAY	695.29	46.34	123	42	81	2462	0.00093	0.5829	0.01027	1279	-0.00006	0.5383	0.01723	0.00099
							0.92129				*-1.61761*			*2.20941*
MA 1,150,0 S	679.4	45.29	89	20	69	2654	0.00084	0.5791	0.01070	983	-0.00002	0.5356	0.01835	0.00086
							0.66864				*-1.37546*			*1.77178*
MA 5,50 S filter 1DAY	673.86	44.92	99	37	62	2490	0.00091	0.5823	0.01051	1251	-0.00004	0.5384	0.01706	0.00095
							0.86480				*-1.55706*			*2.10870*
MA 1,150 E filter 1%	670.81	44.71	50	17	33	2739	0.00082	0.5743	0.01090	903	-0.00001	0.5477	0.01851	0.00083
							0.61348				*-1.30872*			*1.66381*
MA 5,50,0 S filter 1%	669	44.59	69	28	41	2451	0.00093	0.5851	0.01053	1291	-0.00004	0.5349	0.01686	0.00097
							0.92004				*-1.57552*			*2.16976*
MA 2,200,0 TIME filter 1%	659.68	43.97	134	42	92	1726	0.00128	0.5956	0.01035	1866	-0.00002	0.5399	0.01545	0.00130
							1.74842				*-1.74091*			*2.99439*
MA 1,150 W filter 1%	654.43	43.62	56	21	35	2496	0.00089	0.5817	0.01063	1146	0.00001	0.5371	0.01755	0.00088
							0.80575				*-1.39195*			*1.89707*
MA 1,14 TRI filter 1%	641.5	42.76	227	88	139	2280	0.00099	0.5939	0.01012	1493	0.00004	0.5335	0.01650	0.00095
							1.07392				*-1.46019*			*2.19500*
MA 1,14 W filter 1DAY	636.36	42.42	350	126	224	2327	0.00097	0.5862	0.01011	1449	0.00006	0.5449	0.01665	0.00091
							1.02234				*-1.39473*			*2.09177*
MA 2,200,0 W	635.09	42.33	79	23	56	2631	0.00084	0.5785	0.01076	904	0.00001	0.5338	0.01895	0.00083
							0.66693				*-1.26774*			*1.65609*
MA 1,150,0 VAR	616.28	41.08	58	10	48	3065	0.00073	0.5687	0.01200	551	0.00006	0.5618	0.01865	0.00067
							0.34834				*-0.94483*			*1.11380*
MA 5,50,0	604.16	40.27	98	37	61	2407	0.00091	0.5829	0.01052	1252	-0.00002	0.5356	0.01718	0.00093
							0.85594				*-1.51033*			*2.05305*
MA 1,200,0 EXP	585.27	39.01	91	15	76	2836	0.00077	0.5733	0.01101	721	0.00008	0.5389	0.01997	0.00069
							0.46475				*-1.02238*			*1.27258*
MA 1,150,0 TRI	584.67	38.97	79	21	58	2558	0.00085	0.5797	0.01070	978	0.00005	0.5343	0.01856	0.00080
							0.69145				*-1.22254*			*1.63685*
MA 1,14 W filter 1%	571.73	38.11	229	89	140	2308	0.00097	0.5875	0.01012	1465	0.00006	0.5423	0.01659	0.00091
							1.01974				*-1.40027*			*2.09552*
MA 1,200 W filter 1%	559.4	37.29	48	17	31	2584	0.00084	0.5789	0.01086	1008	0.00009	0.5353	0.01801	0.00075
							0.66338				*-1.15044*			*1.55355*
MA 1,150 S filter 1%	546.8	36.45	44	15	29	2637	0.00081	0.5753	0.01075	1005	0.00008	0.5478	0.01813	0.00073
							0.57637				*-1.17077*			*1.51477*
MA 1,150 TRI filter 1%	530.92	35.39	40	17	23	2548	0.00084	0.5781	0.01076	1094	0.00008	0.5435	0.01763	0.00076
							0.66061				*-1.21033*			*1.61737*
MA 2,200 TIME filter 1DAY	529.79	35.31	114	35	79	1772	0.00119	0.5926	0.01040	1819	0.00008	0.5413	0.01554	0.00111
							1.52365				*-1.45634*			*2.55812*
MA 2,200 W filter 1DAY	523.32	34.88	58	17	41	2632	0.00082	0.5760	0.01084	959	0.00011	0.5407	0.01834	0.00071
							0.60637				*-1.08534*			*1.44797*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,200 TIME filter 1%	522.25	34.81	62	25	37	1701	0.00125	0.5944	0.01046	1891	0.00007	0.5418	0.01533	0.00118
							1.66058				*-1.50277*			*2.71624*
MA 5,150,0 EXP	517.63	34.50	47	15	32	2743	0.00077	0.5742	0.01107	892	0.00009	0.5455	0.01830	0.00068
							0.46031				*-1.09554*			*1.35709*
MA 5,50,0 TRI	440.09	29.33	116	41	75	2379	0.00087	0.5805	0.01054	1280	0.00007	0.5410	0.01704	0.00080
							0.73524				*-1.30874*			*1.77528*
MA 5,50,0 TRI filter 1%	439.79	29.31	77	30	47	2412	0.00087	0.5825	0.01049	1330	0.00009	0.5410	0.01677	0.00078
							0.73835				*-1.27926*			*1.75677*
MA 1,14 S filter 1%	429.86	28.65	203	79	124	2336	0.00091	0.5890	0.01004	1437	0.00015	0.5390	0.01678	0.00076
							0.84809				*-1.16706*			*1.74378*
MA 2,200,0 E filter 1%	416.85	27.78	36	10	26	2826	0.00073	0.5725	0.01126	766	0.00026	0.5451	0.01891	0.00047
							0.34047				*-0.69905*			*0.88754*
MA 1,200,0 S	414.24	27.61	67	17	50	2726	0.00075	0.5741	0.01145	808	0.00019	0.5428	0.01836	0.00056
							0.39821				*-0.85364*			*1.07542*
MA 5,150 W filter 1DAY	405.37	27.02	56	21	35	2515	0.00081	0.5797	0.01082	1126	0.00017	0.5413	0.01739	0.00064
							0.56830				*-1.01992*			*1.37298*
MA 1,200,0 TRI	405.28	27.01	61	18	43	2701	0.00075	0.5750	0.01111	833	0.00021	0.5409	0.01885	0.00054
							0.39715				*-0.82420*			*1.04810*
MA 1,200,0 VAR	403.25	26.88	46	5	41	3162	0.00065	0.5667	0.01230	454	0.00045	0.5740	0.01848	0.00020
							0.09582				*-0.26331*			*0.30654*
MA 5,150,0 S	402.72	26.84	47	13	34	2633	0.00077	0.5739	0.01097	1001	0.00017	0.5490	0.01783	0.00060
							0.45483				*-0.97410*			*1.24296*
MA 5,50,0 W filter 1%	400.44	26.69	87	32	55	2430	0.00085	0.5807	0.01036	1312	0.00011	0.5439	0.01699	0.00074
							0.68082				*-1.22478*			*1.66152*
MA 5,50 TRI filter 1DAY	394.48	26.29	111	41	70	2461	0.00083	0.5794	0.01052	1280	0.00014	0.5450	0.01694	0.00069
							0.62402				*-1.14218*			*1.54018*
MA 5,150,0 TRI	394.35	26.29	39	18	21	2552	0.00080	0.5799	0.01103	982	0.00017	0.5331	0.01803	0.00063
							0.54075				*-0.96673*			*1.29051*
MA 1,14 S filter 1DAY	381.59	25.43	300	107	193	2355	0.00087	0.5847	0.00991	1421	0.00021	0.5465	0.01697	0.00066
							0.73295				*-1.01394*			*1.51139*
MA 5,150,0 W filter 1%	379.1	25.27	42	17	25	2498	0.00080	0.5789	0.01083	1144	0.00019	0.5433	0.01729	0.00061
							0.53729				*-0.98055*			*1.31439*
MA 1,50,0 TIME	376.77	25.11	351	126	225	1868	0.00108	0.5999	0.01120	1872	0.00011	0.5358	0.01470	0.00097
							1.25173				*-1.38878*			*2.28157*
MA 2,200,0 EXP	362.12	24.14	67	13	54	2828	0.00071	0.5728	0.01122	729	0.00033	0.5412	0.01944	0.00038
							0.27862				*-0.55160*			*0.70372*
MA 2,200,0 TRI	360.65	24.04	47	13	34	2708	0.00074	0.5739	0.01124	826	0.00024	0.5442	0.01866	0.00050
							0.36687				*-0.76125*			*0.96763*
MA 5,50 W filter 1DAY	335.9	22.39	133	42	91	2463	0.00081	0.5806	0.01043	1278	0.00018	0.5427	0.01706	0.00063
							0.56473				*-1.04638*			*1.40573*

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 1,14 TRI filter 1DAY	333.96	22.26	315	116	199	2355	0.00085	0.5830	0.01009	1422	0.00024	0.5489	0.01678	0.00061
							0.67431				*-0.93999*			*1.39720*
MA 5,150 TRI filter 1DAY	320.25	21.35	38	14	24	2553	0.00076	0.5770	0.01133	1088	0.00027	0.5465	0.01681	0.00049
							0.42063				*-0.78280*			*1.04108*
MA 5,50,0 VAR	310.81	20.72	42	17	25	2654	0.00073	0.5739	0.01115	995	0.00026	0.5493	0.01752	0.00047
							0.33432				*-0.77743*			*0.97259*
MA 1,150 VAR filter 1%	295.97	19.73	35	7	28	3214	0.00061	0.5672	0.01205	552	0.00063	0.5826	0.01774	-0.00002
							-0.03208				*0.01689*			*-0.03339*
MA 5,150,0 VAR	271.65	18.11	26	5	21	3079	0.00062	0.5648	0.01225	536	0.00068	0.5850	0.01784	-0.00006
							0.00000				*0.10002*			*-0.09861*
MA 1,200 VAR filter 1%	267.95	17.86	33	5	28	3296	0.00058	0.5649	0.01221	470	0.00082	0.6013	0.01780	-0.00024
							-0.12920				*0.31460*			*-0.37443*
MA 5,150 E filter 1DAY	262.96	17.53	48	13	35	2743	0.00068	0.5716	0.01445	898	0.00039	0.5563	0.01753	0.00029
							0.18412				*-0.47672*			*0.58022*
MA 1,200 E filter 1%	262.62	17.50	50	11	39	2827	0.00067	0.5723	0.01129	765	0.00048	0.5458	0.01885	0.00019
							0.15478				*-0.27171*			*0.35862*
MA 2,200,0 S	256.71	17.11	49	11	38	2730	0.00068	0.5725	0.01149	804	0.00041	0.5479	0.01831	0.00027
							0.18387				*-0.41604*			*0.51760*
MA 5,50,0 VAR filter 1%	256.2	17.08	29	14	15	2795	0.00068	0.5753	0.01103	969	0.00040	0.5517	0.01761	0.00028
							0.18512				*-0.47013*			*0.57775*
MA 5,150,0 TRI filter 1%	252.45	16.83	32	12	20	2602	0.00072	0.5746	0.01131	1040	0.00035	0.5505	0.01705	0.00037
							0.30216				*-0.59333*			*0.77582*
MA 5,150,0 VAR filter 1%	237.53	15.83	15	4	11	3242	0.00058	0.5666	0.01224	523	0.00077	0.5862	0.01721	-0.00019
							-0.12863				*0.24736*			*-0.31016*
MA 1,200 TRI filter 1%	237.24	15.81	40	12	28	2704	0.00069	0.5721	0.01128	888	0.00044	0.5502	0.01801	0.00025
							0.21392				*-0.37139*			*0.49721*
MA 5,150 S filter 1DAY	229.1	15.27	48	13	35	2633	0.00069	0.5705	0.01113	1008	0.00041	0.5611	0.01752	0.00028
							0.21225				*-0.45584*			*0.58151*
MA 5,150,0 E filter 1%	225.86	15.05	36	12	24	2758	0.00066	0.5729	0.01111	884	0.00046	0.5515	0.01827	0.00020
							0.12294				*-0.32953*			*0.39805*
MA 5,50 VAR filter 1DAY	223.04	14.87	43	14	29	2774	0.00067	0.5750	0.01128	994	0.00045	0.5549	0.01701	0.00022
							0.15394				*-0.36697*			*0.45779*
MA 2,200,0 VAR filter 1%	217.03	14.47	23	5	18	3290	0.00056	0.5657	0.01228	476	0.00094	0.5958	0.01743	-0.00038
							-0.19370				*0.50620*			*-0.59608*
MA 2,200,0 TRI filter 1%	203.8	13.58	34	11	23	2698	0.00067	0.5712	0.01143	894	0.00049	0.5532	0.01768	0.00018
							0.15270				*-0.26896*			*0.35880*
MA 2,200,0 VAR	201.8	13.45	32	4	28	3158	0.00058	0.5621	0.01243	457	0.00102	0.6075	0.01778	-0.00044
							-0.12771				*0.62138*			*-0.67627*
MA 2,200,0 S filter 1%	190.76	12.71	38	10	28	2713	0.00066	0.5695	0.01161	879	0.00052	0.5581	0.01740	0.00014
							0.12236				*-0.20548*			*0.27748*

Appendix II. Table III. Results for Moving Average Rules for the period 1/1/86-31/12/00 for Nasdaq Composite

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
MA 2,200 S filter 1DAY	182.24	12.15	46	9	37	2730	0.00065	0.5711	0.01182	861	0.00055	0.5523	0.01707	0.00010
							0.09193				*-0.14263*			*0.19680*
MA 5,150 VAR filter 1DAY	178.47	11.90	27	5	22	3233	0.00056	0.5660	0.01224	535	0.00094	0.5918	0.01707	-0.00038
							-0.19279				*0.53299*			*-0.62627*
MA 2,200 VAR filter 1DAY	171.34	11.42	33	5	28	3312	0.00055	0.5643	0.01246	456	0.00110	0.6088	0.01661	-0.00055
							-0.22639				*0.74493*			*-0.84702*
MA 2,200 E filter 1DAY	167.37	11.16	60	13	47	2832	0.00062	0.5706	0.01159	759	0.00067	0.5515	0.01821	-0.00005
							0.00000				*0.09672*			*-0.09410*
MA 2,200 TRI filter 1DAY	165.6	11.04	38	11	27	2709	0.00065	0.5707	0.01142	882	0.00055	0.5539	0.01778	0.00010
							0.09173				*-0.14403*			*0.19842*
MA 5,150,0 S filter 1%	157.67	10.51	34	12	22	2611	0.00066	0.5718	0.01109	1030	0.00050	0.5578	0.01747	0.00016
							0.12099				*-0.26270*			*0.33449*
MA 1,200 S filter 1%	152.86	10.19	44	10	34	2721	0.00063	0.5700	0.01145	871	0.00061	0.5563	0.01779	0.00002
							0.03062				*-0.02047*			*0.03952*
MA 1,14 TIME filter 1DAY	78.68	5.24	491	235	256	1755	0.00092	0.5741	0.01213	2022	0.00036	0.5668	0.01374	0.00056
							0.79929				*-0.72627*			*1.32038*
MA 1,50 TIME filter 1DAY	54.32	3.62	238	85	153	1866	0.00078	0.5802	0.01123	1875	0.00041	0.5552	0.01468	0.00037
							0.43523				*-0.57216*			*0.87040*
MA 1,14 TIME filter 1%	51.64	3.44	323	158	165	1708	0.00090	0.5630	0.01256	2046	0.00036	0.5738	0.01346	0.00054
							0.73908				*-0.72906*			*1.26736*
MA 5,50,0 TIME filter 1%	34.06	2.27	222	81	141	1916	0.00073	0.5796	0.01125	1826	0.00045	0.5553	0.01475	0.00028
							0.30187				*-0.45907*			*0.65858*
MA 5,50 TIME filter 1DAY	26.52	1.77	304	99	205	1960	0.00069	0.5738	0.01137	1781	0.00049	0.5609	0.01472	0.00020
							0.19355				*-0.34810*			*0.46995*
MA 1,50 TIME filter 1%	-1	-0.07	183	71	112	1828	0.00069	0.5818	0.01134	1907	0.00051	0.5543	0.01457	0.00018
							0.18910				*-0.30140*			*0.42301*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "Buy" ("Self") 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).

Buy/Hold return	**660.18%**
Annual Buy/Hold return	**44.00%**
Observations	**3791**
Days in test	**5476**

Appendix III - Table I

13/10/86-31/12/2000

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
FORECAST OSCILLATOR 50	188735.76	13268.21	520	274	246	1705	0.00465	0.5865	0.02082	1832	-0.00193	0.4449	0.00658
							5.68441				*-5.41243*		*9.61022*
FORECAST OSCILLATOR 30	*154518.41*	10862.72	549	288	261	1745	0.00443	0.5851	0.02096	1792	-0.00187	0.4431	0.00630
							5.35928				*-5.27137*		*9.20639*
FORECAST OSCILLATOR 150	137280.09	9650.85	508	259	249	1693	0.00448	0.5830	0.02045	1844	-0.00174	0.4490	0.00622
							5.38815				*-5.09897*		*9.08200*
FORECAST OSCILLATOR 14	90226.17	6342.94	567	307	260	1745	0.00411	0.5834	0.02036	1792	-0.00156	0.4448	0.00567
							4.82167				*-4.74593*		*8.28575*
Momentum 14	7118.58	500.44	168	73	95	1833	0.00253	0.5412	0.01988	1704	-0.00015	0.4830	0.00268
							2.20293				*-2.31665*		*3.91411*
MACD 12/26 -9	6225.41	437.65	112	52	60	1797	0.00249	0.5326	0.01908	1740	-0.00005	0.4931	0.00254
							2.12068				*-2.16515*		*3.71163*
Momentum 30	6209.89	436.56	101	39	62	1750	0.00258	0.5446	0.02066	1787	-0.00008	0.4824	0.00266
							2.25339				*-2.23529*		*3.88727*
Momentum 50	3165.88	222.56	70	29	41	1845	0.00212	0.5420	0.02133	1692	0.00028	0.4817	0.00184
							1.50600				*-1.59617*		*2.68657*
Momentum 150	552.3	33.83	56	19	37	1818	0.00125	0.5165	0.02095	1719	0.00123	0.5096	0.00002
							0.01703				*-0.01672*		*0.02922*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy,"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 during the trades 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.

Buy/Hold return	3770.77%
Annual Buy/Hold return	265.09%
Observations	3537

Appendix III - Table II
13/10/86-12/11/90

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
FORECAST OSCILLATOR 30	3368.34	824.02	139	83	56	499	0.00748	0.6553	0.02685	504	-0.00251	0.4365	0.00999
							3.63504				*-3.61371*		*6.27760*
FORECAST OSCILLATOR 50	3244.77	793.79	133	80	53	465	0.00793	0.6581	0.02731	538	-0.00228	0.4480	0.01021
							3.86772				*-3.52140*		*6.39891*
FORECAST OSCILLATOR 14	2914.77	713.06	147	93	54	506	0.00707	0.6443	0.25710	497	-0.00224	0.4447	0.00931
							3.35356				*-3.40157*		*5.85013*
FORECAST OSCILLATOR 150	1718.57	420.43	123	69	54	436	0.00700	0.6376	0.02610	567	-0.00103	0.4744	0.00803
							3.13936				*-2.63742*		*5.00280*
Momentum 14	956.82	234.07	39	20	19	590	0.00425	0.5949	0.02208	413	-0.00010	0.4746	0.00435
							1.36757				*-1.73895*		*2.69062*
Momentum 30	852.56	208.57	22	10	12	518	0.00467	0.5927	0.02495	485	0.00010	0.4948	0.00457
							1.61943				*-1.69478*		*2.87022*
MACD 12/26 -9	624.22	152.71	30	17	13	513	0.00409	0.5692	0.02130	490	0.00075	0.5204	0.00334
							1.19022				*-1.23264*		*2.09829*
Momentum 50	494.01	120.85	16	6	10	569	0.00347	0.5870	0.02599	434	0.00113	0.4908	0.00234
							0.76217				*-0.91999*		*1.45707*
Momentum 150	138.58	33.90	11	5	6	381	0.00261	0.5486	0.02529	622	0.00237	0.5434	0.00024
							0.09759				*-0.07154*		*0.14640*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy,"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 during the trades 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.

Buy/Hold return	759.10%
Annual Buy/Hold return	185.70%
Observations	1003
Days in test	1492

Appendix III - Table III
13/11/90-31/12/96

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
FORECAST OSCILLATOR 150	258.69	42.13	216	95	121	666	0.00203	0.5495	0.01435	867	-0.00116	0.4383	0.00319
							2.62217				*-2.19742*		*4.17402*
FORECAST OSCILLATOR 30	197.62	32.19	248	116	132	730	0.00161	0.5425	0.01506	803	-0.00103	0.4359	0.00264
							2.07648				*-1.94234*		*3.48049*
FORECAST OSCILLATOR 50	194.15	31.62	225	99	126	703	0.00164	0.5448	0.01446	830	-0.00098	0.4373	0.00262
							2.09439				*-1.88518*		*3.44616*
FORECAST OSCILLATOR 14	175.68	28.61	253	121	132	737	0.00148	0.5577	0.01458	796	-0.00094	0.4209	0.00242
							1.88766				*-1.79787*		*3.19171*
MACD 12/26 -9	155.86	25.39	44	17	27	749	0.00136	0.5033	0.01445	784	-0.00086	0.4707	0.00222
							1.71648				*-1.66604*		*2.92934*
Momentum 14	149.7	24.38	77	29	48	654	0.00152	0.5046	0.01532	879	-0.00074	0.4733	0.00226
							1.86936				*-1.53778*		*2.95059*
Momentum 30	81.04	13.20	44	16	28	634	0.00106	0.5032	0.01547	899	-0.00036	0.4750	0.00142
							1.19223				*-0.93889*		*1.84599*
Momentum 50	17.94	2.92	28	12	16	599	0.00037	0.5008	0.01389	934	0.00013	0.4775	0.00024
							0.20288				*-0.15430*		*0.30911*
Momentum 150	-33.32	-5.43	34	8	26	666	-0.00051	0.4700	0.01400	867	0.00079	0.4994	-0.00130
							-1.06775				*0.89642*		*-1.70101*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**19.36%**
Annual Buy/Hold return	**3.15%**
Observations	**1533**
Days in test	**2241**

Appendix III - Table IV

2/1/97-31/12/2000

System Name	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Out	Out	Out>0	Buy-Out
FORECAST OSCILLATOR 30	900.04	225.32	149	79	70	478	0.00504	0.5669	0.02020	523	-0.00171	0.4761	0.00675
							2.87630				*-2.70521*		*4.83378*
FORECAST OSCILLATOR 50	834.99	209.03	146	82	64	469	0.00497	0.5629	0.01916	532	-0.00153	0.4812	0.00650
							2.80111				*-2.56835*		*4.65023*
FORECAST OSCILLATOR 14	716.91	179.47	159	87	72	481	0.00459	0.5530	0.02028	520	-0.00133	0.4885	0.00592
							2.51484				*-2.38156*		*4.24047*
FORECAST OSCILLATOR 150	660.96	165.47	122	66	56	429	0.00495	0.5641	0.02021	572	-0.00107	0.486	0.00602
							2.70051				*-2.23138*		*4.27112*
Momentum 30	154.69	38.72	33	12	21	504	0.00208	0.5337	0.02096	497	0.00094	0.505	0.00114
							0.47208				*-0.47153*		*0.81718*
Momentum 150	150.85	37.76	7	4	3	501	0.00213	0.5369	0.02423	500	0.00089	0.502	0.00124
							0.51254				*-0.51385*		*0.88888*
MACD 12/26 -9	139.4	34.90	36	16	20	476	0.00206	0.5231	0.02142	525	0.00101	0.5162	0.00105
							0.44683				*-0.42130*		*0.75178*
Momentum 50	138.67	34.71	24	9	15	471	0.00211	0.5202	0.02296	530	0.00098	0.5189	0.00113
							0.48578				*-0.44792*		*0.80862*
Momentum 14	84.41	21.13	50	22	28	531	0.00137	0.5085	0.02071	470	0.00167	0.5319	-0.00030
							-0.11901				*0.12885*		*-0.21465*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**255.03%**
Annual Buy/Hold return	**63.84%**
Observations	**1001**
Days in test	**1458**

Appendix IV - Table I

5/2/71 - 31/12/85

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
FORECAST OSCILLATOR 150	3296426.20	1110172.65	2261	1085	1176	3906	0.00184	0.6306	0.00926	3497	-0.00104	0.4946	0.01191	0.00288
							6.48742				*-6.99605*			*11.63760*
FORECAST OSCILLATOR 30	1391142.10	46494.54	2299	1150	1149	3758	0.00181	0.6296	0.00973	3765	-0.00086	0.5040	0.01130	0.00267
							6.26342				*-6.32390*			*10.89275*
FORECAST OSCILLATOR 50	1386419.50	46336.70	2288	1117	1171	3826	0.00176	0.6289	0.00953	3674	-0.00088	0.5001	0.01154	0.00264
							6.06387				*-6.36581*			*10.75168*
FORECAST OSCILLATOR 14	632086.35	21125.49	2344	1226	1118	3670	0.00175	0.6283	0.01009	3866	-0.00073	0.5079	0.01097	0.00248
							5.93333				*-5.76130*			*10.12292*
Momentum 14	79464.30	2655.84	600	258	342	4493	0.00118	0.6061	0.00865	2997	-0.00059	0.5060	0.01302	0.00177
							3.49050				*-4.66724*			*7.06000*
Momentum 30	22505.36	752.17	398	165	233	4557	0.00105	0.5995	0.00876	2926	-0.00043	0.5142	0.01301	0.00148
							2.85393				*-3.93594*			*5.87708*
Momentum 50	5253.24	175.57	276	106	170	4681	0.00085	0.5903	0.00912	2783	-0.00015	0.5255	0.01282	0.00100
							1.86628				*-2.67708*			*3.93008*
MACD 12/26 -9	4464.48	149.21	521	226	295	3871	0.00102	0.5984	0.00899	3653	-0.00009	0.5333	0.01210	0.00111
							2.56537				*-2.66559*			*4.52685*
Momentum 150	3038.06	101.54	118	52	66	5199	0.00073	0.5882	0.00989	2175	-0.00010	0.5156	0.01244	0.00083
							1.29998				*-2.24616*			*3.05757*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	2370.52%
Annual Buy/Hold return	79.23%
Observations	7557
Days in test	10921

