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WEAK FORM MARKET EFFICIENCY: A COMPARISON
BETWEEN THE SPANISH AND THE U.S. STOCK MARKETS

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I. Introduction and Main Results

The purpose of this paper is to study whether capital markets are efficient in the weak form, i.e., whether prices already reflect all the information contained in past returns, or, on the contrary, whether future returns can at least partially be forecasted on the basis of past data only. Some of the main contributions to the study of the weak form efficiency of the U.S. equity markets are surveyed and some own findings, both in the U.S. market and the Spanish market, are presented for a comparison with a representation of the European economy.

Except for one clear difference, quite similar results are obtained in the studies of the week-end effect, the year-end effect, and the size effect, in that these are statistically significant, somewhat more so in Spain than in the U.S. The difference is that in the U.S. Mondays have a very strong and significant negative return and Fridays a positive one, while in Spain it is exactly the other way around: Mondays have a significant above-average return.

The auto-correlation studies, though, show some startling dissimilarities between the two markets: in the U.S. there does not seem to be any significant auto-correlation in monthly returns, whereas some has been found in both daily and weekly returns and in returns on investments with long holding periods (between 3 and 8 years). In contrast, significant positive auto-correlation in both daily and monthly returns are found in the Spanish data, but much less in weekly returns; for long holding periods, though, the evidence is very similar to the case of the U.S. markets: there are also negative auto-correlations. The strongest manifestation of market inefficiency is found to be the existence of strong lagged cross-correlation of large companies over small companies, as characterized by the value-weighted and equally-weighted index, respectively. This effect is again found to be strongest in monthly returns for the Spanish market, unlike the U.S. case, where it is strongest for weekly returns.

In trying to use these inefficiencies, several investment strategies are found that earn quite significant abnormal returns. The best strategies are the ones that take advantage of both the size effect and the lead effect that large companies have over smaller ones, which appear to clearly dominate the auto-correlation effect. For short-term returns and in the Spanish case, this applies best with monthly returns, in the U.S. with weekly returns. All strategies have been analyzed taking into account all transaction costs currently applicable.

II. Survey of Tests of Weak Form Efficiency of the U.S. Markets

The literature that deals with tests of weak form efficiency has developed several different methodologies, but one main idea is always present: to see whether it is possible to find investment strategies that yield abnormal returns and whose investment decision rules are exclusively based on past or present financial asset prices. The tricky part is that we need a market model in order to decide when a return is abnormal. Hence, every test of market efficiency is at the same time a test of the chosen market model. The main attempts found in the literature are:

1) *Filters*: The underlying model used is that in investors' minds expected returns are always positive. Thus, if markets are efficient, prices are such that returns are really positive (and the investors' assessment is correct). Therefore, the a priori best strategy should always be "buy and hold for good", i.e. any strategy involving any kind of transactions in between can, a priori, only be worse, not to mention when transaction costs are taken into account. Finding a filter strategy that yields abnormal returns thus implies a market inefficiency of the weak form. Several studies test strategies based on filter rules that are close in spirit to the ones proposed by chartists. This approach was first tested in a systematic way by Alexander (1961 and 1964). In short, the filter rule goes as follows. Whenever a security's price has moved y percent up, buy and hold that security; but hold it only until its price drops y percent, then sell the security and go short. Alexander, in testing filters from 1% through 50%, finds a few with positive results, but they are not large enough to guarantee a profitable investment rule in the context of real transaction costs. The result obtained by Fama and Blume in 1966 is similar.

2) *Straight or contrarian investment strategies*: the underlying assumption here is that expected returns are constant. The return on an asset in the market can be written as

$$R_t = E(R_t) + e_t$$

where R_t is the return, $E(R_t)$ is the expected return and is assumed to be constant, and e_t is a random disturbance term. The claim of efficiency of a market can then be characterized formally by stating that the terms e_t (the unexpected returns) are identically and independently distributed across time with mean zero. Therefore, in looking for departures from market efficiency, we have to look for situations where this is not the case.

The existence of auto-correlation in a series of returns is one such case and constitutes a clear violation of weak form market efficiency, because it implies that security prices are not random and can be foreseen: if there is positive correlation, it is more likely that next period's return will have the same sign as last period's (and vice versa under negative correlation).

Fama (1965), using the 30 industrial companies that constitute the Dow Jones Industrial Average, claims that in the U.S. market there is no significant auto-correlation in either daily or monthly returns. Only a few correlations turn out to have significant statistics, and in those cases the values of the correlations are small: in daily returns the largest significant value is only 11%; and in monthly returns only two companies have significant negative values (of around 30%, though). So far, it looks as if markets are efficient to all practical purposes.

In 1986, however, Keim and Stambaugh find evidence that returns are predictable to a certain degree. Also, in 1988 and 1990, Lo and MacKinlay report significant

auto-correlations in weekly returns, although they seem to be quite size dependent: they find 30% for the EW index, and only 8% for the VW index.

DeBondt and Thaler (87 and 88), in turn, claim that "markets overreact". Using long holding periods and using a contrarian investment rule they find significant abnormal returns with some asymmetry: 36 months after portfolio formation, losers have earned 25% more than winners and 20% more than the rest of the market; five years after portfolio formation, losers have earned 32% more than winners. This is probably the strongest evidence against the weak form efficiency of the U.S. market so far.

Ball and Kothari (1989) explain that there is actually negative serial correlation in long holding period returns (specifically, in 5-year returns), but that this is due to changes in the expected return of firms that have experienced extreme results and thus find themselves with a different capital structure, thus with a different risk, and thus with a different beta. DeBondt and Thaler's result could therefore be interpreted otherwise than as evidence of inefficiency.

Also, Keim and Stambaugh (1986) suggest an explanation based on the non-stationarity of returns: factor risk premia are mean-reverting.

Yet another reason is found, which is partially linked to auto-correlation: the existence of cross-autocorrelation, or lagged cross-correlation, or lead-lag effects. Specifically, there seems to be a lead lag of large companies over small companies. In other words, in the prices of large companies one can find information that is useful for assessing what smaller companies will do in the future. Using weekly data, Lo and MacKinlay find up to 32% in this kind of cross-correlation. This fact, linked to the finding that smaller companies have on average higher returns than large ones, raises a nice opportunity to earn abnormal returns.

3) *Seasonal inefficiencies*: Mainly two effects have been discovered: the year-end effect, and the week-end effect. Both seem to be decreasing as the years go by, but they are still significant, specially for small companies.

For the whole period 1928 to 1982 Keim and Stambaugh (1984) report an average return on Mondays of -0.186%, and of 0.064% and 0.147% on Fridays and Saturdays respectively, which contrasts strongly with the average daily return for the period of 0.021%. More relevant is, perhaps, the period 1953 to 1982 (since it is more recent and contains no Saturdays), in which they find average returns of negative 0.154% and positive 0.092% on Mondays and Fridays respectively, while the average daily return for the