Appendix IV - Table II

5/12/71 - 31/12/85

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
FORECAST OSCILLATOR 150	20736.06	1390.28	1072	521	551	1889	0.00177	0.6335	0.00691	1723	-0.00125	0.4840	0.00789	0.00302
							6.77295				*-7.30992*			*12.11428*
FORECAST OSCILLATOR 50	12374.46	829.66	1103	545	558	1878	0.00164	0.6308	0.00727	1831	-0.00105	0.4899	0.00750	0.00269
							6.14483				*-6.52439*			*10.94515*
FORECAST OSCILLATOR 14	11863.65	795.41	1095	604	491	1831	0.00169	0.6399	0.00735	1914	-0.00097	0.4890	0.00737	0.00266
							6.32739				*-6.24088*			*10.87369*
FORECAST OSCILLATOR 30	9643.66	646.57	1094	557	537	1852	0.00162	0.6332	0.00734	1880	-0.00094	0.4941	0.00742	0.00256
							6.02208				*-6.06183*			*10.44900*
Momentum 14	4594.47	308.04	255	109	146	2104	0.00125	0.6158	0.00655	1595	-0.00090	0.4903	0.00847	0.00215
							4.46287				*-5.55105*			*8.65377*
Momentum 30	1896.18	127.13	191	82	109	2098	0.00106	0.6047	0.00644	1594	-0.00064	0.5056	0.00864	0.00170
							3.52680				*-4.38709*			*6.83708*
MACD 12/26 -9	1732.08	116.13	242	114	128	1882	0.00116	0.6052	0.00668	1851	-0.00051	0.5205	0.00814	0.00167
							3.87697				*-4.00615*			*6.81721*
Momentum 50	521.98	35.00	129	48	81	2107	0.00077	0.5945	0.00662	1566	-0.00025	0.5179	0.00856	0.00102
							2.10720				*-2.62654*			*4.08530*
Momentum 150	474.64	31.82	65	29	36	2292	0.00071	0.6037	0.00662	1291	-0.00030	0.4911	0.00895	0.00101
							1.86129				*-2.65596*			*3.87859*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	**225.22%**
Annual Buy/Hold return	**15.10%**
Observations	**3766**
Days in test	**5444**

Appendix IV - Table III

1/1/86 - 31/12/2000

Trading System	Pct Gain	An. Ret.	Total Trades	Winning	Losing	N Buy	Buy	Buy>0	stdev	N Sell	Sell	Sell>0	stdev	Buy-Sell
FORECAST OSCILLATOR 30	13426.35	894.93	1194	585	609	1886	0.00198	0.6246	0.01165	1872	-0.00079	0.5126	0.01419	0.00277
							3.71265				*-3.83957*			*6.53103*
FORECAST OSCILLATOR 150	12876.75	858.29	1144	540	604	1941	0.00189	0.6244	0.01118	1691	-0.00087	0.5018	0.01510	0.00276
							3.50023				*-3.91942*			*6.38230*
FORECAST OSCILLATOR 50	10382.33	692.03	1169	564	605	1919	0.00186	0.6243	0.01137	1813	-0.00075	0.5077	0.01458	0.00261
							3.40467				*-3.69066*			*6.13003*
FORECAST OSCILLATOR 14	4899.56	326.58	1244	617	627	1826	0.00180	0.6161	0.01226	1945	-0.00049	0.5267	0.01362	0.00229
							3.18650				*-3.06134*			*5.40598*
Momentum 14	1393.48	92.88	344	148	196	2324	0.00110	0.5947	0.01026	1402	-0.00025	0.5239	0.01675	0.00135
							1.40150				*-2.14100*			*3.07087*
Momentum 30	842.76	56.17	206	82	124	2330	0.00103	0.5906	0.01053	1332	-0.00017	0.5244	0.01682	0.00120
							1.19808				*-1.90788*			*2.68725*
Momentum 50	616.53	41.09	146	57	89	2445	0.00090	0.5820	0.01094	1217	-0.00003	0.5354	0.01679	0.00093
							0.83038				*-1.51761*			*2.03923*
Momentum 150	416.78	27.78	52	22	30	2729	0.00078	0.5735	0.01209	884	0.00018	0.5515	0.01624	0.00060
							0.49027				*-0.90619*			*1.19262*
MACD 12/26 -9	150.93	10.06	276	111	165	1978	0.00086	0.5903	0.01076	1780	0.00032	0.5449	0.01519	0.00054
							0.66559				*-0.80315*			*1.27144*

"Pct Gain" is the total return yielded by the strategy during the whole period, "Total trades" is the number of closed trades generated by the strategy, "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).

Buy/Hold return	660.18%
Annual Buy/Hold return	44.00%
Observations	3791
Days in test	5476

Appendix V. Table I. Athens Stock Exchange. MA strategies for the period 13/10/86 - 31/12/00. Taking into account transaction costs

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 TRI filter 1%	42447.87	15935.42	18.69%	85278	50.22%	168.77%	4244.79	298.41	2.97	49	19	30
MA 1,50 W filter 1%	40649.13	18119.22	18.45%	98216	58.61%	217.71%	4064.91	285.77	3.10	62	24	38
MA 1,50 VAR filter 1%	38539.28	5686.09	10.17%	55900	31.06%	205.32%	3853.93	270.93	5.30	26	10	16
MA 5,50,0 E filter 1%	36907.30	9185.46	15.97%	57507	35.82%	124.27%	3690.73	259.46	2.51	31	14	17
MA 1,50 S filter 1%	35951.12	12512.56	17.29%	72377	50.33%	191.11%	3595.11	252.74	3.61	49	18	31
MA 5,50,0 VAR	35224.62	3643.65	7.99%	45607	22.76%	184.93%	3522.46	247.63	4.93	18	8	10
MA 1,50 W filter 1DAY	35159.25	18811.38	19.45%	96705	63.64%	227.17%	3515.93	247.17	3.69	71	23	48
MA 5,50 E filter 1DAY	32605.52	11507.25	19.07%	60356	45.98%	141.16%	3260.55	229.22	3.06	43	16	27
MA 1,14 VAR filter 1%	32449.39	13105.17	15.30%	85665	62.12%	306.06%	3244.94	228.12	3.62	68	25	43
MA 5,50,0 W filter 1%	32190.70	12227.39	20.23%	60453	46.75%	131.14%	3219.07	226.30	2.55	44	18	26
MA 1,14,0 Variable	32062.52	14518.86	18.41%	78871	59.35%	222.40%	3206.25	225.40	3.11	63	23	40
MA 5,50 VAR filter 1DAY	31513.35	3090.78	7.57%	40832	22.82%	201.49%	3151.33	221.54	4.92	18	8	10
MA 5,50,0 TRI filter 1%	31418.65	12244.93	21.65%	56555	44.45%	105.28%	3141.86	220.87	2.19	41	18	23
MA 5,50 S filter 1DAY	30173.85	11408.73	20.11%	56719	46.80%	132.68%	3017.38	212.12	2.80	44	17	27
MA 1,50,0 VAR	29200.00	8545.03	12.93%	66078	55.81%	331.57%	2920.00	205.28	8.51	57	14	43
MA 5,50,0 S filter 1%	28828.89	9684.42	20.60%	47014	38.68%	87.77%	2882.89	202.67	1.95	34	16	18
MA 1,50 S filter 1DAY	28541.90	13950.64	21.59%	64616	55.83%	158.59%	2854.19	200.65	3.77	57	18	39
MA 1,50 TRI filter 1DAY	28057.77	12802.64	19.58%	65374	57.08%	191.47%	2805.78	197.25	3.25	59	21	38
MA 1,50,0 TRI	27897.09	14697.69	17.76%	82744	66.28%	273.16%	2789.71	196.12	5.58	76	20	56
MA 1,14 VAR filter 1DAY	26935.48	15449.71	19.05%	81098	66.79%	250.57%	2693.55	189.36	3.58	77	25	52
MA 1,50 VAR filter 1DAY	26590.10	5523.16	12.19%	45315	41.32%	239.03%	2659.01	186.93	7.46	37	10	27
MA 5,50,0 VAR filter 1%	25657.64	2618.53	8.09%	32351	20.69%	155.60%	2565.76	180.37	4.25	16	7	9
MA 5,50,0 W	24873.59	12258.38	19.37%	63279	60.69%	213.30%	2487.36	174.86	3.46	65	22	43
MA 1,50 E filter 1%	24326.59	11365.23	19.99%	56851	57.21%	186.17%	2432.66	171.02	4.48	59	17	42
MA 5,150,0 W filter 1%	22182.83	2758.65	9.30%	29674	25.24%	171.55%	2218.28	155.95	6.11	20	7	13
MA 5,50 W filter 1DAY	21860.50	13858.66	25.20%	55004	60.26%	139.15%	2186.05	153.68	3.30	64	20	44
MA 1,50 E filter 1DAY	21012.02	12515.13	22.66%	55239	61.96%	173.48%	2101.20	147.72	4.04	67	19	48
MA 2,200,0 VAR filter 1%	20854.50	1410.37	5.76%	24493	14.86%	157.99%	2085.45	146.61	20.70	11	2	9
MA 2,200,0 VAR	20769.88	2183.46	8.32%	26236	20.83%	150.33%	2076.99	146.01	10.80	16	4	12
MA 1,50,0 S	20643.04	11495.77	18.36%	62606	67.03%	265.03%	2064.30	145.12	5.80	77	19	58
MA 1,50,0 W	19846.34	17366.47	18.56%	93557	78.79%	324.44%	1984.63	139.52	4.77	108	28	80
MA 1,150 TIME filter 1%	19300.42	8255.44	23.22%	35549	45.71%	96.82%	1930.04	135.68	3.66	42	14	28
MA 1,150,0 TIMESERIES	18909.66	13922.52	25.63%	54325	65.19%	154.37%	1890.97	132.94	4.58	73	20	53
MA 5,50,0	18143.89	8458.75	23.18%	36487	50.27%	116.85%	1814.39	127.55	3.29	48	16	32
MA 1,150 W filter 1%	17537.40	4178.52	14.70%	28424	38.30%	160.53%	1753.74	123.29	4.75	33	11	22
MA 5,50 TRI filter 1DAY	17355.00	9366.79	24.59%	38092	54.44%	121.39%	1735.50	122.01	2.72	54	20	34
MA 2,200 VAR filter 1DAY	17083.01	1516.71	7.12%	21309	19.83%	178.61%	1708.30	120.09	15.50	15	3	12
MA 1,14 W filter 1%	15556.59	15164.89	14.99%	101188	84.63%	464.67%	1555.66	109.36	2.59	130	48	82
MA 1,14 E filter 1%	15251.30	12584.08	17.80%	70679	78.42%	340.46%	1525.13	107.22	2.88	106	38	68
MA 1,200,0 VAR	15154.61	4214.68	16.37%	25741	41.13%	151.19%	1515.46	106.54	13.70	36	6	30
MA 1,14 TRIANGULAR	15133.55	22066.51	8.83%	249873	93.94%	963.78%	1513.35	106.39	3.59	196	57	139
MA 5,50,0 TRI	14803.18	8053.57	23.62%	34101	56.59%	139.62%	1480.32	104.07	3.46	57	18	39
MA 1,200 VAR filter 1%	14776.58	2781.60	13.59%	20467	27.80%	104.58%	1477.66	103.88	7.37	22	6	16
MA 1,14 SIMPLE	14701.59	20668.69	8.99%	229859	93.60%	940.98%	1470.16	103.35	3.70	192	55	137
MA 5,150 VAR filter 1DAY	14647.98	1499.10	8.07%	18577	21.15%	162.08%	1464.80	102.98	6.60	16	6	10

Appendix V. Table I. Athens Stock Exchange. MA strategies for the period 13/10/86 - 31/12/00. Taking into account transaction costs

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,14 TRI filter 1%	14593.96	13406.29	14.69%	91288	84.01%	472.07%	1459.40	102.60	2.84	127	45	82
MA 5,150 W filter 1DAY	14142.39	2768.58	12.38%	22371	36.78%	197.22%	1414.24	99.42	6.97	31	9	22
MA 5,150,0 VAR	13462.94	1464.12	8.44%	17349	22.40%	165.44%	1346.29	94.64	13.54	17	4	13
MA 5,150,0 TIMESERIES	13326.26	9833.27	21.64%	45438	70.67%	226.56%	1332.63	93.68	4.27	84	24	60
MA 1,50,0 EXP	12666.84	8631.13	16.55%	52143	75.71%	357.37%	1266.68	89.05	6.32	97	21	76
MA 1,14,0 EXP	12465.68	17482.22	6.79%	257318	95.16%	1300.58%	1246.57	87.63	4.43	211	54	157
MA 1,150 S filter 1%	11630.94	1380.55	8.40%	16429	29.21%	247.57%	1163.09	81.77	8.09	23	8	15
MA 5,150 TIME filter 1DAY	11564.63	8686.45	28.34%	30655	62.28%	119.77%	1156.46	81.30	4.06	66	18	48
MA 2,200 TIME filter 1DAY	11485.88	4953.72	20.22%	24498	53.12%	162.68%	1148.59	80.75	5.43	51	14	37
MA 5,150,0 VAR filter 1%	11370.19	1123.47	8.12%	13840	17.84%	119.79%	1137.02	79.93	7.52	13	4	9
MA 5,150,0 TIME filter 1%	11223.78	7372.38	26.99%	27315	58.91%	118.27%	1122.38	78.90	3.23	60	20	40
MA 1,150 VAR filter 1%	10692.81	1914.24	12.09%	15827	32.44%	168.21%	1069.28	75.17	6.77	26	8	18
MA 5,150,0 E filter 1%	10317.10	1286.82	9.07%	14185	27.27%	200.59%	1031.71	72.53	7.12	21	7	14
MA 1,150 E filter 1%	10301.78	2096.19	12.19%	17192	40.08%	228.69%	1030.18	72.42	5.76	34	11	23
MA 1,150 TRI filter 1%	10232.16	1411.09	9.17%	15392	33.52%	265.66%	1023.22	71.93	11.06	27	7	20
MA 5,150 E filter 1DAY	10045.38	1363.25	9.29%	14674	31.54%	239.54%	1004.54	70.62	9.53	25	7	18
MA 2,200,0 S	9815.25	1217.77	8.62%	14134	30.56%	254.67%	981.52	69.00	8.36	24	9	15
MA 1,50,0 TIME	9777.71	11762.16	14.00%	83986	88.36%	530.91%	977.77	68.74	2.32	147	57	90
MA 5,50,0 TIME filter 1%	9266.24	9358.38	21.75%	43031	78.47%	260.79%	926.62	65.14	1.93	104	44	60
MA 1,14 S filter 1%	9191.46	9921.67	18.48%	53684	82.88%	348.44%	919.15	64.62	2.58	120	43	77
MA 1,150,0 VAR	9147.60	3325.63	17.11%	19435	52.93%	209.34%	914.76	64.31	9.82	50	10	40
MA 1,200 S filter 1%	8850.50	933.43	7.76%	12034	26.45%	241.01%	885.05	62.22	6.00	20	9	11
MA 1,14,0 W	8843.10	21556.42	6.82%	315976	97.20%	1324.79%	884.31	62.17	3.64	248	65	183
MA 1,200 TIME filter 1%	8809.65	3062.13	19.07%	16053	45.12%	136.56%	880.97	61.93	4.38	39	13	26
MA 5,150,0 TRI filter 1%	8646.57	865.81	7.59%	11411	24.23%	219.32%	864.66	60.79	4.16	18	8	10
MA 1,200,0 S	8117.43	1518.04	11.27%	13472	39.74%	252.71%	811.74	57.07	9.61	33	9	24
MA 1,150,0 S	7888.33	1177.15	8.98%	13108	39.82%	343.42%	788.83	55.46	13.95	33	8	25
MA 2,200,0 EXP	7878.79	1440.40	10.52%	13697	42.48%	303.96%	787.88	55.39	9.28	36	11	25
MA 5,150,0 W	7860.23	1966.00	14.82%	13262	40.73%	174.74%	786.02	55.26	5.38	34	10	24
MA 1,200 E filter 1%	7833.34	1216.34	9.77%	12444	37.05%	279.07%	783.33	55.07	6.79	30	11	19
MA 1,14 S filter 1DAY	7811.17	10522.04	18.89%	55716	85.98%	355.28%	781.12	54.91	2.67	133	45	88
MA 5,150 S filter 1DAY	7710.65	1169.07	10.77%	10853	28.95%	168.76%	771.07	54.21	4.49	22	8	14
MA 5,150,0 EXP	7685.77	1082.91	9.27%	11676	34.17%	268.45%	768.58	54.03	9.44	27	8	19
MA 1,14 E filter 1DAY	7603.90	11384.28	19.49%	58397	86.98%	346.17%	760.39	53.46	3.26	138	40	98
MA 2,200,0 S filter 1%	7575.79	685.97	6.73%	10189	25.65%	280.98%	757.58	53.26	9.45	19	7	12
MA 5,150 TRI filter 1DAY	7525.38	1058.70	9.84%	10764	30.09%	205.91%	752.54	52.90	6.88	23	7	16
MA 1,200,0 TRI	7100.27	1407.28	11.51%	12222	41.91%	263.97%	710.03	49.92	9.18	35	10	25
MA 2,200,0 TIMESERIES filter 1%	7047.21	5670.92	23.96%	23664	70.22%	193.02%	704.72	49.54	4.49	80	22	58
MA 1,50 TIME filter 1%	7033.99	7423.33	26.20%	28332	75.17%	186.91%	703.40	49.45	1.64	92	42	50
MA 2,200 W filter 1DAY	6967.13	1174.04	10.08%	11646	40.18%	298.52%	696.71	48.98	9.20	33	9	24
MA 1,200 TRI filter 1%	6882.00	739.92	7.85%	9429	27.01%	244.23%	688.20	48.38	6.52	20	8	12
MA 1,150,0 W	6826.49	2540.13	16.21%	15669	56.43%	248.10%	682.65	47.99	9.46	54	10	44
MA 1,200 W filter 1%	6794.86	1101.51	9.99%	11031	38.40%	284.56%	679.49	47.77	10.00	31	8	23
MA 2,200 S filter 1DAY	6698.79	871.92	9.35%	9330	28.20%	201.79%	669.88	47.09	8.88	21	7	14
MA 2,200,0 W filter 1%	6586.17	934.29	9.14%	10227	35.60%	289.70%	658.62	46.30	10.93	28	7	21

Appendix V. Table I. Athens Stock Exchange. MA strategies for the period 13/10/86 - 31/12/00. Taking into account transaction costs

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,200,0 EXP	6564.07	1892.79	13.91%	13606	51.76%	272.03%	656.41	46.15	9.12	47	11	36
MA 1,14 TRI filter 1DAY	6429.62	10547.40	20.09%	52491	87.75%	336.70%	642.96	45.20	2.59	141	47	94
MA 2,200,0 TRI filter 1%	6389.82	748.34	8.53%	8778	27.20%	219.09%	638.98	44.92	5.53	20	8	12
MA 2,200,0 W	6161.46	1115.45	9.82%	11363	45.78%	366.34%	616.15	43.32	12.53	39	9	30
MA 2,200 TRI filter 1DAY	6137.94	911.80	9.99%	9129	32.77%	228.07%	613.79	43.15	7.21	25	8	17
MA 2,200,0 TRI	6024.20	1020.47	10.53%	9691	37.83%	259.29%	602.42	42.35	8.22	30	9	21
MA 5,150,0 S filter 1%	6019.44	882.73	10.49%	8419	28.50%	171.79%	601.94	42.32	4.29	21	8	13
MA 1,200,0 W	5890.80	1517.88	12.15%	12493	52.85%	334.99%	589.08	41.41	11.23	48	10	38
MA 5,50,0 EXP	5810.45	2954.43	22.89%	12908	54.99%	140.24%	581.05	40.85	3.77	51	15	36
MA 5,150,0 S	5735.43	787.92	9.65%	8165	29.76%	208.35%	573.54	40.32	6.95	22	7	15
MA 1,150,0 TRI	5525.99	1153.01	11.06%	10425	46.99%	324.89%	552.60	38.85	16.79	40	7	33
MA 1,150,0 EXP	5407.86	1759.37	13.70%	12840	57.88%	322.41%	540.79	38.02	10.60	55	11	44
MA 5,150,0 TRI	5192.12	801.47	10.46%	7665	32.26%	208.53%	519.21	36.50	5.73	24	8	16
MA 2,200,0 E filter 1%	4146.67	635.80	9.77%	6511	36.31%	271.85%	414.67	29.15	9.33	27	7	20
MA 2,200 E filter 1DAY	4058.96	857.71	12.20%	7030	42.26%	246.38%	405.90	28.53	8.53	33	8	25
MA 1,200,0 TIMESERIES	3856.70	3620.66	28.76%	12590	69.37%	141.21%	385.67	27.11	5.55	73	16	57
MA 1,50 TIME filter 1DAY	3545.23	5216.81	27.80%	18769	81.11%	191.82%	354.52	24.92	1.88	105	42	63
MA 1,14 W filter 1DAY	3155.23	8068.18	19.74%	40863	92.28%	367.37%	315.52	22.18	2.81	165	49	116
MA 5,50 TIME filter 1DAY	2904.66	5958.11	27.75%	21470	86.47%	211.60%	290.47	20.42	1.94	125	48	77
MA 2,200,0 TIME	2059.17	4918.24	24.99%	19680	89.54%	258.27%	205.92	14.48	4.60	136	30	106
MA 1,14 TIME filter 1%	1075.58	4661.67	15.01%	31049	96.54%	542.97%	107.56	7.56	1.44	195	85	110
MA 1,14 TIME SERIES	799.98	8096.61	5.62%	144012	99.44%	1668.79%	80.00	5.62	1.54	313	128	185
MA 1,14 TIME filter 1DAY	-403.54	2485.50	16.43%	15124	102.67%	524.71%	-40.35	-2.84	1.35	235	95	140

Buy/Hold return	3743.86
Annual Buy/Hold return	263.2
Observations	3537
Days in test	5192
Transaction costs	0.70%

Appendix V. Table II. Athens Stock Exchange MA strategies for the period 13/10/86 - 12/11/90. Taking into account transaction costs

Trading Strategy	Net Profit	Commissions	Com. Pct	Total Profit	Tot. Com.	Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Total Trades	Winning	Losing
MA 1,50 TRI filter 1%	13865	581	3.61%	16099	13.88%	284.31%	1386.54	339.20	13.62	10	6	4
MA 5,50,0 S filter 1%	13185	329	2.28%	14428	8.62%	277.45%	1318.50	322.56	50.40	6	5	1
MA 5,50,0 E filter 1%	12898	320	2.30%	13905	7.25%	214.99%	1289.76	315.52	60.03	5	3	2
MA 5,50,0 TRI filter 1%	12519	422	2.99%	14122	11.35%	280.10%	1251.95	306.27	38.13	8	6	2
MA 1,50 W filter 1DAY	12242	774	5.04%	15336	20.18%	299.96%	1224.18	299.48	13.33	15	7	8
MA 1,50 W filter 1%	12113	631	4.29%	14731	17.77%	314.66%	1211.35	296.34	9.65	13	7	6
MA 5,50 E filter 1DAY	11799	516	3.82%	13517	12.71%	233.05%	1179.86	288.64	17.99	9	5	4
MA 5,50 S filter 1DAY	11685	508	3.74%	13591	14.03%	275.48%	1168.48	285.85	22.32	10	6	4
MA 5,50,0 W filter 1%	11243	522	3.99%	13083	14.06%	252.61%	1124.27	275.04	11.04	10	6	4
MA 1,50 TRI filter 1DAY	10995	628	4.69%	13389	17.88%	281.33%	1099.49	268.98	14.55	13	7	6
MA 1,50 S filter 1DAY	10406	690	5.52%	12493	16.70%	202.38%	1040.65	254.58	10.03	12	5	7
MA 5,50 W filter 1DAY	10350	699	5.38%	13002	20.40%	279.33%	1035.00	253.20	12.41	15	7	8
MA 5,50,0 VAR	10073	207	1.93%	10710	5.95%	208.73%	1007.26	246.41	38.48	4	2	2
MA 1,14,0 Variable	9766	812	6.41%	12659	22.85%	256.39%	976.58	238.91	7.83	17	9	8
MA 5,50 VAR filter 1DAY	9667	197	1.91%	10282	5.98%	212.63%	966.73	236.50	25.12	4	2	2
MA 1,50 S filter 1%	9577	676	5.87%	11512	16.81%	186.40%	957.69	234.29	9.86	12	6	6
MA 5,50 TRI filter 1DAY	9543	548	4.78%	11471	16.81%	251.99%	954.26	233.45	16.52	12	6	6
MA 1,50 VAR filter 1%	9357	410	3.99%	10265	8.84%	121.48%	935.72	228.91	11.12	6	2	4
MA 1,14 VAR filter 1DAY	9180	811	6.50%	12469	26.38%	305.56%	917.96	224.57	7.82	20	9	11
MA 1,14 VAR filter 1%	9093	985	8.09%	12169	25.28%	212.29%	909.34	222.46	6.01	19	8	11
MA 1,50 E filter 1%	8964	857	7.59%	11293	20.62%	171.57%	896.42	219.30	11.02	15	5	10
MA 1,50,0 VAR	8877	732	6.54%	11186	20.64%	215.48%	887.74	217.18	16.72	15	4	11
MA 5,50,0 VAR filter 1%	8641	187	2.03%	9197	6.04%	196.87%	864.12	211.40	18.88	4	2	2
MA 1,50,0 TRI	8323	558	5.24%	10664	21.95%	319.27%	832.35	203.62	24.97	16	6	10
MA 1,50 E filter 1DAY	8301	760	7.14%	10637	21.96%	207.36%	830.13	203.08	10.17	16	6	10
MA 1,50 VAR filter 1DAY	8204	457	4.91%	9294	11.74%	138.86%	820.36	200.69	14.22	8	2	6
MA 1,150 TIME filter 1%	7903	201	2.35%	8548	7.55%	221.61%	790.29	193.34	19.60	5	3	2
MA 1,150,0 TIMESERIES	7570	303	3.47%	8721	13.20%	280.44%	757.03	185.20	18.79	9	5	4
MA 5,50,0 W	7561	480	5.10%	9415	19.69%	286.20%	756.08	184.97	15.38	14	6	8
MA 1,50,0 W	7055	709	7.22%	9808	28.07%	288.55%	705.48	172.59	14.98	21	7	14
MA 5,50,0	6945	318	3.97%	8011	13.32%	235.55%	694.45	169.89	19.87	9	5	4
MA 2,200,0 VAR filter 1%	6898	7	0.10%	6954	0.80%	695.51%	689.82	168.76	N/A	0	0	0
MA 1,14 TRIANGULAR	6882	1853	13.43%	13799	50.13%	273.34%	688.17	168.35	5.20	45	15	30
MA 1,200,0 VAR	6798	141	1.97%	7133	4.69%	138.02%	679.83	166.31	65.05	3	2	1
MA 2,200,0 VAR	6783	46	0.66%	6948	2.37%	260.91%	678.27	165.93	N/A	1	1	0
MA 1,200 VAR filter 1%	6782	101	1.44%	7003	3.16%	119.15%	678.23	165.92	N/A	2	2	0
MA 1,14,0 W	6736	2811	16.13%	17429	61.35%	280.40%	673.64	164.80	5.02	62	20	42
MA 1,14 SIMPLE	6669	1685	12.76%	13198	49.48%	287.61%	666.85	163.14	5.07	44	16	28
MA 1,50,0 S	6649	556	6.59%	8436	21.19%	221.33%	664.89	162.66	13.36	15	6	9
MA 5,150 VAR filter 1DAY	6609	46	0.68%	6770	2.38%	249.72%	660.89	161.68	N/A	1	1	0
MA 2,200 VAR filter 1DAY	6599	45	0.67%	6760	2.38%	257.31%	659.87	161.43	N/A	1	1	0
MA 5,150,0 VAR	6523	100	1.48%	6737	3.17%	114.11%	652.34	159.59	N/A	2	2	0
MA 5,150,0 VAR filter 1%	6409	98	1.48%	6620	3.18%	114.69%	640.92	156.79	N/A	2	2	0
MA 1,14 W filter 1%	6316	1542	13.88%	11110	43.15%	210.94%	631.60	154.51	3.94	36	14	22
MA 1,14 TRI filter 1%	6240	1238	11.44%	10818	42.32%	269.86%	624.00	152.65	4.50	35	14	21

Appendix V. Table II. Athens Stock Exchange MA strategies for the period 13/10/86 - 12/11/90. Taking into account transaction costs

Trading Strategy	Net Profit	Commissions	Com. Pct	Total Profit	Tot. Com.	Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Total Trades	Winning	Losing
MA 5,50,0 TRI	6206	389	5.16%	7524	17.52%	239.23%	620.60	151.82	17.61	12	5	7
MA 1,14 E filter 1DAY	6111	913	8.74%	10447	41.50%	375.04%	611.13	149.51	8.06	34	11	23
MA 1,150 VAR filter 1%	6012	154	2.40%	6416	6.29%	161.86%	601.23	147.08	24.43	4	3	1
MA 5,150,0 W filter 1%	5968	133	2.09%	6370	6.30%	201.58%	596.83	146.01	23.17	4	2	2
MA 1,150,0 VAR	5857	219	3.39%	6458	9.30%	174.54%	585.73	143.29	36.64	6	3	3
MA 1,14,0 EXP	5689	1670	13.39%	12470	54.38%	306.07%	568.87	139.17	6.98	50	13	37
MA 1,14 TRI filter 1DAY	5688	988	10.28%	9615	40.85%	297.50%	568.79	139.15	4.85	33	15	18
MA 1,150 W filter 1%	5680	255	4.07%	6265	9.34%	129.80%	567.98	138.95	15.71	6	2	4
MA 5,150,0 TIME filter 1%	5654	313	4.63%	6762	16.38%	254.16%	565.43	138.33	9.74	11	5	6
MA 5,150,0 TIMESERIES	5504	437	6.12%	7137	22.88%	273.87%	550.44	134.66	10.08	16	7	9
MA 1,14 E filter 1%	5286	1002	11.52%	8702	39.26%	240.80%	528.61	129.32	4.82	31	11	20
MA 5,150 W filter 1DAY	5087	198	3.46%	5714	10.97%	217.19%	508.72	124.45	44.13	7	2	5
MA 5,150 TIME filter 1DAY	5063	345	5.49%	6273	19.29%	251.22%	506.27	123.85	11.56	13	5	8
MA 1,14 S filter 1%	4592	1082	13.74%	7877	41.70%	203.53%	459.24	112.35	3.92	33	13	20
MA 1,50,0 EXP	4283	920	13.71%	6709	36.17%	163.85%	428.27	104.77	11.75	27	6	21
MA 1,14 S filter 1DAY	4249	751	10.25%	7331	42.05%	310.19%	424.86	103.94	5.15	33	13	20
MA 1,14 W filter 1DAY	4158	1079	13.65%	7905	47.40%	247.29%	415.81	101.72	3.83	39	16	23
MA 2,200 TIME filter 1DAY	3430	350	8.10%	4315	20.50%	153.01%	343.04	83.92	18.26	13	3	10
MA 5,150 S filter 1DAY	3383	134	3.55%	3768	10.20%	187.26%	338.35	82.77	31.18	6	2	4
MA 1,150 S filter 1%	3176	144	4.00%	3606	11.92%	197.74%	317.64	77.71	17.52	7	2	5
MA 5,50,0 TIME filter 1%	3163	1135	21.27%	5336	40.72%	91.43%	316.32	77.38	2.51	30	13	17
MA 1,50,0 TIME	3158	1581	24.78%	6381	50.52%	103.85%	315.76	77.25	1.67	41	22	19
MA 1,200 TIME filter 1%	3002	234	6.60%	3540	15.18%	130.13%	300.24	73.45	10.97	9	3	6
MA 5,150,0 E filter 1%	2995	127	3.78%	3345	10.47%	176.57%	299.47	73.26	13.19	6	2	4
MA 5,150,0 TRI filter 1%	2988	105	3.22%	3277	8.82%	174.24%	298.75	73.09	11.83	5	2	3
MA 1,200,0 S	2898	85	2.71%	3123	7.19%	165.60%	289.83	70.90	59.68	4	2	2
MA 5,150 TRI filter 1DAY	2896	121	3.73%	3237	10.55%	182.58%	289.60	70.85	14.51	6	2	4
MA 1,150 TRI filter 1%	2892	197	5.87%	3354	13.76%	134.20%	289.24	70.76	17.25	8	2	6
MA 5,150 E filter 1DAY	2831	133	4.11%	3225	12.23%	197.26%	283.08	69.25	23.46	7	2	5
MA 2,200,0 TIMESERIES filter 1%	2767	453	11.56%	3915	29.32%	153.56%	276.70	67.69	12.65	19	5	14
MA 2,200,0 S	2762	83	2.78%	2978	7.27%	161.26%	276.16	67.56	31.53	4	2	2
MA 1,50 TIME filter 1%	2739	1007	22.99%	4381	37.48%	63.00%	273.90	67.01	1.57	26	14	12
MA 1,150 E filter 1%	2714	254	7.61%	3333	18.56%	143.83%	271.43	66.40	9.69	11	3	8
MA 1,200,0 TRI	2530	137	4.65%	2949	14.19%	204.87%	253.02	61.90	34.57	8	3	5
MA 5,150,0 S filter 1%	2494	115	4.11%	2801	10.93%	165.91%	249.45	61.02	11.84	6	2	4
MA 1,200 S filter 1%	2490	74	2.76%	2692	7.47%	170.59%	249.05	60.93	18.45	4	2	2
MA 5,150,0 W	2304	91	3.53%	2594	11.16%	216.53%	230.40	56.36	65.26	6	1	5
MA 2,200 TRI filter 1DAY	2295	121	4.60%	2635	12.88%	180.20%	229.53	56.15	18.29	7	3	4
MA 2,200,0 S filter 1%	2261	71	2.89%	2449	7.67%	165.40%	226.13	55.32	17.20	4	2	2
MA 5,50,0 EXP	2235	172	6.21%	2773	19.42%	212.53%	223.46	54.67	13.87	11	4	7
MA 2,200 S filter 1DAY	2220	72	3.01%	2406	7.71%	155.95%	222.03	54.32	21.30	4	2	2
MA 2,200,0 TRI	2208	115	4.54%	2538	13.01%	186.58%	220.80	54.02	20.30	7	3	4
MA 2,200,0 TRI filter 1%	2208	99	3.97%	2489	11.29%	184.83%	220.75	54.00	16.09	6	3	3
MA 1,200,0 EXP	2141	172	6.72%	2563	16.46%	144.82%	214.15	52.39	33.00	9	2	7
MA 1,200 TRI filter 1%	2092	95	4.01%	2363	11.47%	186.27%	209.21	51.18	12.49	6	3	3

Appendix V. Table II. Athens Stock Exchange MA strategies for the period 13/10/86 - 12/11/90. Taking into account transaction costs

Trading Strategy	Net Profit	Commissions	Com. Pct	Total Profit	Tot. Com.	Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Total Trades	Winning	Losing
MA 1,200 E filter 1%	2070	161	6.62%	2434	14.95%	125.98%	207.03	50.65	11.40	8	3	5
MA 1,150,0 W	2062	164	6.50%	2522	18.24%	180.74%	206.21	50.45	48.43	10	1	9
MA 2,200,0 EXP	1981	155	6.64%	2335	15.13%	127.94%	198.13	48.47	21.80	8	2	6
MA 5,150,0 TRI	1836	72	3.53%	2042	10.07%	185.19%	183.62	44.92	30.94	5	1	4
MA 1,14 TIME SERIES	1829	2814	34.99%	8042	77.26%	120.79%	182.90	44.74	1.09	83	47	36
MA 1,150,0 S	1772	147	6.57%	2234	20.66%	214.60%	177.20	43.35	33.87	11	2	9
MA 1,200,0 TIMESERIES	1651	258	11.36%	2270	27.29%	140.21%	165.07	40.38	15.59	15	3	12
MA 5,150,0 EXP	1632	100	5.15%	1944	16.05%	211.67%	163.17	39.92	19.31	8	2	6
MA 1,50 TIME filter 1DAY	1604	1042	33.87%	3076	47.85%	41.26%	160.44	39.25	1.52	32	16	16
MA 5,50 TIME filter 1DAY	1567	1060	32.03%	3310	52.65%	64.38%	156.73	38.34	2.33	37	15	22
MA 2,200 W filter 1DAY	1555	179	8.84%	2022	23.11%	161.49%	155.47	38.03	20.33	12	2	10
MA 5,150,0 S	1536	79	4.50%	1759	12.64%	181.09%	153.63	37.58	31.05	6	1	5
MA 1,200 W filter 1%	1429	154	8.60%	1794	20.35%	136.67%	142.91	34.96	13.52	10	2	8
MA 2,200,0 W filter 1%	1416	142	8.15%	1740	18.64%	128.79%	141.56	34.63	11.71	9	2	7
MA 1,200,0 W	1370	168	9.10%	1843	25.67%	181.97%	136.95	33.50	22.29	13	2	11
MA 1,150,0 TRI	1363	128	7.59%	1681	18.88%	148.73%	136.35	33.36	37.58	9	1	8
MA 2,200,0 TIME	1310	433	17.54%	2467	46.90%	167.40%	130.98	32.04	6.69	29	9	20
MA 1,14 TIME filter 1%	1135	1692	45.21%	3742	69.67%	54.11%	113.49	27.76	1.16	57	30	27
MA 1,150,0 EXP	1094	180	11.11%	1619	32.46%	192.25%	109.38	26.76	22.10	16	2	14
MA 2,200,0 W	1084	155	10.32%	1500	27.73%	168.69%	108.39	26.52	17.61	13	2	11
MA 2,200 E filter 1DAY	1033	114	8.94%	1274	18.92%	111.56%	103.27	25.26	19.63	8	1	7
MA 2,200,0 E filter 1%	926	110	9.51%	1154	19.78%	108.03%	92.60	22.65	18.82	8	1	7
MA 1,14 TIME filter 1DAY	-64	1193	81.70%	1461	104.35%	27.73%	-6.35	-1.55	0.95	69	35	34

Buy/Hold return	753.13
Annual Buy/Hold return	184.24
Observations	1003
Days in test	1492
Transaction costs	0.70%

Appendix V. Table III. Athens Stock Exchange MA strategies for the period 13/11/90 - 31/12/96

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 S filter 1%	608	339	32.12%	1055	42.33%	31.79%	60.84	9.91	2.53	17	8	9
MA 1,50 S filter 1DAY	548	452	41.46%	1091	49.81%	20.14%	54.77	8.92	3.07	21	8	13
MA 5,50,0 W filter 1%	521	323	35.25%	916	43.14%	22.40%	52.08	8.48	2.40	16	7	9
MA 1,50 TRI filter 1%	516	348	36.12%	964	46.49%	28.72%	51.57	8.40	2.21	18	8	10
MA 5,50,0	479	367	40.01%	916	47.72%	19.28%	47.90	7.80	2.71	18	7	11
MA 5,50 S filter 1DAY	468	318	37.42%	850	44.89%	19.97%	46.85	7.63	2.27	16	7	9
MA 5,50,0 TRI filter 1%	460	313	37.24%	840	45.19%	21.34%	46.02	7.50	2.33	16	7	9
MA 1,50 W filter 1%	433	449	45.24%	992	56.31%	24.45%	43.33	7.06	2.78	23	8	15
MA 5,50,0 W	417	589	52.99%	1112	62.48%	17.91%	41.73	6.80	2.98	28	9	19
MA 5,50,0 S filter 1%	407	250	35.79%	699	41.85%	16.93%	40.65	6.62	1.61	13	7	6
MA 1,50,0 S	404	594	50.23%	1182	65.83%	31.06%	40.39	6.58	3.54	31	9	22
MA 1,50,0 TRI	400	612	50.73%	1207	66.83%	31.76%	40.04	6.52	3.68	32	9	23
MA 1,14,0 Variable	355	502	52.02%	964	63.14%	21.38%	35.54	5.79	2.67	26	9	17
MA 5,50,0 TRI	344	467	52.24%	894	61.53%	17.79%	34.38	5.60	2.95	24	8	16
MA 5,50 W filter 1DAY	335	552	57.32%	963	65.15%	13.66%	33.55	5.46	3.30	27	8	19
MA 5,50 E filter 1DAY	294	304	46.63%	653	55.01%	17.97%	29.38	4.79	2.27	17	7	10
MA 1,50 E filter 1DAY	259	516	58.81%	877	70.42%	19.74%	25.94	4.22	3.42	28	8	20
MA 1,14 VAR filter 1DAY	250	548	59.82%	916	72.69%	21.51%	25.02	4.08	2.93	30	9	21
MA 1,50 W filter 1DAY	232	592	64.74%	914	74.67%	15.33%	23.16	3.77	2.56	31	10	21
MA 1,50 TRI filter 1DAY	224	456	60.83%	749	70.09%	15.21%	22.42	3.65	2.32	25	9	16
MA 5,50,0 E filter 1%	198	234	52.29%	448	55.69%	6.50%	19.83	3.23	1.22	13	7	6
MA 1,50,0 EXP	192	666	62.11%	1072	82.11%	32.20%	19.17	3.12	4.63	39	8	31
MA 1,50,0 W	186	852	63.62%	1339	86.09%	35.31%	18.63	3.03	3.83	48	11	37
MA 5,50 TRI filter 1DAY	168	409	65.67%	623	73.03%	11.21%	16.81	2.74	1.93	23	9	14
MA 5,50,0 EXP	160	362	61.29%	590	72.81%	18.80%	16.04	2.61	2.72	22	7	15
MA 1,14 VAR filter 1%	147	384	60.01%	639	76.98%	28.27%	14.72	2.40	2.53	25	8	17
MA 1,50 E filter 1%	143	335	61.42%	545	73.69%	19.97%	14.34	2.34	2.02	21	8	13
MA 1,14 E filter 1%	101	621	70.02%	887	88.62%	26.57%	10.10	1.65	1.86	38	14	24
MA 1,50 TIME filter 1%	49	499	73.72%	677	92.71%	25.75%	4.94	0.80	1.23	33	15	18
MA 5,50,0 TIME filter 1%	38	604	74.98%	805	95.25%	27.03%	3.82	0.62	1.63	39	15	24
MA 2,200 TIME filter 1DAY	38	301	82.55%	364	89.50%	8.41%	3.82	0.62	2.28	19	6	13
MA 5,50,0 VAR	23	131	81.65%	160	85.72%	4.98%	2.29	0.37	1.40	9	4	5
MA 1,150,0 S	-18	213	96.59%	221	107.94%	11.76%	-1.75	-0.29	3.76	15	3	12
MA 1,14 W filter 1%	-23	779	77.19%	1010	102.25%	32.48%	-2.27	-0.37	1.97	51	17	34
MA 1,200 E filter 1%	-54	148	154.46%	96	156.05%	1.03%	-5.38	-0.88	1.96	10	3	7
MA 1,150 S filter 1%	-59	133	177.40%	75	178.91%	0.85%	-5.90	-0.96	1.69	9	3	6
MA 1,50,0 TIME	-74	849	73.15%	1160	106.38%	45.42%	-7.40	-1.21	2.36	60	17	43
MA 1,200 TIME filter 1%	-75	225	135.48%	166	144.90%	6.95%	-7.45	-1.21	1.85	16	5	11
MA 5,50,0 VAR filter 1%	-80	96	637.35%	15	630.27%	-1.11%	-7.97	-1.30	1.73	7	2	5
MA 5,150,0 W filter 1%	-88	126	305.14%	41	314.05%	2.92%	-8.84	-1.44	2.46	9	2	7
MA 5,150 TIME filter 1DAY	-99	304	108.79%	279	135.35%	24.41%	-9.86	-1.61	2.20	25	7	18
MA 5,150,0 E filter 1%	-101	106	1829.66%	6	1835.56%	0.32%	-10.08	-1.64	1.60	8	2	6
MA 1,50 TIME filter 1DAY	-109	595	96.78%	615	117.75%	21.67%	-10.92	-1.78	1.82	42	14	28
MA 1,200 S filter 1%	-112	120	831.54%	14	877.59%	5.54%	-11.19	-1.82	0.80	9	4	5
MA 2,200,0 S	-115	178	259.16%	69	267.51%	3.22%	-11.52	-1.88	1.52	13	4	9

Appendix V. Table III. Athens Stock Exchange MA strategies for the period 13/11/90 - 31/12/96

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 2,200 W filter 1DAY	-115	188	224.47%	84	237.99%	6.02%	-11.54	-1.88	1.72	14	4	10
MA 5,150,0 S	-117	143	625.70%	23	612.58%	-2.10%	-11.70	-1.91	1.59	10	3	7
MA 1,50 VAR filter 1%	-125	185	255.06%	72	272.31%	6.76%	-12.47	-2.03	1.31	14	5	9
MA 1,150 E filter 1%	-125	165	393.04%	42	397.62%	1.17%	-12.52	-2.04	1.29	12	4	8
MA 5,50 TIME filter 1DAY	-132	758	99.73%	760	117.41%	17.72%	-13.22	-2.15	2.09	50	15	35
MA 1,200 TRI filter 1%	-134	113	455.59%	-25	440.63%	-3.28%	-13.42	-2.19	2.01	8	2	6
MA 2,200,0 E filter 1%	-140	139	3868.81%	-4	3777.40%	-2.36%	-13.98	-2.28	2.22	10	2	8
MA 1,50 VAR filter 1DAY	-150	300	201.02%	149	200.37%	-0.32%	-14.96	-2.44	1.77	21	6	15
MA 5,50 VAR filter 1DAY	-152	125	499.22%	-25	508.61%	1.88%	-15.24	-2.48	1.23	10	3	7
MA 5,150,0 EXP	-156	162	2881.74%	6	2862.94%	-0.65%	-15.58	-2.54	1.61	12	3	9
MA 1,14 TRI filter 1%	-160	776	96.88%	801	119.97%	23.83%	-16.01	-2.61	2.13	54	16	38
MA 2,200,0 TIMESERIES filter 1%	-162	401	140.72%	285	156.74%	11.39%	-16.16	-2.63	2.52	30	7	23
MA 5,150,0 TRI filter 1%	-162	108	193.05%	-56	189.62%	-1.77%	-16.18	-2.64	0.98	8	3	5
MA 2,200,0 S filter 1%	-163	117	268.58%	-44	272.31%	1.39%	-16.28	-2.65	1.59	9	2	7
MA 5,150,0 W	-164	221	325.52%	68	341.34%	4.86%	-16.41	-2.67	1.59	17	5	12
MA 1,14 S filter 1%	-166	667	103.70%	644	125.86%	21.37%	-16.64	-2.71	1.92	48	15	33
MA 1,200,0 TRI	-169	211	445.90%	47	455.63%	2.18%	-16.86	-2.75	2.44	16	3	13
MA 2,200 E filter 1DAY	-171	202	671.78%	30	668.50%	-0.49%	-17.09	-2.78	2.25	15	3	12
MA 5,150 W filter 1DAY	-180	191	1003.61%	19	1042.76%	3.90%	-17.97	-2.93	2.23	15	3	12
MA 2,200,0 TRI filter 1%	-181	110	142.54%	-77	133.81%	-6.13%	-18.08	-2.94	1.73	8	2	6
MA 2,200 S filter 1DAY	-185	144	334.35%	-43	330.27%	-1.22%	-18.54	-3.02	2.12	11	2	9
MA 1,200,0 TIMESERIES	-187	392	159.37%	246	175.97%	10.41%	-18.70	-3.05	3.50	30	5	25
MA 5,150 S filter 1DAY	-190	137	221.57%	-62	207.51%	-6.35%	-19.00	-3.09	1.30	10	3	7
MA 1,150 TIME filter 1%	-194	206	346.86%	59	425.51%	22.67%	-19.36	-3.15	1.52	19	6	13
MA 1,150 TRI filter 1%	-198	153	339.77%	-45	340.68%	0.27%	-19.83	-3.23	2.72	12	2	10
MA 2,200,0 W	-205	233	519.09%	45	555.72%	7.06%	-20.47	-3.33	2.12	19	4	15
MA 2,200,0 EXP	-216	227	1409.74%	16	1437.16%	1.94%	-21.57	-3.51	1.14	18	5	13
MA 1,200,0 S	-222	233	1063.96%	22	1114.98%	4.80%	-22.22	-3.62	1.81	19	4	15
MA 5,150 E filter 1DAY	-223	152	204.29%	-74	200.25%	-1.98%	-22.28	-3.63	1.90	12	2	10
MA 2,200,0 TRI	-225	191	507.03%	-38	498.20%	-1.74%	-22.54	-3.67	1.89	15	3	12
MA 5,150,0 TIME filter 1%	-225	245	398.57%	61	466.78%	17.11%	-22.54	-3.67	1.19	22	8	14
MA 1,200,0 EXP	-229	257	624.54%	41	657.11%	5.21%	-22.94	-3.74	1.44	21	5	16
MA 1,150,0 TRI	-230	280	398.33%	70	426.59%	7.10%	-22.97	-3.74	3.00	23	3	20
MA 2,200,0 W filter 1%	-233	160	218.39%	-73	217.65%	-0.34%	-23.29	-3.79	2.16	13	2	11
MA 5,150 TRI filter 1DAY	-235	140	339.71%	-41	471.12%	38.68%	-23.52	-3.83	1.95	11	2	9
MA 1,150 W filter 1%	-239	198	484.73%	-41	484.75%	0.00%	-23.86	-3.89	1.53	16	4	12
MA 5,150,0 TRI	-239	162	202.12%	-80	197.12%	-2.47%	-23.87	-3.89	0.96	13	4	9
MA 2,200 TRI filter 1DAY	-242	156	160.09%	-97	148.62%	-7.16%	-24.24	-3.95	2.43	12	2	10
MA 1,200 W filter 1%	-249	170	212.87%	-80	211.46%	-0.66%	-24.90	-4.06	1.45	14	3	11
MA 5,150,0 S filter 1%	-256	116	77.37%	-150	70.71%	-8.61%	-25.56	-4.16	0.75	9	3	6
MA 5,150,0 TIMESERIES	-258	371	156.30%	237	208.58%	33.45%	-25.77	-4.20	1.99	36	9	27
MA 2,200,0 TIME	-271	678	120.34%	563	148.14%	23.10%	-27.11	-4.42	3.85	54	8	46
MA 1,14 S filter 1DAY	-277	797	108.31%	736	137.59%	27.04%	-27.65	-4.50	2.12	62	17	45
MA 1,200,0 W	-277	288	857.57%	34	923.81%	7.72%	-27.67	-4.51	1.85	25	5	20
MA 1,50,0 VAR	-283	369	321.08%	115	345.73%	7.68%	-28.26	-4.60	1.97	31	7	24

Appendix V. Table III. Athens Stock Exchange MA strategies for the period 13/11/90 - 31/12/96

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,150,0 EXP	-286	296	836.19%	35	907.07%	8.48%	-28.55	-4.65	1.89	26	5	21
MA 1,150,0 TIMESERIES	-286	335	212.43%	157	281.56%	32.54%	-28.59	-4.66	2.00	34	8	26
MA 1,14 TRIANGULAR	-289	1167	74.81%	1560	118.52%	58.43%	-28.90	-4.71	3.11	91	19	72
MA 1,150,0 W	-300	332	451.58%	73	507.62%	12.41%	-29.96	-4.88	2.45	30	5	25
MA 1,14 E filter 1DAY	-307	865	113.91%	759	140.40%	23.25%	-30.67	-5.00	2.69	66	15	51
MA 1,14 SIMPLE	-332	1139	83.14%	1370	124.27%	49.46%	-33.25	-5.42	3.17	90	18	72
MA 1,150,0 VAR	-345	265	297.40%	-89	286.00%	-3.83%	-34.46	-5.61	1.13	23	4	19
MA 1,150 VAR filter 1%	-347	152	72.06%	-211	64.43%	-10.59%	-34.68	-5.65	0.75	13	2	11
MA 1,200,0 VAR	-398	261	171.75%	-152	161.87%	-5.75%	-39.83	-6.49	1.29	24	2	22
MA 1,200 VAR filter 1%	-405	155	57.29%	-271	49.43%	-13.72%	-40.49	-6.59	0.30	14	2	12
MA 1,14 TRI filter 1DAY	-416	784	144.10%	544	176.54%	22.52%	-41.64	-6.78	2.21	69	17	52
MA 1,14,0 EXP	-462	1243	91.51%	1358	133.99%	46.42%	-46.16	-7.52	3.05	105	20	85
MA 2,200,0 VAR	-468	136	38.13%	-357	31.03%	-18.61%	-46.76	-7.62	0.21	13	1	12
MA 5,150,0 VAR filter 1%	-479	69	16.24%	-426	12.59%	-22.48%	-47.94	-7.81	N/A	7	0	7
MA 2,200,0 VAR filter 1%	-484	94	22.94%	-411	17.85%	-22.20%	-48.43	-7.89	N/A	9	0	9
MA 5,150,0 VAR	-493	110	27.24%	-405	21.89%	-19.67%	-49.31	-8.03	N/A	11	0	11
MA 1,14,0 W	-523	1307	93.12%	1404	137.24%	47.38%	-52.28	-8.52	3.14	115	21	94
MA 5,150 VAR filter 1DAY	-525	105	23.81%	-442	18.77%	-21.16%	-52.50	-8.55	0.17	11	1	10
MA 1,14 W filter 1DAY	-543	840	204.32%	411	232.07%	13.58%	-54.28	-8.84	2.79	80	15	65
MA 2,200 VAR filter 1DAY	-574	122	25.21%	-485	18.29%	-27.45%	-57.36	-9.34	N/A	13	0	13
MA 1,14 TIME filter 1%	-575	707	234.45%	302	290.73%	24.00%	-57.53	-9.37	1.35	80	25	55
MA 1,14 TIME SERIES	-674	1104	80.08%	1379	148.91%	85.94%	-67.42	-10.98	1.38	142	43	99
MA 1,14 TIME filter 1DAY	-681	895	242.06%	370	284.15%	17.39%	-68.07	-11.09	1.58	104	29	75

Buy/Hold return	**18.53%**
Annual Buy/Hold return	**3.02%**
Observations	**1533**
Days in test	**2241**
Transaction costs	**0.70%**

Appendix V. Table IV. Athens Stock Exchange
MA strategies for the period
2/1/97 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning
MA 1,50 VAR filter 1%	2367	300	11.06%	2714	12.77%	15.48%	236.75	59.27	4.65	7	3
MA 1,50 VAR filter 1DAY	2205	287	11.30%	2535	13.02%	15.19%	220.52	55.21	4.47	7	3
MA 5,50 VAR filter 1DAY	2115	170	7.26%	2341	9.65%	32.97%	211.49	52.95	2.94	5	3
MA 2,200,0 W	1713	168	8.80%	1909	10.30%	17.02%	171.27	42.88	10.10	5	2
MA 1,14,0 EXP	1666	1405	31.08%	4522	63.15%	103.16%	166.62	41.71	3.53	52	19
MA 5,50,0 VAR filter 1%	1627	154	8.48%	1818	10.48%	23.53%	162.73	40.74	2.08	5	3
MA 2,200,0 VAR filter 1%	1624	86	4.94%	1736	6.48%	31.33%	162.35	40.64	4.10	3	2
MA 2,200 VAR filter 1DAY	1621	101	5.69%	1772	8.52%	49.81%	162.08	40.58	3.41	4	3
MA 5,150,0 VAR filter 1%	1538	84	5.12%	1647	6.61%	29.12%	153.82	38.51	3.30	3	2
MA 1,200,0 W	1524	234	12.84%	1823	16.41%	27.75%	152.40	38.15	12.64	8	2
MA 1,150,0 TRI	1414	140	8.62%	1626	13.01%	50.90%	141.44	35.41	13.63	6	2
MA 2,200,0 EXP	1392	145	8.65%	1676	16.92%	95.64%	139.22	34.85	17.66	8	2
MA 1,200 W filter 1%	1368	163	10.35%	1575	13.17%	27.21%	136.76	34.24	7.89	6	2
MA 5,150,0 EXP	1346	139	8.97%	1552	13.25%	47.72%	134.64	33.71	8.57	6	2
MA 2,200,0 S	1341	88	5.94%	1476	9.14%	53.85%	134.15	33.58	7.72	4	2
MA 1,150,0 S	1341	124	8.17%	1511	11.23%	37.44%	134.13	33.58	10.91	5	2
MA 1,14 TRI filter 1%	1326	1020	35.12%	2904	54.35%	54.75%	132.59	33.19	2.56	37	15
MA 1,50,0 VAR	1301	318	18.46%	1722	24.44%	32.43%	130.14	32.58	14.20	12	2
MA 1,150,0 EXP	1286	296	17.78%	1667	22.84%	28.47%	128.60	32.19	14.04	11	2
MA 1,200,0 TRI	1285	154	10.13%	1520	15.48%	52.78%	128.49	32.17	10.87	7	3
MA 1,150 TRI filter 1%	1272	134	9.09%	1471	13.53%	48.87%	127.23	31.85	10.59	6	2
MA 2,200,0 W filter 1%	1258	121	8.53%	1422	11.52%	35.01%	125.83	31.50	6.14	5	2
MA 1,150 VAR filter 1%	1253	173	11.41%	1520	17.57%	54.01%	125.26	31.36	6.73	8	3
MA 2,200,0 TRI	1237	101	7.20%	1399	11.59%	61.09%	123.70	30.97	13.61	5	2
MA 5,50,0 VAR	1198	114	8.57%	1325	9.56%	11.50%	119.79	29.99	3.11	4	2
MA 1,200,0 S	1198	113	8.10%	1390	13.85%	71.00%	119.76	29.98	10.42	6	2
MA 5,150 VAR filter 1DAY	1194	116	8.35%	1386	13.87%	66.09%	119.35	29.88	4.61	6	3
MA 5,150,0 TRI	1187	108	8.21%	1313	9.59%	16.80%	118.73	29.72	4.25	4	2
MA 1,150 S filter 1%	1161	129	9.56%	1350	14.02%	46.69%	116.11	29.07	9.83	6	2
MA 1,150,0 W	1144	338	22.02%	1536	25.53%	15.92%	114.41	28.64	10.86	12	2
MA 5,150,0 S	1123	107	8.62%	1246	9.82%	13.94%	112.35	28.13	3.93	4	2
MA 5,150,0 W filter 1%	1116	159	12.24%	1302	14.25%	16.42%	111.63	27.95	5.05	6	2
MA 1,14 SIMPLE	1111	1287	36.15%	3560	68.78%	90.26%	111.15	27.83	3.08	55	19
MA 2,200,0 VAR	1107	107	8.68%	1228	9.88%	13.85%	110.70	27.71	3.48	4	2
MA 2,200 W filter 1DAY	1103	147	11.45%	1288	14.31%	25.02%	110.34	27.62	6.43	6	2
MA 1,14 W filter 1%	1100	1044	37.51%	2782	60.44%	61.11%	110.05	27.55	2.29	42	17
MA 5,150 E filter 1DAY	1081	128	10.14%	1263	14.44%	42.37%	108.05	27.05	6.58	6	2
MA 1,200,0 EXP	1066	220	14.87%	1478	27.90%	87.57%	106.56	26.68	17.10	13	2
MA 1,150 W filter 1%	1057	284	20.81%	1366	22.63%	8.73%	105.67	26.45	4.66	10	3
MA 1,14 E filter 1%	1044	972	40.79%	2383	56.20%	37.77%	104.37	26.13	2.78	36	13
MA 1,14 TRIANGULAR	1037	1334	37.86%	3524	70.58%	86.43%	103.66	25.95	2.72	57	21
MA 1,14 VAR filter 1%	1033	520	27.58%	1885	45.20%	63.89%	103.28	25.86	3.38	25	9
MA 1,200 VAR filter 1%	1027	219	16.86%	1300	20.95%	24.24%	102.75	25.72	4.68	9	3
MA 2,200,0 S filter 1%	1024	57	5.01%	1141	10.22%	104.15%	102.42	25.64	5.64	4	2
MA 5,150,0 TRI filter 1%	1018	82	7.26%	1134	10.25%	41.13%	101.80	25.48	4.00	4	2

Appendix V. Table IV. Athens Stock Exchange
MA strategies for the period
2/1/97 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning
MA 5,150 TRI filter 1DAY	1012	113	9.74%	1158	12.60%	29.37%	101.24	25.34	6.28	5	2
MA 1,50 W filter 1%	999	594	33.77%	1758	43.19%	27.91%	99.88	25.00	2.66	23	9
MA 5,50,0 E filter 1%	997	322	23.59%	1363	26.81%	13.65%	99.73	24.97	3.41	12	4
MA 5,150,0 E filter 1%	991	126	10.79%	1165	14.97%	38.78%	99.05	24.80	5.77	6	2
MA 5,150,0 W	965	234	19.07%	1228	21.48%	12.60%	96.45	24.15	6.76	9	2
MA 1,150,0 VAR	960	191	15.22%	1255	23.47%	54.22%	96.04	24.04	13.31	10	2
MA 1,14 TIME filter 1%	943	1164	35.44%	3285	71.30%	101.16%	94.29	23.60	1.48	56	28
MA 1,200 S filter 1%	930	85	7.96%	1070	13.08%	64.36%	92.97	23.27	5.60	5	2
MA 1,150 E filter 1%	919	204	16.92%	1207	23.89%	41.22%	91.85	22.99	9.18	10	2
MA 1,200 TRI filter 1%	915	84	7.99%	1054	13.18%	64.81%	91.49	22.90	6.95	5	2
MA 5,150,0 VAR	890	86	8.42%	1027	13.34%	58.53%	89.04	22.29	7.39	5	2
MA 1,14 S filter 1%	866	944	42.48%	2222	61.01%	43.64%	86.63	21.69	2.35	39	15
MA 1,14,0 W	857	1514	39.71%	3812	77.51%	95.19%	85.71	21.46	2.97	68	22
MA 1,50 S filter 1%	847	431	31.32%	1376	38.46%	22.81%	84.68	21.20	5.81	18	4
MA 5,150,0 S filter 1%	842	108	11.09%	975	13.69%	23.47%	84.15	21.07	4.40	5	2
MA 5,150 W filter 1DAY	834	176	16.72%	1051	20.68%	23.63%	83.38	20.87	3.79	8	3
MA 1,50 W filter 1DAY	833	550	36.80%	1494	44.25%	20.26%	83.29	20.85	4.09	22	6
MA 1,50,0 TIME	816	1007	44.84%	2247	63.68%	42.02%	81.61	20.43	2.53	41	15
MA 2,200,0 TRI filter 1%	801	83	8.93%	931	14.02%	56.94%	80.05	20.04	5.76	5	2
MA 2,200,0 E filter 1%	791	87	8.90%	975	18.91%	112.42%	79.05	19.79	7.57	7	2
MA 1,50 E filter 1%	775	511	36.98%	1382	43.91%	18.74%	77.52	19.41	6.52	21	4
MA 2,200 TRI filter 1DAY	767	82	9.17%	895	14.31%	56.10%	76.72	19.21	5.45	5	2
MA 2,200 TIME filter 1DAY	763	449	37.28%	1206	36.72%	-1.50%	76.29	19.10	5.11	16	4
MA 1,200 E filter 1%	758	100	10.31%	966	21.56%	109.20%	75.80	18.98	8.41	8	2
MA 1,14 TIME filter 1DAY	751	1210	39.24%	3084	75.65%	92.77%	75.09	18.80	1.46	60	29
MA 5,150 S filter 1DAY	746	107	12.31%	873	14.51%	17.89%	74.60	18.68	3.73	5	2
MA 1,50 TRI filter 1%	726	426	34.94%	1221	40.52%	15.99%	72.60	18.17	3.91	18	5
MA 1,14 S filter 1DAY	719	970	50.33%	1927	62.67%	24.52%	71.91	18.00	2.27	38	14
MA 1,200,0 VAR	717	241	23.39%	1031	30.47%	30.24%	71.67	17.94	10.00	12	2
MA 2,200 E filter 1DAY	698	109	12.11%	899	22.38%	84.81%	69.80	17.47	7.07	8	2
MA 1,200 TIME filter 1%	691	333	32.83%	1014	31.89%	-2.87%	69.06	17.29	3.83	12	4
MA 1,50,0 S	690	553	39.57%	1399	50.65%	28.00%	69.02	17.28	11.65	25	3
MA 5,150,0 TIMESERIES	683	719	49.37%	1455	53.11%	7.56%	68.25	17.09	6.65	27	5
MA 1,50 TRI filter 1DAY	676	424	35.74%	1186	43.05%	20.43%	67.55	16.91	4.14	19	5
MA 2,200 S filter 1DAY	671	77	9.67%	792	15.30%	58.27%	67.07	16.79	4.33	5	2
MA 1,14 TRI filter 1DAY	669	981	53.29%	1842	63.66%	19.46%	66.94	16.76	1.99	38	15
MA 1,50,0 TRI	653	515	39.20%	1313	50.28%	28.26%	65.27	16.34	8.01	24	4
MA 1,50,0 W	648	831	51.41%	1616	59.89%	16.49%	64.83	16.23	4.48	33	8
MA 1,50,0 EXP	647	547	39.96%	1370	52.78%	32.09%	64.69	16.19	5.12	26	6
MA 1,14 E filter 1DAY	626	897	51.91%	1729	63.82%	22.94%	62.55	15.66	2.15	37	14
MA 5,50 E filter 1DAY	600	353	35.23%	1001	40.11%	13.85%	59.97	15.01	4.16	16	4
MA 1,14,0 Variable	598	406	37.42%	1085	44.88%	19.92%	59.83	14.98	3.98	19	5
MA 1,14 TIME SERIES	598	1554	35.60%	4365	86.29%	142.37%	59.82	14.98	1.77	86	36
MA 1,50 S filter 1DAY	585	486	43.16%	1127	48.07%	11.39%	58.53	14.65	4.42	21	5
MA 2,200,0 TIMESERIES filter 1%	581	680	53.29%	1276	54.43%	2.13%	58.14	14.55	3.99	26	7

Appendix V. Table IV. Athens Stock Exchange
MA strategies for the period
2/1/97 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning
MA 1,14 VAR filter 1DAY	576	521	40.06%	1300	55.69%	39.03%	57.60	14.42	4.91	27	6
MA 1,14 W filter 1DAY	575	1054	53.83%	1958	70.61%	31.17%	57.54	14.40	1.85	45	18
MA 5,50,0 TIME filter 1%	537	796	55.27%	1440	62.68%	13.42%	53.75	13.46	1.73	33	14
MA 1,150,0 TIMESERIES	505	745	60.67%	1227	58.85%	-2.99%	50.50	12.64	6.32	28	5
MA 1,50 E filter 1DAY	494	502	48.64%	1032	52.19%	7.29%	49.36	12.36	4.34	22	5
MA 5,50,0 W	457	384	42.57%	901	49.28%	15.78%	45.70	11.44	2.93	19	6
MA 5,50 S filter 1DAY	428	343	42.30%	811	47.28%	11.77%	42.77	10.71	4.25	17	4
MA 1,150 TIME filter 1%	404	389	51.50%	756	46.61%	-9.50%	40.37	10.11	5.86	16	3
MA 5,50,0 W filter 1%	397	337	43.70%	772	48.61%	11.23%	39.69	9.94	3.08	17	5
MA 1,200,0 TIMESERIES	377	638	65.93%	968	61.05%	-7.40%	37.69	9.44	4.11	25	6
MA 5,50,0 EXP	360	340	48.42%	701	48.68%	0.53%	36.00	9.01	5.37	16	3
MA 5,150,0 TIME filter 1%	336	531	62.96%	843	60.19%	-4.40%	33.55	8.40	5.96	23	4
MA 5,50,0 TRI filter 1%	335	330	49.24%	670	50.04%	1.62%	33.46	8.38	2.71	16	5
MA 1,50 TIME filter 1%	330	703	65.87%	1067	69.08%	4.88%	32.99	8.26	2.17	31	11
MA 5,50,0 S filter 1%	298	276	47.68%	579	48.55%	1.82%	29.79	7.46	3.04	14	4
MA 1,50 TIME filter 1DAY	273	669	73.53%	910	70.02%	-4.78%	27.30	6.83	2.16	29	10
MA 5,50,0	256	355	57.65%	616	58.43%	1.35%	25.61	6.41	5.90	18	3
MA 5,50 TRI filter 1DAY	236	340	57.62%	590	60.04%	4.18%	23.58	5.90	3.05	18	5
MA 5,50 TIME filter 1DAY	234	836	82.41%	1014	76.94%	-6.64%	23.39	5.86	1.31	35	16
MA 5,50 W filter 1DAY	213	393	64.91%	605	64.78%	-0.19%	21.31	5.33	3.38	20	5
MA 2,200,0 TIME	190	1043	85.53%	1219	84.40%	-1.33%	19.02	4.76	4.38	44	9
MA 5,150 TIME filter 1DAY	148	530	84.13%	630	76.44%	-9.14%	14.83	3.71	5.78	25	4
MA 5,50,0 TRI	133	318	66.46%	479	72.15%	8.56%	13.33	3.34	4.13	19	4

Buy/Hold return	252.56
Annual Buy/Hold return	63.23
Observations	1001
Days in test	1458
Transaction costs	0.70%

Appendix V. Table V. Athens Stock Exchange Momentum, MACD and Forecast Oscillator strategies for the period 13/10/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 30	14343	13413	21.60%	62099	76.90%	256.04%	1434.33	100.83	4.80	101	25	76
MACD 12/26 -9	12186	12054	19.36%	62254	80.43%	315.37%	1218.57	85.67	2.21	112	45	67
Momentum 50	11257	6125	19.35%	31659	64.44%	233.07%	1125.70	79.14	5.28	70	18	52
Momentum 14	5870	17407	24.45%	71186	91.75%	275.23%	587.03	41.27	2.67	168	52	116
Momentum 150	1978	1045	18.92%	5523	64.18%	239.24%	197.82	13.91	7.72	56	11	45
FORECAST OSCILLATOR 50	292	19841	1.05%	1887358	99.98%	9411.12%	29.22	2.05	2.12	520	168	352
FORECAST OSCILLATOR 150	112	14038	1.02%	1372801	99.99%	9678.13%	11.21	0.79	2.02	508	169	339
FORECAST OSCILLATOR 30	-295	16220	1.05%	1545184	100.02%	9428.34%	-29.50	-2.07	2.07	549	177	372
FORECAST OSCILLATOR 14	-680	12675	1.40%	902662	100.08%	7026.70%	-67.99	-4.78	1.64	567	209	358

Buy/Hold return	3743.86
Annual Buy/Hold return	263.2
Observations	3537
Days in test	5192
Transaction costs	0.70%

Appendix V. Table VI. Athens Stock Exchange Momentum, MACD and Forecast Oscillator strategies
13/10/86 - 12/11/90

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 30	6000	697	8.18%	8526	29.62%	262.27%	600.05	146.80	21.22	22	6	16
Momentum 14	5122	1187	12.40%	9568	46.47%	274.69%	512.17	125.30	4.76	39	15	24
FORECAST OSCILLATOR 50	4196	6545	20.17%	32448	87.07%	331.65%	419.63	102.66	2.24	133	55	78
FORECAST OSCILLATOR 30	3954	7149	21.22%	33683	88.26%	315.85%	395.42	96.73	2.08	139	58	81
MACD 12/26 -9	3758	984	15.77%	6242	39.79%	152.35%	375.84	91.94	2.79	30	14	16
Momentum 50	3748	330	6.67%	4940	24.13%	261.55%	374.80	91.69	17.33	16	5	11
FORECAST OSCILLATOR 14	2850	6231	21.38%	29148	90.22%	322.05%	285.00	69.72	1.39	147	74	73
FORECAST OSCILLATOR 150	2250	4745	27.61%	17186	86.91%	214.76%	224.99	55.04	1.88	123	54	69
Momentum 150	1031	149	10.75%	1386	25.60%	138.21%	103.10	25.22	0.35	11	2	9

Buy/Hold return	**753.13**
Annual Buy/Hold return	**184.24**
Observations	**1003**
Days in test	**1492**
Transaction costs	**0.70%**

Appendix V. Table VII, Athens Stock Exchange Momentum, MACD and Forecast Oscillator strategies for the period 13/11/90 - 31/12/96

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MACD 12/26 -9	372	891	57.16%	1559	76.11%	33.17%	37.23	6.06	2.65	44	14	30
Momentum 30	-29	716	88.41%	810	103.58%	17.16%	-2.90	-0.47	2.97	44	11	33
Momentum 14	-156	1180	78.83%	1497	110.44%	40.10%	-15.63	-2.55	2.56	77	20	57
Momentum 50	-209	340	189.57%	179	216.26%	14.08%	-20.86	-3.40	2.42	28	6	22
Momentum 150	-589	283	84.97%	-333	76.65%	-9.79%	-58.86	-9.59	0.91	34	4	30
FORECAST OSCILLATOR 150	-827	1483	57.33%	2587	131.96%	130.17%	-82.69	-13.47	1.65	216	52	164
FORECAST OSCILLATOR 50	-874	1225	63.08%	1942	145.01%	129.88%	-87.40	-14.24	1.55	225	50	175
FORECAST OSCILLATOR 30	-908	1212	61.32%	1976	145.96%	138.04%	-90.82	-14.79	1.24	248	61	187
FORECAST OSCILLATOR 14	-920	1261	71.77%	1757	152.38%	112.32%	-92.02	-14.99	1.18	253	68	185

Buy/Hold return	18.53%
Annual Buy/Hold return	3.02%
Observations	1533
Days in test	2241
Transaction costs	0.70%

Appendix V. Table VIII. Athens Stock Exchange Momentum, MACD and Forecast Oscillator strategies for the period 2/1/97 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	1274	143	10.11%	1508	15.5%	53.6%	127	31.90	12.75	7	3	4
Momentum 50	706	527	42.73%	1387	49.1%	14.9%	71	17.66	5.78	24	5	19
Momentum 30	605	825	57.70%	1547	60.9%	5.6%	60	15.14	5.09	33	7	26
MACD 12/26 -9	446	738	62.31%	1394	68.0%	9.1%	45	11.17	1.76	36	15	21
FORECAST OSCILLATOR 150	369	2424	86.77%	6610	94.4%	8.8%	37	9.25	1.88	122	46	76
FORECAST OSCILLATOR 30	233	2604	91.78%	9000	97.4%	6.1%	23	5.84	2.08	149	51	98
FORECAST OSCILLATOR 50	202	2827	93.32%	8350	97.6%	4.6%	20	5.07	1.82	146	54	92
Momentum 14	-84	1053	108.70%	844	110.0%	1.2%	-8	-2.11	2.24	50	15	35
FORECAST OSCILLATOR 14	-124	2636	104.95%	7169	101.7%	-3.1%	-12	-3.11	1.51	159	62	97

Buy/Hold return	**252.56**
Annual Buy/Hold return	**63.23**
Observations	**1001**
Days in test	**1458**
Transaction costs	**0.70%**

Appendix VI. Table I. Nasdaq - High Tr.Costs MA strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 E filter 1%	45532	16722	5.4%	307015	85.2%	1463.7%	4553.23	152.18	3.67	157	58	99
MA 2,200,0 W filter 1%	28691	7100	10.2%	69870	58.9%	480.0%	2869.14	95.89	2.92	72	30	42
MA 1,50,0 TRI	24065	27093	2.4%	1117228	97.8%	3934.9%	2406.50	80.43	4.4	316	79	237
MA 1,150 W filter 1%	23440	11347	13.6%	83623	72.0%	430.4%	2343.98	78.34	2.69	103	39	64
MA 1,200 W filter 1%	21916	8891	14.3%	62169	64.7%	352.7%	2191.57	73.25	3.05	84	30	54
MA 5,150,0 W	21302	9585	9.7%	98353	78.3%	703.9%	2130.20	71.20	3.49	124	41	83
MA 1,150 S filter 1%	20489	6660	12.5%	53465	61.7%	395.2%	2048.93	68.48	3.23	77	28	49
MA 1,150 E filter 1%	18894	5962	10.4%	57230	67.0%	543.0%	1889.39	63.15	4.05	89	29	60
MA 1,50 VAR filter 1%	18444	8115	11.1%	73111	74.8%	573.7%	1844.45	61.64	3.28	111	38	73
MA 1,150 TIME filter 1%	18397	10604	11.5%	91863	80.0%	592.8%	1839.70	61.49	2.07	130	54	76
MA 1,150 TRI filter 1%	17616	5514	12.2%	45063	60.9%	397.8%	1761.59	58.88	2.73	75	30	45
MA 1,50 W filter 1%	17575	20753	9.1%	228486	92.3%	916.3%	1757.53	58.74	2.37	209	74	135
MA 1,150,0 EXP	16920	15606	9.6%	163008	89.6%	836.1%	1691.98	56.55	4.87	184	43	141
MA 1,14 VAR filter 1%	16467	17664	6.8%	260478	93.7%	1281.4%	1646.74	55.04	2.15	225	87	138
MA 1,50,0 VAR	16111	14903	6.4%	231696	93.0%	1346.6%	1611.10	53.85	5.23	217	48	169
MA 2,200,0 W	15514	11638	12.7%	91407	83.0%	552.1%	1551.38	51.85	4.46	143	36	107
MA 1,50 S filter 1%	15197	10207	8.5%	119882	87.3%	925.6%	1519.67	50.79	2.77	167	58	109
MA 1,50 TRI filter 1%	14712	11091	8.1%	137719	89.3%	1009.0%	1471.23	49.17	2.49	181	66	115
MA 2,200 W filter 1DAY	14625	7511	13.0%	57845	74.7%	475.4%	1462.55	48.88	4.05	110	31	79
MA 1,150,0 S	14532	13285	13.5%	98180	85.2%	529.7%	1453.25	48.57	4.88	154	35	119
MA 5,50,0 E filter 1%	13746	5375	9.5%	56570	75.7%	696.7%	1374.63	45.94	2.6	113	45	68
MA 5,150,0 TIME filter 1%	13457	12154	11.4%	106897	87.4%	668.8%	1345.68	44.98	2.22	167	62	105
MA 1,200,0 W	13132	13991	11.9%	117918	88.9%	648.9%	1313.18	43.89	4.79	177	40	137
MA 5,150,0 EXP	12906	4790	10.8%	44344	70.9%	556.3%	1290.55	43.13	4.4	98	28	70
MA 2,200,0 E filter 1%	12548	3733	12.5%	29822	57.9%	362.8%	1254.79	41.94	3.24	68	24	44
MA 1,50,0 EXP	12463	29708	2.6%	1147192	98.9%	3719.6%	1246.25	41.65	3.68	370	93	277
MA 5,50,0 EXP	12187	9634	6.5%	148790	91.8%	1318.0%	1218.69	40.73	3.77	202	57	145
MA 1,50 VAR filter 1DAY	11775	6714	8.7%	76749	84.7%	867.8%	1177.49	39.35	4.1	150	42	108
MA 1,200 TIME filter 1%	11719	7319	12.8%	57040	79.5%	519.2%	1171.94	39.17	2.33	126	48	78
MA 5,150,0 W filter 1%	11036	5150	15.8%	32578	66.1%	318.3%	1103.55	36.88	2.45	85	32	53
MA 5,150,0 S	10880	4801	13.4%	35924	69.7%	421.6%	1088.00	36.36	3.75	94	28	66
MA 1,150,0 VAR	10233	4142	9.0%	46127	77.8%	766.5%	1023.30	34.20	9.95	119	21	98
MA 1,50,0 S	10193	19348	2.6%	749943	98.6%	3723.4%	1019.31	34.07	4.48	350	77	273
MA 1,200 VAR filter 1%	10111	2035	10.6%	19125	47.1%	342.9%	1011.15	33.79	7.45	49	11	38
MA 1,150,0 W	10067	17902	10.2%	174906	94.2%	820.8%	1006.66	33.64	4.44	230	51	179
MA 5,150,0 VAR	9768	1388	7.9%	17589	44.5%	463.4%	976.79	32.65	5.92	45	14	31
MA 1,200,0 TRI	9739	7912	19.3%	40924	76.2%	294.1%	973.87	32.55	4.39	113	27	86
MA 1,14,0 Variable	9508	11847	4.2%	278813	96.6%	2173.2%	950.76	31.78	2.99	273	84	189
MA 5,150,0 TRI	9507	4294	13.6%	31656	70.0%	415.8%	950.71	31.77	2.97	94	32	62
MA 2,200,0 TRI	9498	5517	18.1%	30475	68.8%	280.2%	949.81	31.74	3.37	91	27	64
MA 1,150,0 TRI	9346	8630	12.9%	66665	86.0%	564.2%	934.57	31.24	4.53	156	37	119
MA 5,150 W filter 1DAY	9299	6137	14.9%	41185	77.4%	419.5%	929.91	31.08	2.92	117	38	79
MA 1,150 VAR filter 1%	9221	2284	11.8%	19377	52.4%	344.6%	922.07	30.82	5.82	57	15	42
MA 1,50 E filter 1DAY	9161	9223	4.6%	201880	95.5%	1989.7%	916.14	30.62	3.87	249	67	182
MA 1,200,0 VAR	9132	3077	10.7%	28658	68.1%	534.5%	913.22	30.52	11.11	89	13	76

Appendix VI. Table I. Nasdaq - High Tr.Costs MA strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 2,200,0 VAR	9119	1646	9.5%	17327	47.4%	398.6%	911.87	30.48	6.61	49	12	37
MA 1,200,0 EXP	8580	9463	14.4%	65534	86.9%	501.9%	858.03	28.68	5.48	161	32	129
MA 5,50,0 W	8230	9417	3.5%	272838	97.0%	2709.9%	823.05	27.51	3.55	282	78	204
MA 1,50 S filter 1DAY	8210	8616	6.0%	143655	94.3%	1472.0%	821.04	27.44	3.44	229	65	164
MA 5,150,0 E filter 1%	8065	2881	15.6%	18423	56.2%	259.6%	806.53	26.96	2.25	63	26	37
MA 2,200,0 TIMESERIES filter 1%	8054	15734	11.6%	136174	94.1%	714.3%	805.43	26.92	3.01	226	65	161
MA 5,150,0 VAR filter 1%	7957	697	5.8%	12071	34.1%	490.7%	795.71	26.59	6.09	31	11	20
MA 5,50,0 VAR filter 1%	7940	2935	17.0%	17257	54.0%	217.5%	794.04	26.54	2.12	59	24	35
MA 2,200,0 VAR filter 1%	7587	1118	9.0%	12467	39.1%	336.5%	758.69	25.36	5.82	37	10	27
MA 1,200 TRI filter 1%	7517	3661	19.9%	18377	59.1%	196.7%	751.72	25.12	2.32	68	26	42
MA 5,50,0 VAR	7240	3473	13.6%	25549	71.7%	427.2%	723.99	24.20	3.3	97	30	67
MA 5,50,0 W filter 1%	7131	6951	11.9%	58247	87.8%	635.4%	713.12	23.83	2.3	165	59	106
MA 2,200,0 EXP	6899	6081	18.0%	33768	79.6%	341.9%	689.88	23.06	5.02	123	26	97
MA 1,200,0 S	6853	5597	14.7%	37975	82.0%	456.0%	685.32	22.90	5.22	133	28	105
MA 5,150 TRI filter 1DAY	6810	2899	12.9%	22417	69.6%	438.3%	681.04	22.76	3.44	91	29	62
MA 5,150,0 TRI filter 1%	6775	2387	14.9%	16062	57.8%	289.0%	677.46	22.64	2.37	65	26	39
MA 5,50,0 S filter 1%	6367	3995	10.4%	38292	83.4%	699.1%	636.71	21.28	2.55	139	50	89
MA 2,200 VAR filter 1DAY	6250	1222	9.9%	12289	49.1%	394.4%	624.98	20.89	7.64	50	11	39
MA 1,50,0 W	6219	23360	1.8%	1294672	99.5%	5415.7%	621.92	20.79	3.64	432	103	329
MA 5,50 E filter 1DAY	6145	5148	7.5%	68439	91.0%	1110.0%	614.51	20.54	3.75	189	52	137
MA 2,200,0 TRI filter 1%	6132	2705	19.2%	14099	56.5%	194.5%	613.24	20.50	2.07	62	25	37
MA 1,200 E filter 1%	6083	4652	23.9%	19486	68.8%	188.1%	608.34	20.33	3.25	88	25	63
MA 1,50 TRI filter 1DAY	5680	7979	7.0%	114481	95.0%	1263.6%	567.98	18.98	2.97	237	70	167
MA 1,200,0 TIMESERIES	5529	9889	4.8%	204684	97.3%	1914.0%	552.94	18.48	4.09	287	67	220
MA 5,50,0	5388	6313	8.0%	78869	93.2%	1064.0%	538.77	18.01	3.06	210	62	148
MA 2,200 TRI filter 1DAY	5067	3161	21.7%	14562	65.2%	200.4%	506.70	16.93	2.61	78	26	52
MA 5,50,0 TRI filter 1%	5064	4596	12.3%	37259	86.4%	600.4%	506.40	16.92	2.24	153	56	97
MA 2,200,0 S	5053	3951	19.3%	20468	75.3%	290.1%	505.31	16.89	3.95	105	26	79
MA 5,150 S filter 1DAY	4870	2998	17.2%	17463	72.1%	320.1%	486.96	16.28	3.32	95	28	67
MA 1,14 E filter 1%	4562	18857	8.3%	227162	98.0%	1080.5%	456.24	15.25	2.1	309	107	202
MA 2,200,0 S filter 1%	4458	2448	20.9%	11719	62.0%	196.6%	445.82	14.90	2.51	70	24	46
MA 5,150 VAR filter 1DAY	4364	872	10.4%	8372	47.9%	359.8%	436.44	14.59	5.56	46	12	34
MA 5,150 E filter 1DAY	4325	2335	14.1%	16575	73.9%	424.5%	432.52	14.46	4.37	99	25	74
MA 5,150,0 S filter 1%	4256	2176	20.1%	10814	60.6%	201.4%	425.57	14.22	2.24	67	25	42
MA 1,14 VAR filter 1DAY	4113	9090	2.8%	325957	98.7%	3440.5%	411.30	13.75	3.02	346	98	248
MA 1,200 S filter 1%	4091	2977	24.7%	12059	66.1%	167.6%	409.11	13.67	2.64	78	25	53
MA 5,50 VAR filter 1DAY	3589	2291	16.8%	13609	73.6%	337.4%	358.89	11.99	3.62	96	26	70
MA 1,150,0 TIMESERIES	3494	8470	4.6%	185571	98.1%	2049.6%	349.42	11.68	3.52	310	77	233
MA 1,50 W filter 1DAY	3439	7998	4.3%	185504	98.1%	2176.4%	343.90	11.49	3.2	311	83	228
MA 2,200 S filter 1DAY	2773	2181	19.8%	11011	74.8%	277.8%	277.28	9.27	4.03	96	23	73
MA 5,50 S filter 1DAY	2646	3368	7.6%	44044	94.0%	1129.3%	264.60	8.84	3.06	209	60	149
MA 2,200 E filter 1DAY	2637	3174	25.7%	12372	78.7%	206.7%	263.71	8.81	4.18	108	24	84
MA 2,200 TIME filter 1DAY	2566	5963	8.8%	67681	96.2%	992.0%	256.60	8.58	3.6	246	60	186
MA 5,150,0 TIMESERIES	2558	8327	4.6%	182329	98.6%	2059.0%	255.82	8.55	3.36	328	82	246
MA 5,50,0 TRI	2470	5195	9.4%	55496	95.5%	920.8%	247.00	8.26	2.87	232	66	166

Appendix VI. Table I. Nasdaq - High Tr.Costs MA strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,14 W filter 1%	2014	20487	6.5%	314249	99.4%	1424.1%	201.42	6.73	1.96	387	135	252
MA 1,14 TRI filter 1%	1856	20623	6.0%	344011	99.5%	1559.1%	185.63	6.20	2	399	137	262
MA 5,50 TRI filter 1DAY	1662	3949	10.7%	36976	95.5%	794.4%	166.17	5.55	2.85	221	62	159
MA 5,150 TIME filter 1DAY	1166	5285	8.7%	60986	98.1%	1031.8%	116.60	3.90	3.19	279	70	209
MA 5,50 W filter 1DAY	568	4426	10.9%	40742	98.6%	807.6%	56.75	1.90	2.79	273	73	200
MA 1,14 S filter 1%	364	9544	8.2%	116703	99.7%	1119.0%	36.36	1.22	2.07	371	122	249
MA 1,14,0 EXP	-211	28513	0.3%	9002456	100.0%	31473.7%	-21.08	-0.70	2.82	778	202	576
MA 1,14 E filter 1DAY	-239	11879	3.2%	369001	100.1%	3008.3%	-23.86	-0.80	2.53	515	144	371
MA 1,14 SIMPLE	-394	16210	0.3%	4708161	100.0%	28947.7%	-39.40	-1.32	2.47	746	211	535
MA 2,200,0 TIME	-421	9037	2.1%	432028	100.1%	4685.1%	-42.15	-1.41	4.4	551	98	453
MA 1,14 TRIANGULAR	-678	13286	0.4%	3030763	100.0%	22717.2%	-67.80	-2.27	2.29	762	224	538
MA 1,14,0 W	-823	14501	0.1%	11620281	100.0%	80039.0%	-82.33	-2.75	2.51	924	253	671
MA 1,50 TIME filter 1%	-826	3566	45.4%	7853	110.5%	143.4%	-82.61	-2.76	1.65	327	115	212
MA 5,50,0 TIME filter 1%	-876	3727	26.2%	14202	106.2%	304.6%	-87.56	-2.93	1.85	400	129	271
MA 1,14 S filter 1DAY	-883	4830	5.2%	92945	101.0%	1842.4%	-88.32	-2.95	2.23	557	157	400
MA 1,14 TRI filter 1DAY	-908	4923	5.3%	93186	101.0%	1811.2%	-90.79	-3.03	2.18	577	165	412
MA 1,14 W filter 1DAY	-912	4742	2.2%	212248	100.4%	4395.0%	-91.21	-3.05	2.15	649	185	464
MA 1,50,0 TIME	-944	4595	3.6%	128813	100.7%	2723.6%	-94.39	-3.15	2.36	645	170	475
MA 1,50 TIME filter 1DAY	-954	2555	25.3%	10085	109.5%	332.1%	-95.42	-3.19	2	457	129	328
MA 5,50 TIME filter 1DAY	-988	2262	21.5%	10530	109.4%	409.2%	-98.80	-3.30	2.14	572	145	427
MA 1,14 TIME filter 1%	-998	1456	121.6%	1197	183.4%	50.7%	-99.78	-3.33	0.91	574	230	344
MA 1,14 TIME SERIES	-1000	2130	1.0%	205709	100.5%	9605.4%	-99.99	-3.34	1.25	1269	402	867
MA 1,14 TIME filter 1DAY	-1000	1388	59.8%	2321	143.1%	139.3%	-100.00	-3.34	0.97	954	319	635

One way transaction costs	0.60%
Buy/Hold return	2355.79%
Annual Buy/Hold return	78.73%
Observations	7557
Days in test	10921

Appendix VI. Table II. Nasdaq Comp.- High Tr.Costs MA strategies for the period 5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 W filter 1%	5909	2978	13.03%	22851	74.14%	468.83%	590.91	39.62	3.30	88	38	50
MA 1,50 E filter 1%	4858	2057	13.56%	15165	67.96%	401.03%	485.83	32.57	4.71	72	26	46
MA 1,50,0 EXP	4430	5100	11.19%	45568	90.28%	706.57%	442.98	29.70	5.44	153	39	114
MA 1,200 W filter 1%	4361	1169	15.44%	7569	42.38%	174.45%	436.13	29.24	3.85	33	15	18
MA 1,14 W filter 1%	3988	510	1.14%	44884	91.11%	7914.25%	398.84	26.74	2.49	158	61	97
MA 1,150 W filter 1%	3870	1313	15.75%	8337	53.59%	240.26%	386.97	25.94	3.82	46	20	26
MA 1,200,0 W	3854	2206	18.35%	12024	67.95%	270.28%	385.38	25.84	7.82	70	17	53
MA 2,200,0 W	3843	1965	19.08%	10297	62.68%	228.51%	384.30	25.77	6.77	60	16	44
MA 1,50,0 TRI	3779	3378	9.75%	34631	89.09%	813.39%	377.89	25.34	5.33	143	38	105
MA 2,200,0 W filter 1%	3762	1080	16.34%	6611	43.10%	163.74%	376.19	25.22	3.39	33	15	18
MA 1,150 S filter 1%	3740	901	13.92%	6471	42.20%	203.15%	374.00	25.08	4.05	32	14	18
MA 1,150,0 EXP	3723	2324	17.91%	12978	71.31%	298.16%	372.31	24.96	6.40	77	21	56
MA 1,14 VAR filter 1%	3677	3042	15.84%	19201	80.85%	410.36%	367.73	24.65	2.65	104	42	62
MA 1,150,0 S	3622	2080	20.31%	10245	64.64%	218.34%	362.23	24.29	6.28	63	17	46
MA 1,50 VAR filter 1%	3535	1578	19.26%	8197	56.87%	195.34%	353.52	23.70	4.46	50	17	33
MA 1,50 S filter 1%	3213	1739	14.94%	11643	72.41%	384.69%	321.28	21.54	3.39	78	30	48
MA 2,200 W filter 1DAY	3186	1455	19.75%	7370	56.78%	187.50%	318.55	21.36	5.18	49	15	34
MA 1,14 TRI filter 1%	3065	5246	11.79%	44491	93.11%	689.59%	306.54	20.55	2.52	172	61	111
MA 2,200,0 TIME filter 1%	3062	3527	26.67%	13221	76.84%	188.06%	306.23	20.53	3.52	89	27	62
MA 1,200,0 EXP	3012	1998	22.45%	8897	66.15%	194.61%	301.17	20.19	6.09	64	17	47
MA 1,50 TRI filter 1%	2991	1972	16.39%	12027	75.13%	358.29%	299.10	20.05	2.82	84	34	50
MA 1,14 E filter 1%	2981	3280	13.82%	23743	87.44%	532.89%	298.10	19.99	2.97	130	45	85
MA 1,150 E filter 1%	2932	1028	17.91%	5741	48.92%	173.17%	293.24	19.66	4.36	38	14	24
MA 1,150 TRI filter 1%	2906	981	18.41%	5331	45.49%	147.17%	290.59	19.48	3.36	34	14	20
MA 1,150 VAR filter 1%	2698	471	11.59%	4067	33.66%	190.50%	269.83	18.09	6.38	22	8	14
MA 1,50,0 VAR	2653	2733	17.42%	15684	83.09%	376.84%	265.27	17.79	6.42	108	24	84
MA 1,200,0 TRI	2631	1438	22.61%	6363	58.65%	159.47%	263.09	17.64	5.47	50	14	36
MA 2,200,0 EXP	2630	1512	23.77%	6360	58.66%	146.81%	262.96	17.63	5.51	50	14	36
MA 5,150,0 W	2580	1651	20.75%	7955	67.57%	225.59%	257.96	17.30	4.21	65	21	44
MA 5,150,0 S	2577	1278	22.18%	5764	55.28%	149.30%	257.74	17.28	4.06	45	15	30
MA 5,150,0 EXP	2523	1351	22.35%	6044	58.26%	160.70%	252.28	16.91	4.29	49	16	33
MA 5,50,0 W filter 1%	2464	1697	18.06%	9396	73.78%	308.49%	246.41	16.52	2.79	78	30	48
MA 2,200,0 E filter 1%	2429	968	22.36%	4329	43.90%	96.30%	242.89	16.28	2.92	31	13	18
MA 1,150,0 W	2401	2717	20.15%	13484	82.19%	307.99%	240.10	16.10	5.38	103	25	78
MA 2,200,0 TRI	2390	1145	22.24%	5146	53.56%	140.79%	238.99	16.02	4.24	42	14	28
MA 1,200 E filter 1%	2334	961	21.45%	4481	47.90%	123.29%	233.44	15.65	3.66	35	13	22
MA 5,150,0 E filter 1%	2312	686	17.43%	3937	41.26%	136.67%	231.25	15.50	2.47	28	14	14
MA 1,200 TRI filter 1%	2298	654	17.00%	3847	40.26%	136.85%	229.79	15.41	2.62	27	13	14
MA 5,150,0 W filter 1%	2282	660	13.33%	4950	53.90%	304.28%	228.19	15.30	3.85	42	15	27
MA 1,200 TIME filter 1%	2211	2059	31.22%	6596	66.48%	112.95%	221.12	14.83	2.28	61	24	37
MA 5,50,0 VAR filter 1%	2164	776	20.14%	3850	43.78%	117.32%	216.44	14.51	3.20	30	12	18
MA 5,50,0 EXP	2139	1791	15.86%	11292	81.06%	411.15%	213.92	14.34	4.85	97	26	71
MA 5,150,0 VAR	2069	404	13.09%	3089	33.02%	152.33%	206.90	13.87	4.21	20	8	12
MA 1,200,0 S	2036	1635	25.20%	6489	68.63%	172.35%	203.57	13.65	6.08	64	15	49
MA 1,200 S filter 1%	1996	765	20.19%	3789	47.32%	134.40%	199.61	13.38	2.99	33	14	19

Appendix VI. Table II. Nasdaq Comp.- High Tr.Costs MA strategies for the period 5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50,0 S	1964	3186	10.65%	29924	93.44%	777.61%	196.39	13.17	5.27	167	37	130
MA 1,50 VAR filter 1DAY	1933	1532	20.60%	7440	74.02%	259.41%	193.28	12.96	4.55	75	21	54
MA 5,150 W filter 1DAY	1920	1407	24.21%	5811	66.96%	176.53%	191.97	12.87	4.06	60	18	42
MA 1,150,0 TRI	1912	1834	24.85%	7380	74.09%	198.12%	191.21	12.82	6.11	75	16	59
MA 2,200,0 TRI filter 1%	1897	594	18.25%	3258	41.76%	128.89%	189.72	12.72	2.36	27	13	14
MA 2,200 TRI filter 1DAY	1894	869	21.55%	4031	53.02%	146.04%	189.38	12.70	3.57	39	14	25
MA 1,50,0 W	1820	4219	9.36%	45051	95.96%	924.75%	182.00	12.20	4.14	199	49	150
MA 1,200 VAR filter 1%	1817	558	18.79%	2970	38.81%	106.54%	181.74	12.18	6.68	24	6	18
MA 5,150,0 TRI	1790	1179	24.06%	4900	63.47%	163.81%	178.99	12.00	4.06	53	16	37
MA 2,200,0 S	1773	1277	25.82%	4947	64.16%	148.51%	177.28	11.89	5.19	54	14	40
MA 1,200,0 VAR	1772	945	22.67%	4168	57.49%	153.58%	177.20	11.88	9.11	44	8	36
MA 1,150,0 VAR	1736	1078	21.41%	5033	65.52%	205.99%	173.55	11.64	7.82	56	12	44
MA 5,50,0 VAR	1722	1170	24.18%	4838	64.40%	166.34%	172.22	11.55	4.05	54	16	38
MA 1,50 E filter 1DAY	1718	2024	14.79%	13686	87.45%	491.30%	171.81	11.52	5.09	120	28	92
MA 1,150 TIME filter 1%	1706	2036	37.70%	5402	68.41%	81.47%	170.63	11.44	1.79	61	26	35
MA 2,200,0 VAR	1705	634	21.71%	2920	41.61%	91.65%	170.52	11.43	5.40	26	7	19
MA 5,150,0 TRI filter 1%	1665	705	22.05%	3200	47.98%	117.60%	166.45	11.16	2.39	32	14	18
MA 1,14,0 Variable	1663	2945	14.51%	20293	91.81%	532.58%	166.28	11.15	3.57	148	41	107
MA 1,14,0 EXP	1643	7936	3.35%	237137	99.31%	2867.40%	164.27	11.01	2.77	321	96	225
MA 2,200 E filter 1DAY	1617	1154	29.24%	3947	59.05%	101.91%	161.65	10.84	3.66	45	14	31
MA 5,50,0 E filter 1%	1616	1011	20.49%	4935	67.24%	228.21%	161.64	10.84	2.81	58	22	36
MA 2,200,0 S filter 1%	1610	695	22.75%	3057	47.32%	108.02%	161.02	10.80	2.70	31	13	18
MA 5,150,0 TIME filter 1%	1595	2500	35.67%	7010	77.24%	116.54%	159.52	10.70	2.05	80	31	49
MA 5,150,0 S filter 1%	1594	636	20.59%	3088	48.39%	135.05%	159.38	10.69	2.79	32	13	19
MA 5,150 S filter 1DAY	1579	1011	25.63%	3945	59.97%	134.03%	157.92	10.59	3.51	46	15	31
MA 1,50 TRI filter 1DAY	1557	2098	17.93%	11701	86.70%	383.61%	155.65	10.44	3.45	114	33	81
MA 2,200,0 VAR filter 1%	1415	391	17.65%	2218	36.19%	105.11%	141.53	9.49	4.77	20	6	14
MA 2,200 VAR filter 1DAY	1342	580	23.77%	2442	45.04%	89.51%	134.24	9.00	5.08	27	7	20
MA 5,150,0 VAR filter 1%	1318	323	16.13%	2003	34.21%	112.01%	131.80	8.84	3.09	18	7	11
MA 5,150 TRI filter 1DAY	1295	1072	28.31%	3786	65.80%	132.41%	129.51	8.68	3.47	52	16	36
MA 1,50 S filter 1DAY	1266	2105	18.72%	11245	88.74%	373.97%	126.63	8.49	3.85	120	31	89
MA 5,150 E filter 1DAY	1178	1007	29.48%	3417	65.52%	122.24%	117.81	7.90	3.53	50	15	35
MA 5,50 VAR filter 1DAY	1162	1001	28.02%	3572	67.47%	140.84%	116.21	7.79	4.14	53	14	39
MA 5,150 VAR filter 1DAY	1149	346	18.16%	1904	39.64%	118.30%	114.92	7.70	3.57	21	7	14
MA 5,50,0 TRI filter 1%	1133	1221	23.37%	5224	78.32%	235.18%	113.27	7.59	2.37	76	28	48
MA 2,200 S filter 1DAY	1061	919	29.46%	3121	66.01%	124.09%	106.09	7.11	3.79	49	14	35
MA 1,14 S filter 1%	1053	3068	14.81%	20719	94.92%	540.98%	105.27	7.06	2.64	168	52	116
MA 5,50,0	978	1890	22.44%	8421	88.39%	293.87%	97.77	6.56	3.55	111	29	82
MA 5,50 E filter 1DAY	975	1278	20.59%	6209	84.30%	309.44%	97.46	6.53	3.89	92	24	68
MA 5,50,0 W	958	2377	17.48%	13596	92.96%	431.67%	95.76	6.42	3.51	143	37	106
MA 1,14 E filter 1DAY	926	4573	10.48%	43635	97.88%	833.91%	92.61	6.21	2.60	224	68	156
MA 1,200,0 TIMESERIES	913	3299	23.77%	13876	93.42%	292.97%	91.31	6.12	4.06	146	33	113
MA 5,50,0 TRI	725	1738	22.60%	7688	90.58%	300.73%	72.46	4.86	3.20	115	31	84
MA 5,50,0 S filter 1%	672	912	26.15%	3487	80.72%	208.68%	67.22	4.51	2.28	70	25	45
MA 1,14 VAR filter 1DAY	639	2921	17.10%	17083	96.26%	462.94%	63.88	4.28	3.13	171	45	126

Appendix VI. Table II. Nasdaq Comp.- High Tr.Costs MA strategies for the period 5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 W filter 1DAY	535	2451	19.26%	12726	95.80%	397.40%	53.47	3.58	3.32	156	39	117
MA 5,50 TRI filter 1DAY	430	1478	25.84%	5717	92.48%	257.82%	43.00	2.88	3.24	110	28	82
MA 1,14 SIMPLE	398	5770	3.79%	152248	99.74%	2531.73%	39.79	2.67	2.45	335	102	233
MA 2,200 TIME filter 1DAY	383	2361	31.59%	7474	94.88%	200.33%	38.26	2.57	3.56	129	30	99
MA 1,50 TIME filter 1%	175	1874	24.53%	7641	97.71%	298.31%	17.53	1.18	1.63	142	56	86
MA 5,50 W filter 1DAY	172	1846	25.02%	7376	97.67%	290.31%	17.15	1.15	3.05	140	35	105
MA 1,14 TRIANGULAR	170	4800	3.37%	142511	99.88%	2865.46%	17.04	1.14	2.25	343	108	235
MA 5,50 S filter 1DAY	84	1197	29.26%	4091	97.95%	234.72%	8.38	0.56	2.89	110	28	82
MA 1,14,0 W	63	4944	1.55%	318437	99.98%	6339.95%	6.34	0.43	2.40	407	121	286
MA 1,150,0 TIMESERIES	35	2840	36.04%	7879	99.55%	176.20%	3.53	0.24	2.98	153	38	115
MA 5,150,0 TIMESERIES	27	2912	30.92%	9417	99.72%	222.51%	2.68	0.18	2.88	165	42	123
MA 5,50,0 TIME filter 1%	-105	2033	20.87%	9743	101.08%	384.36%	-10.49	-0.70	1.94	177	59	118
MA 2,200,0 TIME	-192	4301	14.76%	29138	100.66%	581.89%	-19.21	-1.29	4.44	258	45	213
MA 5,150 TIME filter 1DAY	-241	2248	50.76%	4429	105.43%	107.72%	-24.06	-1.61	2.96	140	33	107
MA 1,14 TRI filter 1DAY	-416	2777	12.98%	21398	101.94%	685.50%	-41.61	-2.79	2.07	260	78	182
MA 1,14 S filter 1DAY	-435	2821	14.92%	18911	102.30%	585.86%	-43.55	-2.92	2.27	254	71	183
MA 1,14 W filter 1DAY	-529	2736	9.47%	28893	101.83%	975.27%	-52.92	-3.55	2.09	296	85	211
MA 1,50,0 TIME	-577	2559	10.50%	24381	102.37%	875.17%	-57.73	-3.87	2.19	292	79	213
MA 1,50 TIME filter 1DAY	-688	1814	32.12%	5648	112.18%	249.30%	-68.80	-4.61	2.04	218	59	159
MA 5,50 TIME filter 1DAY	-800	1703	22.84%	7455	110.73%	384.85%	-80.02	-5.37	1.91	267	69	198
MA 1,14 TIME filter 1%	-948	1359	182.65%	744	227.49%	24.55%	-94.84	-6.36	0.78	251	104	147
MA 1,14 TIME SERIES	-992	1908	8.08%	23605	104.20%	1189.07%	-99.24	-6.65	1.05	577	185	392
MA 1,14 TIME filter 1DAY	-997	1370	149.29%	918	208.61%	39.73%	-99.70	-6.68	0.96	460	142	318

One way transaction costs	0.70%
Buy/Hold return	222.96%
Annual Buy/Hold return	14.95%
Observations	3766
Days in test	5444

Appendix VI. Table III. Nasdaq - High Tr.Costs MA strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 E filter 1%	6116	1768	11.24%	15732	61.1%	443.86%	611.60	40.77	3.64	85	32	53
MA 1,150 TIME filter 1%	4957	2120	19.60%	10817	54.2%	176.43%	495.68	33.04	2.44	68	26	42
MA 2,200,0 W filter 1%	4803	946	12.86%	7359	34.7%	170.09%	480.31	32.01	2.85	36	15	21
MA 5,150,0 W	4197	1476	17.92%	8235	49.0%	173.70%	419.67	27.97	3.67	57	18	39
MA 5,50,0 E filter 1%	3890	1181	15.70%	7519	48.3%	207.34%	389.03	25.93	2.39	55	23	32
MA 1,50,0 TRI	3655	3106	12.36%	25127	85.5%	591.39%	365.51	24.36	4.77	172	41	131
MA 1,150 E filter 1%	3652	939	14.00%	6708	45.6%	225.32%	365.19	24.34	4.86	50	14	36
MA 5,150,0 TIME filter 1%	3620	2440	24.47%	9973	63.7%	160.35%	362.04	24.13	2.59	86	29	57
MA 1,50 VAR filter 1%	3557	1216	16.75%	7262	51.0%	204.61%	355.72	23.71	3.56	59	19	40
MA 1,50 VAR filter 1DAY	3335	1380	17.17%	8041	58.5%	240.90%	333.52	22.23	3.96	73	21	52
MA 1,50,0 VAR	3290	2304	20.13%	11445	71.3%	253.88%	329.00	21.93	5.04	106	24	82
MA 1,150 W filter 1%	3288	1410	21.54%	6544	49.8%	131.00%	328.79	21.92	3.53	56	17	39
MA 1,150 TRI filter 1%	3208	839	15.81%	5309	39.6%	150.35%	320.82	21.38	2.59	40	16	24
MA 1,150 S filter 1%	3145	903	16.52%	5468	42.5%	157.13%	314.49	20.96	3.67	44	14	30
MA 1,200 W filter 1%	3060	1087	19.44%	5594	45.3%	133.06%	305.99	20.40	3.47	48	15	33
MA 1,150,0 VAR	2990	843	13.68%	6163	51.5%	276.22%	299.05	19.93	12.04	58	9	49
MA 5,50,0 W	2883	2149	14.81%	14510	80.1%	441.03%	288.25	19.21	3.25	138	42	96
MA 5,150,0 EXP	2841	771	14.90%	5176	45.1%	202.75%	284.10	18.94	5.64	47	11	36
MA 5,50,0 S filter 1%	2838	1295	19.36%	6690	57.6%	197.47%	283.79	18.92	2.58	69	25	44
MA 1,14 VAR filter 1%	2665	2307	20.32%	11354	76.5%	276.55%	266.55	17.77	2.40	121	43	78
MA 1,150,0 TIMESERIES	2664	3345	20.90%	16005	83.4%	298.78%	266.38	17.76	4.05	153	36	117
MA 1,150,0 EXP	2650	2049	22.09%	9275	71.4%	223.38%	265.00	17.66	5.25	103	22	81
MA 5,50,0 EXP	2622	1646	17.70%	9299	71.8%	305.61%	262.21	17.48	3.40	104	31	73
MA 2,200,0 E filter 1%	2588	612	14.68%	4168	37.9%	158.34%	258.80	17.25	4.33	36	10	26
MA 1,50 TRI filter 1%	2527	1586	19.00%	8351	69.7%	267.09%	252.71	16.84	2.79	97	32	65
MA 2,200 W filter 1DAY	2473	1065	20.35%	5233	52.8%	159.29%	247.26	16.48	4.27	58	15	43
MA 1,50 S filter 1DAY	2457	1853	19.86%	9332	73.7%	270.98%	245.66	16.37	3.04	109	34	75
MA 1,50 S filter 1%	2431	1401	18.95%	7396	67.1%	254.33%	243.07	16.20	3.03	89	28	61
MA 1,200 TIME filter 1%	2331	1094	20.94%	5223	55.4%	164.41%	233.07	15.54	2.39	62	23	39
MA 5,150,0 TRI	2330	805	20.41%	3944	40.9%	100.38%	233.04	15.53	2.34	39	15	24
MA 2,200,0 W	2320	1497	23.58%	6351	63.5%	169.21%	231.96	15.46	4.45	79	19	60
MA 1,50 E filter 1DAY	2309	1749	15.78%	11082	79.2%	401.67%	230.94	15.39	3.16	129	40	89
MA 1,50,0 S	2259	3264	16.98%	19217	88.2%	419.58%	225.93	15.06	4.59	182	39	143
MA 1,150,0 S	2185	1782	26.24%	6794	67.8%	158.59%	218.47	14.56	5.31	89	18	71
MA 5,50 E filter 1DAY	2178	1341	18.06%	7424	70.7%	291.20%	217.77	14.52	3.37	97	29	68
MA 1,200,0 VAR	2161	581	14.40%	4032	46.4%	222.22%	216.11	14.40	18.44	46	4	42
MA 1,14,0 Variable	2139	1962	19.81%	9902	78.4%	295.70%	213.90	14.26	2.30	124	45	79
MA 5,150,0 W filter 1%	2132	891	23.50%	3791	43.8%	86.21%	213.22	14.21	2.21	42	16	26
MA 5,150,0 S	2126	751	18.65%	4027	47.2%	153.09%	212.64	14.17	3.90	47	13	34
MA 1,150,0 TRI	2092	1588	27.16%	5847	64.2%	136.41%	209.18	13.94	4.27	79	19	60
MA 5,150,0 TIMESERIES	2063	3301	23.92%	13796	85.0%	255.50%	206.30	13.75	3.86	157	37	120
MA 1,14 VAR filter 1DAY	2009	2498	15.23%	16404	87.8%	476.16%	200.92	13.39	2.82	175	54	121
MA 5,150,0 VAR filter 1%	1891	134	5.66%	2375	20.4%	260.46%	189.06	12.60	7.48	15	4	11
MA 5,150 W filter 1DAY	1872	1067	26.31%	4054	53.8%	104.52%	187.23	12.48	2.54	56	19	37
MA 1,200,0 W	1865	1801	25.49%	7065	73.6%	188.76%	186.50	12.43	5.07	103	21	82

Appendix VI. Table III. Nasdaq - High Tr.Costs MA strategies
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Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 2,200,0 TRI	1865	961	26.66%	3606	48.3%	81.17%	186.47	12.43	3.81	47	12	35
MA 5,50 S filter 1DAY	1861	1325	19.66%	6739	72.4%	268.13%	186.12	12.41	2.78	99	32	67
MA 5,150 TRI filter 1DAY	1860	563	17.57%	3202	41.9%	138.70%	185.96	12.40	3.00	38	13	25
MA 5,150,0 VAR	1851	235	8.64%	2717	31.8%	268.68%	185.14	12.34	9.22	26	5	21
MA 1,150,0 W	1842	2888	32.21%	8969	79.5%	146.73%	184.18	12.28	4.20	125	28	97
MA 1,150 VAR filter 1%	1776	414	14.00%	2960	40.0%	185.62%	177.65	11.84	7.26	35	7	28
MA 1,200,0 EXP	1745	1611	27.53%	5853	70.2%	154.99%	174.46	11.63	7.72	91	13	78
MA 1,200,0 TRI	1732	1309	32.30%	4053	57.3%	77.30%	173.18	11.54	5.18	61	12	49
MA 5,50,0 VAR	1686	624	20.07%	3108	45.8%	127.96%	168.58	11.24	3.44	42	12	30
MA 1,200,0 TIMESERIES	1683	1941	20.19%	9613	82.5%	308.56%	168.33	11.22	4.91	137	28	109
MA 5,50,0 VAR filter 1%	1652	546	21.33%	2562	35.5%	66.54%	165.20	11.01	1.87	29	12	17
MA 1,200 VAR filter 1%	1632	378	14.12%	2679	39.1%	176.80%	163.21	10.88	9.61	33	5	28
MA 5,50,0	1630	1392	23.04%	6042	73.0%	216.95%	162.96	10.86	2.73	98	31	67
MA 1,200,0 S	1618	1055	25.46%	4142	60.9%	139.31%	161.83	10.79	5.98	67	12	55
MA 5,150,0 TRI filter 1%	1547	462	18.29%	2525	38.7%	111.84%	154.66	10.31	2.39	32	12	20
MA 1,50 W filter 1DAY	1510	2227	20.46%	10884	86.1%	320.89%	150.98	10.06	2.99	155	44	111
MA 1,50 W filter 1%	1507	1794	24.08%	7449	79.8%	231.26%	150.70	10.04	2.70	121	37	84
MA 2,200,0 VAR filter 1%	1506	241	11.13%	2170	30.6%	174.98%	150.64	10.04	8.27	23	4	19
MA 5,50,0 TRI filter 1%	1487	1103	25.07%	4398	66.2%	164.02%	148.69	9.91	2.17	77	28	49
MA 5,150 TIME filter 1DAY	1458	2556	29.64%	8625	83.1%	180.35%	145.80	9.72	3.44	136	34	102
MA 1,50,0 EXP	1355	2895	14.82%	19527	93.1%	527.73%	135.54	9.03	3.77	216	51	165
MA 2,200,0 EXP	1353	1039	28.69%	3621	62.6%	118.32%	135.29	9.02	6.31	67	11	56
MA 1,50 TRI filter 1DAY	1313	1515	21.80%	6953	81.1%	272.16%	131.30	8.75	2.66	123	38	85
MA 1,50,0 W	1290	3867	17.24%	22423	94.2%	446.54%	129.04	8.60	3.67	232	54	178
MA 5,150,0 E filter 1%	1262	473	20.95%	2259	44.1%	110.63%	126.21	8.41	3.00	36	11	25
MA 1,200 TRI filter 1%	1249	650	27.39%	2372	47.3%	72.86%	124.93	8.33	2.89	40	12	28
MA 5,150 E filter 1DAY	1235	470	17.89%	2630	53.0%	196.56%	123.48	8.23	6.06	48	9	39
MA 1,200 E filter 1%	1188	908	34.57%	2626	54.7%	58.35%	118.84	7.92	4.16	50	11	39
MA 2,200,0 VAR	1181	270	13.40%	2018	41.5%	209.68%	118.06	7.87	11.04	32	4	28
MA 2,200,0 S	1174	782	30.47%	2567	54.3%	78.07%	117.44	7.83	4.10	49	11	38
MA 2,200,0 TRI filter 1%	1152	563	27.61%	2038	43.5%	57.50%	115.16	7.68	2.54	34	11	23
MA 5,150 VAR filter 1DAY	1115	202	11.32%	1785	37.5%	231.34%	111.52	7.43	7.39	27	5	22
MA 5,50 VAR filter 1DAY	1091	508	22.77%	2230	51.1%	124.37%	109.10	7.27	3.67	43	11	32
MA 5,50,0 W filter 1%	1086	1055	26.34%	4004	72.9%	176.68%	108.61	7.24	2.31	87	29	58
MA 5,150 S filter 1DAY	1026	568	24.81%	2291	55.2%	122.51%	102.63	6.84	3.69	48	12	36
MA 2,200 TIME filter 1DAY	1004	1505	28.40%	5298	81.0%	185.34%	100.41	6.69	3.93	114	26	88
MA 2,200,0 TIMESERIES filter 1%	979	1952	29.60%	6597	85.2%	187.73%	97.93	6.53	3.09	134	36	98
MA 2,200,0 S filter 1%	978	530	27.78%	1908	48.7%	75.30%	97.85	6.52	3.24	38	10	28
MA 2,200 VAR filter 1DAY	941	234	13.66%	1713	45.1%	229.94%	94.10	6.27	10.89	33	4	29
MA 5,150,0 S filter 1%	825	447	28.32%	1577	47.7%	68.37%	82.49	5.50	2.10	34	12	22
MA 2,200 TRI filter 1DAY	807	566	34.15%	1656	51.3%	50.07%	80.73	5.38	2.74	38	11	27
MA 2,200 S filter 1DAY	773	502	27.56%	1822	57.6%	109.00%	77.29	5.15	5.43	46	8	38
MA 5,50,0 TRI	685	1252	28.45%	4401	84.4%	196.84%	68.47	4.56	2.48	116	35	81
MA 5,50 TRI filter 1DAY	621	1146	29.05%	3945	84.2%	190.01%	62.15	4.14	2.52	111	33	78
MA 1,200 S filter 1%	620	580	37.96%	1529	59.4%	56.52%	62.04	4.14	3.62	44	10	34

Appendix VI. Table III. Nasdaq - High Tr.Costs MA strategies
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Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,14 E filter 1%	498	2908	36.28%	8016	93.8%	158.51%	49.77	3.32	1.98	179	62	117
MA 2,200 E filter 1DAY	460	648	38.73%	1674	72.5%	87.24%	46.00	3.07	5.90	60	9	51
MA 5,50 W filter 1DAY	147	1369	40.76%	3359	95.6%	134.58%	14.71	0.98	2.39	133	38	95
MA 1,14 TRI filter 1%	-238	2585	40.30%	6415	103.7%	157.31%	-23.78	-1.59	1.80	227	78	149
MA 1,14 S filter 1%	-308	2146	49.93%	4299	107.2%	114.60%	-30.76	-2.05	1.69	203	72	131
MA 1,14 W filter 1%	-323	2187	38.25%	5717	105.7%	176.24%	-32.32	-2.15	1.75	229	79	150
MA 2,200,0 TIME	-385	2670	26.99%	9894	103.9%	284.96%	-38.54	-2.57	4.07	287	51	236
MA 1,14 SIMPLE	-480	3964	13.25%	29923	101.6%	666.98%	-47.98	-3.20	2.45	408	110	298
MA 1,14 E filter 1DAY	-537	2396	32.89%	7285	107.4%	226.43%	-53.72	-3.58	2.45	288	75	213
MA 1,14,0 EXP	-597	4398	11.92%	36906	101.6%	752.76%	-59.74	-3.98	2.83	454	108	346
MA 1,14 TRIANGULAR	-663	3805	18.37%	20716	103.2%	461.87%	-66.28	-4.42	2.23	416	117	299
MA 1,14 S filter 1DAY	-761	2020	52.94%	3816	120.0%	126.58%	-76.14	-5.08	2.06	300	83	217
MA 1,14 W filter 1DAY	-779	2198	34.54%	6364	112.2%	224.95%	-77.88	-5.19	2.03	350	97	253
MA 1,14,0 W	-782	4129	11.35%	36389	102.1%	800.23%	-78.21	-5.21	2.29	514	139	375
MA 1,14 TRI filter 1DAY	-815	2086	62.45%	3340	124.4%	99.20%	-81.50	-5.43	2.10	315	85	230
MA 1,50 TIME filter 1%	-842	991	-9896.58%	-10	-8305.2%	-16.08%	-84.20	-5.61	1.46	183	59	124
MA 5,50,0 TIME filter 1%	-855	1180	346.37%	341	351.0%	1.35%	-85.51	-5.70	1.54	222	70	152
MA 1,50 TIME filter 1DAY	-858	1257	231.36%	543	257.9%	11.48%	-85.79	-5.72	1.72	238	68	170
MA 1,50,0 TIME	-858	2230	59.19%	3768	122.8%	107.43%	-85.82	-5.72	2.18	351	91	260
MA 5,50 TIME filter 1DAY	-940	1195	450.43%	265	454.4%	0.88%	-93.98	-6.26	1.98	304	72	232
MA 1,14 TIME filter 1%	-940	1430	276.90%	516	282.1%	1.87%	-94.03	-6.27	1.04	323	126	197
MA 1,14 TIME filter 1DAY	-987	1708	217.08%	787	225.4%	3.85%	-98.69	-6.58	1.09	491	179	312
MA 1,14 TIME SERIES	-991	2381	31.35%	7596	113.0%	260.63%	-99.12	-6.61	1.36	688	226	462

One way transaction costs	**0.50%**
Buy/Hold return	**656.40%**
Annual Buy/Hold return	**43.75%**
Observations	**3791**
Days in test	**5476**

Appendix VI. Table IV. Nasdaq - High Tr.Costs Momentum, MACD and Forecast Oscillator strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	6570	3250.26	10.70%	30381	78.37%	632.58%	657.00	21.96	3.79	118	37	81
Momentum 50	939	5303.02	10.09%	52532	98.21%	872.90%	93.92	3.14	3.09	276	70	206
Momentum 30	894	8959.04	3.98%	225054	99.60%	2402.05%	89.41	2.99	3.43	398	92	306
Momentum 14	-410	9524.48	1.20%	794643	100.05%	8247.46%	-40.96	-1.37	2.69	600	158	442
MACD 12/26 -9	-913	3976.27	8.91%	44645	102.04%	1045.73%	-91.26	-3.05	1.76	521	170	351
FORECAST OSCILLATOR 150	-1000	1679.76	0.01%	32964262	100.00%	1962398.33%	-100.00	-3.34	1.17	2261	539	1722
FORECAST OSCILLATOR 14	-1000	1560.88	0.02%	6320864	100.02%	404919.19%	-100.00	-3.34	0.95	2344	603	1741
FORECAST OSCILLATOR 30	-1000	1741.40	0.01%	13911421	100.01%	798821.61%	-100.00	-3.34	1.17	2299	582	1717
FORECAST OSCILLATOR 50	-1000	1798.52	0.01%	13864195	100.01%	770822.48%	-100.00	-3.34	1.24	2288	559	1729

One way transaction costs	0.60%
Buy/Hold return	2355.79%
Annual Buy/Hold return	78.73%
Observations	7557
Days in test	10921

Appendix VI. Table V. Nasdaq - High Tr.Costs Momentum, MACD and Forecast Oscillator strategies
5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	1297	1206	25.42%	4746	72.68%	185.95%	129.69	8.70	3.76	65	20	45
Momentum 30	367	2475	13.05%	18962	98.06%	651.35%	36.73	2.46	3.72	191	43	148
Momentum 14	313	3590	7.81%	45945	99.32%	1171.12%	31.25	2.10	3.04	255	65	190
Momentum 50	15	1367	26.20%	5220	99.72%	280.62%	1.48	0.10	3.48	129	28	101
MACD 12/26 -9	-386	2169	12.52%	17321	102.23%	716.48%	-38.55	-2.58	1.87	242	77	165
FORECAST OSCILLATOR 150	-1000	1522	0.73%	207361	100.48%	13588.03%	-99.99	-6.70	1.06	1072	223	849
FORECAST OSCILLATOR 14	-1000	1436	1.21%	118637	100.84%	8232.80%	-100.00	-6.70	0.87	1095	240	855
FORECAST OSCILLATOR 50	-1000	1628	1.32%	123745	100.81%	7561.31%	-100.00	-6.70	1.20	1103	226	877
FORECAST OSCILLATOR 30	-1000	1591	1.65%	96437	101.04%	6025.62%	-100.00	-6.70	1.11	1094	239	855

One way transaction costs	0.70%
Buy/Hold return	222.96%
Annual Buy/Hold return	14.95%
Observations	3766
Days in test	5444

Appendix VI. Table VI. Nasdaq - High Tr.Costs Momentum, MACD and Forecast Oscillator strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	2057	683.46	16.40%	4168	50.64%	208.83%	205.70	13.71	3.85	52	16	36
Momentum 50	656	2430.34	39.42%	6165	89.36%	126.70%	65.57	4.37	2.69	146	41	105
Momentum 30	196	2691.15	31.93%	8428	97.68%	205.89%	19.56	1.30	3.23	206	48	158
Momentum 14	-524	2408.33	17.28%	13935	103.76%	500.35%	-52.35	-3.49	2.19	344	96	248
MACD 12/26 -9	-842	1693.48	112.20%	1509	155.79%	38.84%	-84.20	-5.61	1.53	276	90	186
FORECAST OSCILLATOR 150	-999	2048.25	1.59%	128767	100.78%	6235.46%	-99.86	-6.66	1.34	1144	319	825
FORECAST OSCILLATOR 30	-999	2348.11	1.75%	134263	100.74%	5660.49%	-99.91	-6.66	1.43	1194	337	857
FORECAST OSCILLATOR 50	-999	2472.37	2.38%	103823	100.96%	4139.76%	-99.91	-6.66	1.45	1169	337	832
FORECAST OSCILLATOR 14	-1000	1442.14	2.94%	48996	102.04%	3366.75%	-99.98	-6.66	0.91	1244	361	883

One way transaction costs	0.50%
Buy/Hold return	656.40%
Annual Buy/Hold return	43.75%
Observations	3791
Days in test	5476

Appendix VII. Table I. Nasdaq - Low Tr.Costs MA strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 E filter 1%	73638	17810	5.80%	307015	76.01%	1210.35%	7363.80	246.11	3.94	157	60	97
MA 1,50,0 TRI	63780	39628	3.55%	1117228	94.29%	2558.31%	6377.96	213.16	4.81	316	83	233
MA 1,50,0 EXP	39912	46812	4.08%	1147192	96.52%	2265.40%	3991.24	133.39	4.05	370	95	275
MA 2,200,0 W filter 1%	35905	6255	8.95%	69870	48.61%	443.01%	3590.53	120.00	2.93	72	31	41
MA 1,50 W filter 1%	33825	23737	10.39%	228486	85.20%	720.06%	3382.52	113.05	2.51	209	75	134
MA 1,14 VAR filter 1%	33358	21185	8.13%	260478	87.19%	972.06%	3335.84	111.49	2.26	225	89	136
MA 1,150 W filter 1%	32339	10641	12.72%	83623	61.33%	381.97%	3233.86	108.08	2.75	103	40	63
MA 1,50,0 VAR	31859	17848	7.70%	231696	86.25%	1019.67%	3185.92	106.48	5.39	217	51	166
MA 5,150,0 W	31401	9465	9.62%	98353	68.07%	607.39%	3140.06	104.95	3.63	124	42	82
MA 1,50,0 S	31035	30190	4.03%	749943	95.86%	2281.26%	3103.46	103.72	4.58	350	83	267
MA 1,150,0 EXP	30169	17258	10.59%	163008	81.49%	669.71%	3016.86	100.83	5.25	184	44	140
MA 1,200 W filter 1%	28528	7972	12.82%	62169	54.11%	322.00%	2852.75	95.34	2.92	84	32	52
MA 1,150 TIME filter 1%	27692	10547	11.48%	91863	69.85%	508.44%	2769.22	92.55	2.2	130	54	76
MA 1,50 VAR filter 1%	26169	7652	10.47%	73111	64.21%	513.45%	2616.87	87.46	3.56	111	38	73
MA 1,150 S filter 1%	26114	5899	11.03%	53465	51.16%	363.62%	2611.41	87.28	3.25	77	29	48
MA 1,50 TRI filter 1%	26084	12154	8.82%	137719	81.06%	818.53%	2608.42	87.18	2.71	181	66	115
MA 1,50 S filter 1%	25771	10896	9.09%	119882	78.50%	763.69%	2577.09	86.13	2.92	167	59	108
MA 1,50,0 W	25424	40717	3.14%	1294672	98.04%	3017.26%	2542.39	84.97	3.85	432	108	324
MA 1,150 E filter 1%	25021	5411	9.46%	57230	56.28%	495.21%	2502.12	83.63	4.38	89	29	60
MA 2,200,0 W	24399	11727	12.83%	91407	73.31%	471.42%	2439.87	81.54	4.67	143	37	106
MA 1,150,0 S	23691	13718	13.97%	98180	75.87%	443.00%	2369.10	79.18	4.94	154	37	117
MA 5,50,0 EXP	23209	11076	7.44%	148790	84.40%	1033.83%	2320.92	77.57	3.8	202	61	141
MA 1,200,0 W	23069	15032	12.75%	117918	80.44%	530.99%	2306.93	77.10	5.11	177	41	136
MA 5,150,0 TIME filter 1%	22895	13048	12.21%	106897	78.58%	543.79%	2289.51	76.52	2.29	167	63	104
MA 1,14,0 Variable	22870	15737	5.64%	278813	91.80%	1526.42%	2286.98	76.44	2.95	273	91	182
MA 1,150 TRI filter 1%	22348	4848	10.76%	45063	50.41%	368.57%	2234.81	74.69	2.59	75	32	43
MA 1,150,0 W	21097	21569	12.33%	174906	87.94%	613.11%	2109.70	70.51	4.21	230	57	173
MA 2,200 W filter 1DAY	20767	7087	12.25%	57845	64.10%	423.17%	2076.72	69.41	4.34	110	31	79
MA 5,50,0 W	20543	12437	4.56%	272838	92.47%	1928.54%	2054.25	68.66	3.88	282	81	201
MA 1,50 E filter 1DAY	20480	11533	5.71%	201880	89.86%	1472.86%	2047.98	68.45	4.09	249	71	178
MA 5,50,0 E filter 1%	19728	5162	9.13%	56570	65.13%	613.68%	1972.82	65.94	2.79	113	45	68
MA 1,50 VAR filter 1DAY	19065	6891	8.98%	76749	75.16%	737.13%	1906.53	63.72	4.21	150	44	106
MA 5,150,0 EXP	17686	4398	9.92%	44344	60.12%	506.16%	1768.62	59.11	4.74	98	28	70
MA 1,200 TIME filter 1%	17590	7053	12.37%	57040	69.16%	459.33%	1759.02	58.79	2.26	126	51	75
MA 1,50 S filter 1DAY	17336	10361	7.21%	143655	87.93%	1119.14%	1733.56	57.94	3.85	229	65	164
MA 2,200,0 TIMESERIES filter 1%	16863	18049	13.25%	136174	87.62%	561.05%	1686.33	56.36	3.09	226	68	158
MA 2,200,0 E filter 1%	15639	3222	10.80%	29822	47.56%	340.17%	1563.86	52.27	3.42	68	24	44
MA 1,150,0 TRI	15545	8926	13.39%	66665	76.68%	472.72%	1554.48	51.95	4.94	156	37	119
MA 1,150,0 VAR	15077	3967	8.60%	46127	67.32%	682.64%	1507.65	50.39	10.27	119	23	96
MA 5,150,0 S	14774	4353	12.12%	35924	58.87%	385.85%	1477.39	49.38	3.8	94	29	65
MA 5,150,0 W filter 1%	14555	4631	14.22%	32578	55.32%	289.14%	1455.47	48.64	2.56	85	32	53
MA 1,200,0 EXP	14552	9771	14.91%	65534	77.79%	421.78%	1455.25	48.64	5.76	161	33	128
MA 1,200,0 TIMESERIES	14469	12828	6.27%	204684	92.93%	1382.82%	1446.89	48.36	4.41	287	70	217
MA 1,200,0 TRI	14095	7493	18.31%	40924	65.56%	258.06%	1409.48	47.11	4.24	113	29	84
MA 5,150 W filter 1DAY	13652	5882	14.28%	41185	66.85%	368.10%	1365.17	45.63	2.86	117	40	77
MA 1,14 VAR filter 1DAY	13459	13017	3.99%	325957	95.87%	2300.72%	1345.90	44.98	3.39	346	100	246

Appendix VII. Table I. Nasdaq - Low Tr.Costs MA strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,14 E filter 1%	13077	25725	11.32%	227162	94.24%	732.20%	1307.71	43.71	2.21	309	108	201
MA 5,150,0 TRI	12951	3931	12.42%	31656	59.09%	375.81%	1295.09	43.28	3.13	94	32	62
MA 2,200,0 TRI	12814	4988	16.37%	30475	57.95%	254.08%	1281.42	42.83	3.54	91	27	64
MA 1,50 TRI filter 1DAY	12621	9468	8.27%	114481	88.98%	975.79%	1262.09	42.18	3.15	237	72	165
MA 5,50,0 W filter 1%	12359	7221	12.40%	58247	78.78%	535.47%	1235.94	41.31	2.46	165	59	106
MA 1,200,0 VAR	12253	2772	9.67%	28658	57.24%	491.76%	1225.30	40.95	10.15	89	15	74
MA 1,200 VAR filter 1%	11890	1695	8.86%	19125	37.83%	326.92%	1189.03	39.74	7.02	49	12	37
MA 5,50 E filter 1DAY	11616	5660	8.27%	68439	83.03%	903.86%	1161.57	38.82	3.92	189	55	134
MA 5,150,0 VAR	11343	1137	6.46%	17589	35.51%	449.31%	1134.27	37.91	6.32	45	14	31
MA 1,150 VAR filter 1%	11145	1924	9.93%	19377	42.48%	327.95%	1114.49	37.25	6.24	57	15	42
MA 5,50,0	11012	7184	9.11%	78869	86.04%	844.55%	1101.17	36.80	3.38	210	62	148
MA 2,200,0 VAR	10739	1361	7.86%	17327	38.02%	383.93%	1073.86	35.89	6.94	49	12	37
MA 1,200,0 S	10722	5465	14.39%	37975	71.77%	398.68%	1072.16	35.83	5.4	133	29	104
MA 2,200,0 EXP	10441	5793	17.15%	33768	69.08%	302.71%	1044.11	34.90	5.38	123	26	97
MA 1,150,0 TIMESERIES	10408	11647	6.28%	185571	94.39%	1403.94%	1040.79	34.79	3.61	310	82	228
MA 1,50 W filter 1DAY	10302	10816	5.83%	185504	94.45%	1519.81%	1030.16	34.43	3.56	311	84	227
MA 5,50,0 S filter 1%	10196	4013	10.48%	38292	73.37%	600.17%	1019.57	34.08	2.69	139	51	88
MA 5,50,0 VAR	10040	3174	12.42%	25549	60.70%	388.58%	1003.96	33.55	3.49	97	30	67
MA 5,150,0 E filter 1%	9968	2453	13.31%	18423	45.89%	244.73%	996.76	33.31	2.35	63	26	37
MA 5,50,0 VAR filter 1%	9688	2487	14.41%	17257	43.86%	204.36%	968.76	32.38	2.19	59	24	35
MA 1,200 TRI filter 1%	9460	3148	17.13%	18377	48.52%	183.27%	946.03	31.62	2.42	68	26	42
MA 5,150 TRI filter 1DAY	9278	2610	11.64%	22417	58.61%	403.41%	927.75	31.01	3.52	91	30	61
MA 5,150,0 VAR filter 1%	8845	555	4.60%	12071	26.73%	481.44%	884.47	29.56	6.45	31	11	20
MA 1,14 W filter 1%	8639	30105	9.58%	314249	97.25%	915.14%	863.93	28.87	1.95	387	141	246
MA 5,50,0 TRI filter 1%	8611	4679	12.56%	37259	76.89%	512.27%	861.06	28.78	2.41	153	56	97
MA 2,200,0 VAR filter 1%	8609	905	7.26%	12467	30.94%	326.15%	860.93	28.77	6.05	37	10	27
MA 5,150,0 TIMESERIES	8533	11676	6.40%	182329	95.32%	1388.48%	853.31	28.52	3.63	328	84	244
MA 1,14 TRI filter 1%	8469	31286	9.09%	344011	97.54%	972.49%	846.94	28.31	1.91	399	147	252
MA 5,150,0 TRI filter 1%	8463	2038	12.69%	16062	47.31%	272.93%	846.27	28.28	2.34	65	27	38
MA 1,200 E filter 1%	8237	4159	21.35%	19486	57.73%	170.45%	823.74	27.53	3.4	88	25	63
MA 2,200,0 TRI filter 1%	7603	2299	16.31%	14099	46.07%	182.51%	760.33	25.41	2.15	62	25	37
MA 2,200 VAR filter 1DAY	7436	1006	8.18%	12289	39.49%	382.54%	743.56	24.85	8.17	50	11	39
MA 2,200,0 S	7307	3647	17.82%	20468	64.30%	260.84%	730.68	24.42	4.16	105	26	79
MA 1,14,0 EXP	7157	75856	0.84%	9002456	99.92%	11758.40%	715.66	23.92	2.77	778	216	562
MA 5,150 S filter 1DAY	6817	2692	15.42%	17463	60.96%	295.45%	681.69	22.78	3.54	95	28	67
MA 2,200 TRI filter 1DAY	6678	2771	19.03%	14562	54.14%	184.54%	667.80	22.32	2.72	78	26	52
MA 2,200 TIME filter 1DAY	6471	7038	10.40%	67681	90.44%	769.71%	647.05	21.63	3.77	246	63	183
MA 5,150 E filter 1DAY	6178	2097	12.65%	16575	62.73%	395.83%	617.76	20.65	4.79	99	25	74
MA 5,50,0 TRI	5970	5977	10.77%	55496	89.24%	728.59%	597.03	19.95	3.03	232	68	164
MA 5,50 S filter 1DAY	5836	3756	8.53%	44044	86.75%	917.13%	583.55	19.50	3.39	209	61	148
MA 2,200,0 S filter 1%	5744	2106	17.97%	11719	50.99%	183.75%	574.37	19.20	2.61	70	24	46
MA 1,200 S filter 1%	5443	2598	21.55%	12059	54.86%	154.62%	544.30	18.19	2.74	78	25	53
MA 5,150,0 S filter 1%	5435	1861	17.20%	10814	49.74%	189.10%	543.53	18.17	2.18	67	26	41
MA 5,150 VAR filter 1DAY	5167	710	8.48%	8372	38.28%	351.22%	516.74	17.27	5.93	46	12	34
MA 5,50 VAR filter 1DAY	5130	2058	15.12%	13609	62.31%	312.10%	512.97	17.14	3.67	96	27	69
MA 1,14 SIMPLE	4690	40861	0.87%	4708161	99.90%	11410.87%	469.01	15.68	2.48	746	225	521

Appendix VII. Table I. Nasdaq - Low Tr.Costs MA strategies
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Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 5,50 TRI filter 1DAY	4173	4396	11.89%	36976	88.71%	646.22%	417.30	13.95	3.16	221	62	159
MA 2,200 S filter 1DAY	4040	1952	17.73%	11011	63.31%	257.18%	403.96	13.50	4.31	96	23	73
MA 2,200 E filter 1DAY	4036	2883	23.31%	12372	67.38%	189.10%	403.63	13.49	4.43	108	24	84
MA 5,150 TIME filter 1DAY	4010	6516	10.68%	60986	93.43%	774.40%	400.98	13.40	3.1	279	77	202
MA 1,14 S filter 1%	3156	13608	11.66%	116703	97.30%	734.43%	315.64	10.55	2.02	371	130	241
MA 1,14 E filter 1DAY	2575	19781	5.36%	369001	99.30%	1752.38%	257.51	8.61	2.52	515	153	362
MA 5,50 W filter 1DAY	2561	5310	13.03%	40742	93.71%	619.08%	256.08	8.56	2.96	273	75	198
MA 1,14 TRIANGULAR	2172	33749	1.11%	3030763	99.93%	8873.79%	217.20	7.26	2.32	762	236	526
MA 2,200,0 TIME	2026	15711	3.64%	432028	99.53%	2636.88%	202.61	6.77	4.41	551	108	443
MA 1,14,0 W	1829	46067	0.40%	11620281	99.98%	25120.65%	182.93	6.11	2.42	924	276	648
MA 1,14 S filter 1DAY	-378	7342	7.90%	92945	100.41%	1171.12%	-37.80	-1.26	2.22	557	169	388
MA 1,14 W filter 1DAY	-383	8049	3.79%	212248	100.18%	2541.58%	-38.31	-1.28	2.19	649	199	450
MA 1,14 TRI filter 1DAY	-479	7706	8.27%	93186	100.51%	1115.46%	-47.91	-1.60	2.23	577	174	403
MA 1,50 TIME filter 1%	-535	4167	53.06%	7853	106.82%	101.31%	-53.55	-1.79	1.63	327	121	206
MA 5,50,0 TIME filter 1%	-587	4727	33.28%	14202	104.13%	212.87%	-58.65	-1.96	1.82	400	137	263
MA 1,50,0 TIME	-611	7908	6.14%	128813	100.47%	1536.54%	-61.07	-2.04	2.43	645	182	463
MA 1,50 TIME filter 1DAY	-819	3169	31.42%	10085	108.13%	244.12%	-81.95	-2.74	2.06	457	137	320
MA 5,50 TIME filter 1DAY	-933	2939	27.91%	10530	108.86%	290.06%	-93.33	-3.12	2.28	572	154	418
MA 1,14 TIME filter 1%	-988	1524	127.34%	1197	182.51%	43.32%	-98.75	-3.30	0.92	574	249	325
MA 1,14 TIME SERIES	-998	2835	1.38%	205709	100.49%	7191.15%	-99.77	-3.33	1.31	1269	454	815
MA 1,14 TIME filter 1DAY	-999	1421	61.25%	2321	143.06%	133.58%	-99.94	-3.34	0.99	954	355	599

One way transaction costs	0.45%
Buy/Hold return	2359.45%
Annual Buy/Hold return	78.86%
Observations	7557
Days in test	10921

Appendix VII. Table II. Nasdaq - Low Tr.Costs MA strategies
5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 W filter 1%	7247	2881	12.61%	22851	68.29%	441.56%	724.69	48.59	3.64	88	38	50
MA 1,50,0 EXP	6381	5384	11.81%	45568	86.00%	627.87%	638.10	42.78	5.89	153	41	112
MA 1,14 W filter 1%	5849	5281	11.77%	44884	86.97%	639.19%	584.91	39.22	2.69	158	62	96
MA 1,50 E filter 1%	5772	1943	12.82%	15165	61.94%	383.30%	577.25	38.70	4.9	72	27	45
MA 1,50,0 TRI	5368	3501	10.11%	34631	84.50%	735.94%	536.76	35.99	6.14	143	38	105
MA 1,14 VAR filter 1%	4765	2985	15.55%	19201	75.19%	383.65%	476.46	31.94	2.69	104	44	60
MA 1,14 TRI filter 1%	4740	5557	12.49%	44491	89.35%	615.32%	474.03	31.78	2.52	172	65	107
MA 1,200 W filter 1%	4733	1046	13.82%	7569	37.47%	171.13%	473.28	31.73	4.1	33	15	18
MA 1,200,0 W	4589	2059	17.13%	12024	61.83%	261.04%	458.88	30.77	8.23	70	18	52
MA 1,150,0 EXP	4515	2197	16.93%	12978	65.21%	285.11%	451.50	30.27	7.29	77	21	56
MA 2,200,0 W	4466	1814	17.61%	10297	56.63%	221.49%	446.60	29.94	7.52	60	16	44
MA 1,150 W filter 1%	4344	1192	14.30%	8337	47.89%	234.88%	434.43	29.13	4.14	46	20	26
MA 1,150,0 S	4248	1929	18.83%	10245	58.53%	210.81%	424.83	28.48	6.99	63	17	46
MA 1,14 E filter 1%	4168	3322	13.99%	23743	82.44%	489.16%	416.82	27.95	3.18	130	46	84
MA 2,200,0 W filter 1%	4092	966	14.62%	6611	38.11%	160.71%	409.18	27.43	3.59	33	15	18
MA 1,150 S filter 1%	4058	805	12.44%	6471	37.28%	199.81%	405.83	27.21	4.3	32	14	18
MA 1,14,0 EXP	4027	9994	4.21%	237137	98.30%	2232.43%	402.70	27.00	3.05	321	99	222
MA 1,50 VAR filter 1%	4017	1444	17.62%	8197	50.99%	189.36%	401.71	26.93	4.03	50	19	31
MA 1,50 S filter 1%	3929	1654	14.21%	11643	66.26%	366.27%	392.90	26.34	3.72	78	30	48
MA 2,200,0 TIMESERIES filter 1%	3859	3372	25.50%	13221	70.82%	177.65%	385.86	25.87	3.58	89	28	61
MA 1,50 TRI filter 1%	3726	1883	15.66%	12027	69.02%	340.80%	372.58	24.98	3.09	84	34	50
MA 2,200 W filter 1DAY	3621	1325	17.98%	7370	50.87%	182.92%	362.11	24.28	5.62	49	15	34
MA 1,200,0 EXP	3564	1852	20.82%	8897	59.94%	187.88%	356.40	23.90	6.29	64	18	46
MA 1,50,0 VAR	3538	2677	17.07%	15684	77.44%	353.72%	353.80	23.72	7.39	108	24	84
MA 1,150 E filter 1%	3247	924	16.10%	5741	43.44%	169.82%	324.71	21.77	4.68	38	14	24
MA 1,50,0 W	3203	4576	10.16%	45051	92.89%	814.58%	320.28	21.47	4.79	199	49	150
MA 1,150 TRI filter 1%	3185	878	16.46%	5331	40.26%	144.51%	318.49	21.35	3.55	34	14	20
MA 1,150,0 W	3183	2632	19.52%	13484	76.39%	291.44%	318.32	21.34	6.09	103	25	78
MA 1,50,0 S	3143	3370	11.26%	29924	89.50%	694.55%	314.34	21.08	5.92	167	38	129
MA 5,150,0 W	3081	1532	19.25%	7955	61.28%	218.24%	308.06	20.65	4.62	65	21	44
MA 5,50,0 W filter 1%	3053	1611	17.15%	9396	67.51%	293.70%	305.30	20.47	3.03	78	30	48
MA 1,200,0 TRI	3017	1312	20.62%	6363	52.59%	155.00%	301.67	20.23	5.96	50	14	36
MA 2,200,0 EXP	3015	1376	21.64%	6360	52.59%	143.01%	301.53	20.22	6.05	50	14	36
MA 5,150,0 S	2918	1157	20.07%	5764	49.37%	145.95%	291.82	19.57	4.35	45	15	30
MA 5,150,0 EXP	2889	1230	20.35%	6044	52.20%	156.52%	288.94	19.37	4.65	49	16	33
MA 1,150 VAR filter 1%	2868	415	10.20%	4067	29.48%	188.93%	286.85	19.23	6.84	22	8	14
MA 5,50,0 EXP	2815	1734	15.36%	11292	75.07%	388.80%	281.51	18.87	5.46	97	26	71
MA 2,200,0 TRI	2691	1033	20.07%	5146	47.71%	137.71%	269.07	18.04	4.57	42	14	28
MA 2,200,0 E filter 1%	2652	862	19.91%	4329	38.75%	94.64%	265.19	17.78	3.07	31	13	18
MA 1,200 TIME filter 1%	2632	1901	28.82%	6596	60.11%	108.54%	263.15	17.64	2.39	61	24	37
MA 1,14,0 Variable	2584	3012	14.84%	20293	87.27%	488.01%	258.36	17.32	3.88	148	42	106
MA 1,200 E filter 1%	2580	860	19.19%	4481	42.43%	121.13%	257.97	17.30	3.9	35	13	22
MA 5,150,0 W filter 1%	2573	865	17.48%	4950	48.02%	174.66%	257.31	17.25	4.12	42	15	27
MA 5,150,0 E filter 1%	2507	609	15.47%	3937	36.32%	134.85%	250.67	16.81	2.6	28	14	14
MA 1,200 TRI filter 1%	2484	580	15.07%	3847	35.41%	135.06%	248.44	16.66	2.75	27	13	14

Appendix VII. Table II. Nasdaq - Low Tr.Costs MA strategies
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Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 E filter 1DAY	2459	2010	14.69%	13686	82.03%	458.58%	245.88	16.49	5.54	120	29	91
MA 1,200,0 S	2454	1512	23.30%	6489	62.19%	166.93%	245.36	16.45	6.76	64	15	49
MA 1,50 VAR filter 1DAY	2411	1440	19.36%	7440	67.60%	249.23%	241.09	16.16	4.43	75	23	52
MA 1,150,0 TRI	2387	1715	23.24%	7380	67.66%	191.09%	238.68	16.00	6.72	75	16	59
MA 5,50,0 VAR filter 1%	2363	690	17.92%	3850	38.61%	115.45%	236.34	15.85	3.36	30	12	18
MA 5,150 W filter 1DAY	2295	1295	22.28%	5811	60.50%	171.48%	229.53	15.39	4.4	60	18	42
MA 1,50 TRI filter 1DAY	2214	2065	17.65%	11701	81.07%	359.38%	221.44	14.85	3.8	114	33	81
MA 1,200 S filter 1%	2204	682	18.01%	3789	41.84%	132.31%	220.37	14.77	3.18	33	14	19
MA 5,150,0 VAR	2197	355	11.49%	3089	28.87%	151.24%	219.75	14.73	4.45	20	8	12
MA 2,200 TRI filter 1DAY	2132	780	19.36%	4031	47.11%	143.34%	213.17	14.29	3.82	39	14	25
MA 5,150,0 TRI	2105	1078	21.99%	4900	57.04%	159.38%	210.49	14.11	4.36	53	16	37
MA 2,200,0 S	2092	1166	23.57%	4947	57.71%	144.87%	209.21	14.03	5.68	54	14	40
MA 1,150,0 VAR	2063	987	19.61%	5033	59.02%	200.93%	206.28	13.83	8.9	56	12	44
MA 2,200,0 TRI filter 1%	2061	526	16.16%	3258	36.73%	127.32%	206.10	13.82	2.47	27	13	14
MA 1,150 TIME filter 1%	2061	1872	34.66%	5402	61.85%	78.49%	206.05	13.81	1.75	61	27	34
MA 5,150,0 TIME filter 1%	2049	2349	33.52%	7010	70.78%	111.16%	204.86	13.74	1.95	80	33	47
MA 5,50,0 VAR	2036	1070	22.12%	4838	57.92%	161.83%	203.57	13.65	3.99	54	17	37
MA 1,200,0 VAR	2030	853	20.46%	4168	51.30%	150.72%	203.01	13.61	10.19	44	8	36
MA 1,14 E filter 1DAY	2018	5010	11.48%	43635	95.38%	730.61%	201.77	13.53	2.73	224	71	153
MA 1,200 VAR filter 1%	1959	492	16.57%	2970	34.05%	105.45%	195.89	13.13	7.14	24	6	18
MA 5,50,0 E filter 1%	1941	929	18.82%	4935	60.66%	222.36%	194.12	13.02	3.04	58	22	36
MA 1,50 S filter 1DAY	1884	2083	18.52%	11245	83.25%	349.42%	188.39	12.63	4.28	120	31	89
MA 1,14 S filter 1%	1875	3184	15.37%	20719	90.95%	491.84%	187.53	12.57	2.69	168	55	113
MA 2,200 E filter 1DAY	1866	1043	26.42%	3947	52.73%	99.62%	186.58	12.51	3.91	45	14	31
MA 2,200,0 VAR	1852	560	19.19%	2920	36.57%	90.56%	185.24	12.42	5.75	26	7	19
MA 5,150,0 TRI filter 1%	1843	628	19.64%	3200	42.39%	115.83%	184.34	12.36	2.5	32	14	18
MA 5,150 S filter 1DAY	1831	915	23.18%	3945	53.60%	131.24%	183.06	12.27	3.76	46	15	31
MA 2,200,0 S filter 1%	1780	618	20.23%	3057	41.77%	106.53%	178.00	11.93	2.85	31	13	18
MA 5,150,0 S filter 1%	1768	566	18.32%	3088	42.75%	133.30%	176.80	11.85	2.94	32	13	19
MA 1,14 SIMPLE	1735	7049	4.63%	152248	98.86%	2035.25%	173.47	11.63	2.71	335	105	230
MA 5,50,0 W	1608	2404	17.68%	13596	88.17%	398.60%	160.84	10.78	3.92	143	37	106
MA 1,200,0 TIMESERIES	1564	3321	23.94%	13876	88.73%	270.67%	156.44	10.49	4.01	146	36	110
MA 5,150 TRI filter 1DAY	1549	977	25.80%	3786	59.08%	129.00%	154.92	10.39	3.7	52	16	36
MA 2,200,0 VAR filter 1%	1516	343	15.48%	2218	31.64%	104.36%	151.64	10.17	5.03	20	6	14
MA 5,50,0 TRI filter 1%	1485	1147	21.97%	5224	71.57%	225.82%	148.53	9.96	2.56	76	28	48
MA 2,200 VAR filter 1DAY	1475	513	21.02%	2442	39.61%	88.44%	147.48	9.89	5.4	27	7	20
MA 5,50,0	1472	1845	21.90%	8421	82.52%	276.73%	147.18	9.87	3.72	111	30	81
MA 5,150 E filter 1DAY	1410	915	26.77%	3417	58.75%	119.46%	140.96	9.45	3.79	50	15	35
MA 5,50 VAR filter 1DAY	1406	913	25.56%	3572	60.64%	137.22%	140.63	9.43	4.03	53	15	38
MA 5,150,0 VAR filter 1%	1405	283	14.12%	2003	29.84%	111.33%	140.54	9.42	3.23	18	7	11
MA 1,14,0 W	1403	6557	2.06%	318437	99.56%	4734.82%	140.25	9.40	2.73	407	127	280
MA 5,50 E filter 1DAY	1376	1220	19.65%	6209	77.84%	296.18%	137.59	9.22	4.1	92	25	67
MA 1,14 TRIANGULAR	1327	5921	4.15%	142511	99.07%	2284.34%	132.65	8.89	2.54	343	111	232
MA 1,14 VAR filter 1DAY	1309	3037	17.78%	17083	92.34%	419.45%	130.93	8.78	3.37	171	46	125
MA 2,200 S filter 1DAY	1275	832	26.66%	3121	59.14%	121.79%	127.54	8.55	4.1	49	14	35

Appendix VII. Table II. Nasdaq - Low Tr.Costs MA strategies
5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 5,150 VAR filter 1DAY	1244	304	15.94%	1904	34.68%	117.57%	124.37	8.34	3.75	21	7	14
MA 5,50,0 TRI	1173	1696	22.06%	7688	84.75%	284.18%	117.27	7.86	3.51	115	31	84
MA 1,50 W filter 1DAY	1099	2493	19.59%	12726	91.37%	366.36%	109.87	7.37	3.69	156	39	117
MA 5,50,0 S filter 1%	925	848	24.31%	3487	73.46%	202.21%	92.55	6.21	2.47	70	25	45
MA 2,200 TIME filter 1DAY	791	2328	31.15%	7474	89.41%	187.03%	79.14	5.31	3.56	129	32	97
MA 5,50 TRI filter 1DAY	784	1430	25.01%	5717	86.29%	245.08%	78.37	5.25	3.38	110	29	81
MA 1,50 TIME filter 1%	563	1877	24.57%	7641	92.63%	277.04%	56.28	3.77	1.68	142	58	84
MA 5,50 W filter 1DAY	552	1842	24.97%	7376	92.52%	270.56%	55.17	3.70	3.35	140	35	105
MA 5,150,0 TIMESERIES	430	2950	31.33%	9417	95.44%	204.65%	42.97	2.88	3.03	165	43	122
MA 1,150,0 TIMESERIES	407	2841	36.06%	7879	94.83%	163.01%	40.73	2.73	3.01	153	40	113
MA 2,200,0 TIME	355	4745	16.28%	29138	98.78%	506.64%	35.49	2.38	4.71	258	47	211
MA 5,50 S filter 1DAY	352	1155	28.22%	4091	91.40%	223.83%	35.19	2.36	3.19	110	28	82
MA 5,50,0 TIME filter 1%	277	2087	21.42%	9743	97.16%	353.56%	27.66	1.85	2	177	62	115
MA 5,150 TIME filter 1DAY	6	2206	49.81%	4429	99.87%	100.49%	0.57	0.04	2.83	140	36	104
MA 1,14 TRI filter 1DAY	-17	3009	14.06%	21398	100.08%	611.72%	-1.69	-0.11	2.16	260	82	178
MA 1,14 S filter 1DAY	-61	3046	16.11%	18911	100.32%	522.78%	-6.08	-0.41	2.31	254	76	178
MA 1,14 W filter 1DAY	-148	3046	10.54%	28893	100.51%	853.39%	-14.82	-0.99	2.17	296	91	205
MA 1,50,0 TIME	-241	2896	11.88%	24381	100.99%	750.21%	-24.12	-1.62	2.32	292	84	208
MA 1,50 TIME filter 1DAY	-517	1883	33.34%	5648	109.15%	227.36%	-51.70	-3.47	2.21	218	60	158
MA 5,50 TIME filter 1DAY	-659	1816	24.36%	7455	108.84%	346.83%	-65.88	-4.42	2	267	74	193
MA 1,14 TIME filter 1%	-915	1354	182.04%	744	222.95%	22.48%	-91.47	-6.13	0.8	251	109	142
MA 1,14 TIME SERIES	-976	2082	8.82%	23605	104.13%	1080.67%	-97.59	-6.54	1.13	577	195	382
MA 1,14 TIME filter 1DAY	-992	1376	149.85%	918	208.11%	38.88%	-99.24	-6.65	0.97	460	154	306

One way transaction costs	0.60%
Buy/Hold return	223.28%
Annual Buy/Hold return	14.97%
Observations	3766
Days in test	5444

Appendix VII. Table III. Nasdaq - Low Tr.Costs MA strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 1,50 E filter 1%	9018	1318	8.37%	15732	42.68%	409.63%	901.77	60.11	4.18	85	33	52
MA 1,50,0 TRI	8281	2780	11.07%	25127	67.04%	505.90%	828.10	55.20	5.00	172	48	124
MA 1,150 TIME filter 1%	6834	1518	14.04%	10817	36.82%	162.28%	683.44	45.55	2.34	68	28	40
MA 1,150,0 TIMESERIES	5770	2968	18.55%	16005	63.95%	244.78%	577.00	38.46	4.64	153	36	117
MA 1,50,0 S	5763	2988	15.55%	19217	70.01%	350.19%	576.32	38.41	4.79	182	44	138
MA 5,50,0 W	5756	1759	12.12%	14510	60.33%	397.63%	575.64	38.37	3.99	138	42	96
MA 2,200,0 W filter 1%	5715	623	8.47%	7359	22.34%	163.72%	571.52	38.09	3.10	36	15	21
MA 1,50,0 VAR	5569	1788	15.62%	11445	51.34%	228.65%	556.86	37.12	5.63	106	25	81
MA 5,150,0 W	5541	1017	12.34%	8235	32.72%	165.08%	554.06	36.93	3.48	57	20	37
MA 5,150,0 TIME filter 1%	5531	1825	18.30%	9973	44.55%	143.42%	553.05	36.86	2.67	86	30	56
MA 5,50,0 E filter 1%	5106	811	10.79%	7519	32.09%	197.38%	510.59	34.03	2.45	55	24	31
MA 1,14 VAR filter 1DAY	5072	2199	13.41%	16404	69.08%	415.25%	507.20	33.81	3.20	175	57	118
MA 1,14 VAR filter 1%	4959	1835	16.16%	11354	56.32%	248.50%	495.93	33.06	2.50	121	46	75
MA 1,50 VAR filter 1DAY	4817	985	12.25%	8041	40.10%	227.31%	481.69	32.11	4.50	73	21	52
MA 1,50,0 W	4805	3756	16.75%	22423	78.57%	369.01%	480.50	32.03	4.28	232	57	175
MA 1,50 VAR filter 1%	4782	837	11.52%	7262	34.16%	196.40%	478.17	31.87	3.45	59	21	38
MA 5,150,0 TIMESERIES	4751	2894	20.98%	13796	65.56%	212.52%	475.11	31.67	3.86	157	41	116
MA 1,150 E filter 1%	4693	641	9.55%	6708	30.04%	214.46%	469.32	31.28	4.50	50	16	34
MA 1,50,0 EXP	4600	2892	14.81%	19527	76.44%	416.19%	459.97	30.66	4.36	216	55	161
MA 1,50 E filter 1DAY	4555	1421	12.82%	11082	58.90%	359.28%	455.53	30.36	3.60	129	42	87
MA 1,150,0 EXP	4522	1582	17.05%	9275	51.25%	200.53%	452.19	30.14	5.89	103	23	80
MA 5,50,0 EXP	4502	1265	13.61%	9299	51.59%	279.15%	450.17	30.01	3.64	104	33	71
MA 1,150 W filter 1%	4375	966	14.75%	6544	33.14%	124.65%	437.52	29.16	3.60	56	18	38
MA 1,50 S filter 1DAY	4356	1426	15.28%	9332	53.32%	248.88%	435.63	29.04	3.58	109	34	75
MA 1,50 TRI filter 1%	4209	1196	14.32%	8351	49.59%	246.38%	420.94	28.06	2.91	97	34	63
MA 1,14,0 Variable	4165	1573	15.88%	9902	57.94%	264.79%	416.50	27.76	2.50	124	47	77
MA 5,50,0 S filter 1%	4068	918	13.72%	6690	39.19%	185.64%	406.79	27.11	2.54	69	27	42
MA 1,150,0 VAR	4043	586	9.52%	6163	34.40%	261.58%	404.25	26.95	14.61	58	9	49
MA 1,150 S filter 1%	3952	605	11.07%	5468	27.72%	150.46%	395.24	26.34	4.05	44	14	30
MA 1,150 TRI filter 1%	3948	554	10.44%	5309	25.64%	145.48%	394.82	26.32	2.53	40	17	23
MA 1,200 W filter 1%	3929	734	13.12%	5594	29.76%	126.91%	392.91	26.19	3.16	48	17	31
MA 1,50 S filter 1%	3907	1036	14.01%	7396	47.17%	236.65%	390.74	26.04	2.98	89	31	58
MA 1,150,0 W	3695	2294	25.57%	8969	58.80%	129.94%	369.47	24.63	4.49	125	30	95
MA 5,50 E filter 1DAY	3693	1010	13.60%	7424	50.25%	269.50%	369.33	24.62	3.47	97	32	65
MA 1,50 W filter 1DAY	3675	1870	17.18%	10884	66.24%	285.56%	367.49	24.49	3.36	155	46	109
MA 1,200,0 TIMESERIES	3651	1592	16.56%	9613	62.02%	274.49%	365.09	24.33	5.28	137	31	106
MA 5,150,0 EXP	3645	520	10.05%	5176	29.59%	194.30%	364.47	24.29	5.57	47	12	35
MA 2,200,0 W	3562	1084	17.07%	6351	43.91%	157.29%	356.23	23.74	4.75	79	20	59
MA 1,150,0 S	3556	1326	19.51%	6794	47.67%	144.30%	355.56	23.70	5.71	89	19	70
MA 2,200 W filter 1DAY	3388	735	14.05%	5233	35.26%	151.00%	338.81	22.58	4.35	58	16	42
MA 1,200,0 W	3334	1377	19.49%	7065	52.81%	170.88%	333.44	22.23	5.64	103	22	81
MA 1,200 TIME filter 1%	3277	757	14.50%	5223	37.26%	156.99%	327.67	21.84	2.31	62	25	37
MA 5,50 S filter 1DAY	3260	994	14.75%	6739	51.62%	249.98%	325.98	21.73	2.96	99	34	65
MA 1,150,0 TRI	3249	1143	19.56%	5847	44.42%	127.15%	324.93	21.66	4.55	79	20	59
MA 5,150 TIME filter 1DAY	3243	2122	24.61%	8625	62.40%	153.58%	324.33	21.62	3.09	136	40	96

Appendix VII. Table III. Nasdaq - Low Tr.Costs MA strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 2,200 TRI filter 1DAY	1108	369	22.30%	1656	33.08%	48.36%	110.82	7.39	2.91	38	11	27
MA 5,150,0 S filter 1%	1095	290	18.36%	1577	30.56%	66.42%	109.49	7.30	2.23	34	12	22
MA 5,50 W filter 1DAY	957	1066	31.75%	3359	71.52%	125.26%	95.67	6.38	2.57	133	40	93
MA 2,200,0 TIME	941	2828	28.58%	9894	90.49%	216.56%	94.10	6.27	4.52	287	57	230
MA 1,200 S filter 1%	936	386	25.23%	1529	38.76%	53.61%	93.61	6.24	3.86	44	10	34
MA 1,14 TRI filter 1%	894	2393	37.31%	6415	86.07%	130.68%	89.36	5.96	1.97	227	81	146
MA 2,200 E filter 1DAY	860	447	26.71%	1674	48.63%	82.03%	85.98	5.73	5.74	60	10	50
MA 1,14 TRIANGULAR	784	4975	24.02%	20716	96.21%	300.63%	78.43	5.23	2.49	416	124	292
MA 1,14,0 W	706	6242	17.15%	36389	98.06%	471.64%	70.64	4.71	2.55	514	151	363
MA 1,14 W filter 1%	695	2028	35.47%	5717	87.84%	147.63%	69.50	4.63	1.87	229	84	145
MA 1,14 S filter 1%	563	1912	44.48%	4299	86.91%	95.37%	56.27	3.75	1.74	203	77	126
MA 1,14 E filter 1DAY	467	2386	32.75%	7285	93.58%	185.75%	46.74	3.12	2.69	288	81	207
MA 1,14 W filter 1DAY	-101	2317	36.41%	6364	101.59%	178.99%	-10.10	-0.67	2.20	350	107	243
MA 1,14 S filter 1DAY	-206	1977	51.81%	3816	105.41%	103.47%	-20.63	-1.38	2.19	300	91	209
MA 1,14 TRI filter 1DAY	-346	2063	61.79%	3340	110.37%	78.63%	-34.64	-2.31	2.16	315	95	220
MA 1,50,0 TIME	-421	2372	62.97%	3768	111.18%	76.58%	-42.14	-2.81	2.30	351	101	250
MA 1,50 TIME filter 1DAY	-631	1076	198.11%	543	216.17%	9.11%	-63.11	-4.21	1.86	238	73	165
MA 5,50,0 TIME filter 1%	-647	993	291.57%	341	290.00%	-0.54%	-64.72	-4.31	1.63	222	75	147
MA 1,50 TIME filter 1%	-671	790	-7888.30%	-10	-6596.21%	-16.38%	-67.08	-4.47	1.46	183	65	118
MA 1,14 TIME filter 1%	-782	1319	255.45%	516	251.49%	-1.55%	-78.23	-5.21	1.04	323	141	182
MA 5,50 TIME filter 1DAY	-796	1057	398.58%	265	400.32%	0.44%	-79.64	-5.31	2.22	304	77	227
MA 1,14 TIME SERIES	-862	3523	46.38%	7596	111.35%	140.09%	-86.19	-5.74	1.43	688	259	429
MA 1,14 TIME filter 1DAY	-906	1790	227.53%	787	215.20%	-5.42%	-90.64	-6.04	1.17	491	196	295

One way transaction costs	**0.30%**
Buy/Hold return	**657.91%**
Annual Buy/Hold return	**43.85%**
Observations	**3791**
Days in test	**5476**

Appendix VII. Table III. Nasdaq - Low Tr.Costs MA strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
MA 2,200,0 E filter 1%	3152	403	9.66%	4168	24.39%	152.36%	315.20	21.01	4.68	36	10	26
MA 1,50 W filter 1%	3076	1404	18.85%	7449	58.71%	211.40%	307.58	20.50	2.90	121	39	82
MA 1,200,0 EXP	2958	1203	20.56%	5853	49.47%	140.61%	295.76	19.71	7.51	91	15	76
MA 5,150,0 TRI	2900	529	13.42%	3944	26.45%	97.15%	290.04	19.33	2.50	39	15	24
MA 5,50,0	2899	1040	17.21%	6042	52.01%	202.26%	289.95	19.33	2.86	98	33	65
MA 1,200,0 VAR	2807	393	9.75%	4032	30.38%	211.69%	280.73	18.71	20.59	46	4	42
MA 1,50 TRI filter 1DAY	2791	1185	17.04%	6953	59.86%	251.28%	279.06	18.60	3.13	123	38	85
MA 5,150,0 S	2781	504	12.51%	4027	30.96%	147.53%	278.05	18.53	4.29	47	13	34
MA 5,150,0 W filter 1%	2713	590	15.56%	3791	28.45%	82.85%	271.26	18.08	2.36	42	16	26
MA 5,150 W filter 1DAY	2601	729	17.99%	4054	35.84%	99.29%	260.07	17.33	2.75	56	19	37
MA 1,200,0 TRI	2494	904	22.32%	4053	38.47%	72.39%	249.37	16.62	4.69	61	14	47
MA 2,200,0 TRI	2464	643	17.82%	3606	31.67%	77.79%	246.42	16.43	4.11	47	12	35
MA 1,200,0 S	2430	743	17.92%	4142	41.34%	130.65%	242.99	16.20	6.09	67	13	54
MA 5,50,0 TRI filter 1%	2391	786	17.88%	4398	45.64%	155.23%	239.06	15.93	2.42	77	28	49
MA 2,200,0 TIMESERIES filter 1%	2390	1575	23.87%	6597	63.78%	167.18%	238.97	15.93	3.28	134	39	95
MA 5,150 TRI filter 1DAY	2336	369	11.53%	3202	27.07%	134.75%	233.57	15.57	3.30	38	13	25
MA 1,150 VAR filter 1%	2200	271	9.17%	2960	25.67%	179.82%	220.01	14.66	8.12	35	7	28
MA 5,50,0 VAR	2183	414	13.32%	3108	29.75%	123.37%	218.35	14.55	3.71	42	12	30
MA 5,150,0 VAR	2170	150	5.51%	2717	20.11%	264.70%	217.02	14.47	10.17	26	5	21
MA 2,200 TIME filter 1DAY	2168	1169	22.06%	5298	59.07%	167.81%	216.84	14.45	3.80	114	30	84
MA 2,200,0 EXP	2082	731	20.20%	3621	42.50%	110.40%	208.23	13.88	7.01	67	11	56
MA 5,150,0 VAR filter 1%	2076	84	3.52%	2375	12.62%	258.53%	207.55	13.83	8.02	15	4	11
MA 1,14 E filter 1%	2071	2554	31.86%	8016	74.16%	132.80%	207.09	13.80	2.04	179	66	113
MA 1,200 VAR filter 1%	2010	247	9.22%	2679	25.00%	171.28%	200.95	13.39	10.53	33	5	28
MA 5,50,0 VAR filter 1%	1984	351	13.71%	2562	22.55%	64.52%	198.42	13.23	1.96	29	12	17
MA 5,50,0 W filter 1%	1960	765	19.10%	4004	51.04%	167.32%	196.04	13.07	2.48	87	30	57
MA 5,150,0 TRI filter 1%	1900	298	11.82%	2525	24.73%	109.29%	190.01	12.67	2.58	32	12	20
MA 2,200,0 VAR filter 1%	1753	153	7.07%	2170	19.21%	171.87%	175.34	11.69	6.68	23	5	18
MA 5,150 E filter 1DAY	1713	316	12.01%	2630	34.85%	190.05%	171.32	11.42	6.93	48	9	39
MA 5,50,0 TRI	1685	958	21.77%	4401	61.72%	183.57%	168.47	11.23	2.79	116	36	80
MA 1,200 E filter 1%	1678	614	23.37%	2626	36.09%	54.47%	167.83	11.19	4.46	50	11	39
MA 1,14 SIMPLE	1666	5267	17.60%	29923	94.43%	436.49%	166.58	11.10	2.64	408	122	286
MA 2,200,0 S	1651	526	20.50%	2567	35.70%	74.15%	165.05	11.00	4.41	49	11	38
MA 1,200 TRI filter 1%	1645	428	18.03%	2372	30.67%	70.11%	164.49	10.96	3.11	40	12	28
MA 5,150,0 E filter 1%	1618	309	13.68%	2259	28.38%	107.37%	161.77	10.78	3.24	36	11	25
MA 5,50 TRI filter 1DAY	1533	865	21.93%	3945	61.14%	178.76%	153.28	10.22	2.82	111	34	77
MA 5,50 VAR filter 1DAY	1488	337	15.09%	2230	33.27%	120.52%	148.83	9.92	4.02	43	11	32
MA 2,200,0 VAR	1483	175	8.66%	2018	26.50%	205.81%	148.34	9.89	12.05	32	4	28
MA 1,14,0 EXP	1480	6111	16.56%	36906	95.99%	479.67%	147.96	9.86	3.10	454	119	335
MA 2,200,0 TRI filter 1%	1470	342	16.80%	2038	27.87%	65.94%	147.00	9.80	2.70	34	11	23
MA 5,150 S filter 1DAY	1460	380	16.59%	2291	36.27%	118.60%	146.01	9.73	4.07	48	12	36
MA 5,150 VAR filter 1DAY	1361	129	7.22%	1785	23.73%	228.62%	136.11	9.07	8.15	27	5	22
MA 2,200,0 S filter 1%	1308	349	18.28%	1908	31.44%	72.01%	130.78	8.72	3.44	38	10	28
MA 2,200 VAR filter 1DAY	1219	151	8.81%	1713	28.84%	227.18%	121.94	8.13	12.18	33	4	29
MA 2,200 S filter 1DAY	1135	336	18.45%	1822	37.70%	104.32%	113.53	7.57	5.96	46	8	38

Appendix VII. Table IV. Nasdaq - Low Tr.Costs Momentum, MACD and Forecast Oscillator strategies
5/2/71 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	9802	3072	10.11%	30381	67.74%	569.91%	980.16	32.76	3.8	118	40	78
Momentum 30	5260	14191	6.31%	225054	97.66%	1448.85%	526.05	17.58	3.15	398	105	293
Momentum 50	3445	6707	12.77%	52532	93.44%	631.88%	344.50	11.51	2.92	276	79	197
Momentum 14	2577	18141	2.28%	794643	99.68%	4266.21%	257.74	8.61	2.54	600	179	421
MACD 12/26 -9	-582	6020	13.48%	44645	101.30%	651.28%	-58.22	-1.95	1.74	521	184	337
FORECAST OSCILLATOR 150	-1000	2184	0.01%	32964262	100.00%	1509180.96%	-100.00	-3.34	1.42	2261	634	1627
FORECAST OSCILLATOR 50	-1000	2297	0.02%	13864195	100.01%	603548.18%	-100.00	-3.34	1.42	2288	665	1623
FORECAST OSCILLATOR 30	-1000	2205	0.02%	13911421	100.01%	630940.38%	-100.00	-3.34	1.34	2299	683	1616
FORECAST OSCILLATOR 14	-1000	1962	0.03%	6320864	100.02%	322069.29%	-100.00	-3.34	1.15	2344	719	1625

One way transaction costs	**0.45%**
Buy/Hold return	**2359.45%**
Annual Buy/Hold return	**78.86%**
Observations	**7557**
Days in test	**10921**

Appendix VII. Table V. Nasdaq - Low Tr.Costs Momentum, MACD and Forecast Oscillator strategies
5/2/71 - 31/12/85

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	1618	1110.76	23.40%	4746	65.90%	181.60%	161.84	10.85	4.21	65	20	45
Momentum 14	1188	4044.43	8.80%	45945	97.41%	1006.63%	118.79	7.96	3.17	255	70	185
Momentum 30	1005	2602.93	13.73%	18962	94.70%	589.86%	100.53	6.74	3.84	191	47	144
Momentum 50	315	1334.63	25.57%	5220	93.97%	267.51%	31.49	2.11	3.8	129	29	100
MACD 12/26 -9	-2	2339.79	13.51%	17321	100.01%	640.36%	-0.20	-0.01	1.79	242	87	155
FORECAST OSCILLATOR 150	-999	1678.86	0.81%	207361	100.48%	12310.80%	-99.95	-6.70	1.24	1072	245	827
FORECAST OSCILLATOR 14	-1000	1560.56	1.32%	118637	100.84%	7566.24%	-99.98	-6.70	1.01	1095	269	826
FORECAST OSCILLATOR 50	-1000	1798.09	1.45%	123745	100.81%	6837.61%	-99.98	-6.70	1.35	1103	253	850
FORECAST OSCILLATOR 30	-1000	1741.03	1.81%	96437	101.04%	5496.48%	-99.98	-6.70	1.21	1094	270	824

One way transaction costs	0.60%
Buy/Hold return	223.28%
Annual Buy/Hold return	14.97%
Observations	3766
Days in test	5444

Appendix VII. Table VI. Nasdaq - Low Tr.Costs Momentum, MACD and Forecast Oscillator strategies
2/1/86 - 31/12/00

Trading Strategy	Net Profit	Trading Costs	Tr. Costs %	Total Profit	Tot. Tr. Costs	Tr. Cost Effect	Net Pct Gain	Net An. Return	Avg Win/Loss	Tot. Trades	Winning	Losing
Momentum 150	2771	464	11.14%	4168	33.50%	200.74%	277.14	18.47	3.19	52	20	32
Momentum 50	1975	1983	32.17%	6165	67.97%	111.30%	197.5	13.16	2.81	146	44	102
Momentum 30	1731	2501	29.68%	8428	79.46%	167.71%	173.09	11.54	3.13	206	55	151
Momentum 14	890	2755	19.77%	13935	93.61%	373.42%	89.02	5.93	2.26	344	114	230
MACD 12/26 -9	-522	1601	106.05%	1509	134.61%	26.93%	-52.24	-3.48	1.65	276	97	179
FORECAST OSCILLATOR 150	-865	3811	2.96%	128767	100.67%	3301.63%	-86.48	-5.76	1.56	1144	395	749
FORECAST OSCILLATOR 30	-896	4416	3.29%	134263	100.67%	2960.43%	-89.56	-5.97	1.53	1194	424	770
FORECAST OSCILLATOR 50	-906	4767	4.59%	103823	100.87%	2096.86%	-90.6	-6.04	1.56	1169	412	757
FORECAST OSCILLATOR 14	-971	2133	4.35%	48996	101.98%	2242.17%	-97.14	-6.47	1.19	1244	450	794

One way transaction costs	**0.30%**
Buy/Hold return	**657.91%**
Annual Buy/Hold return	**43.85%**
Observations	**3791**
Days in test	**5476**

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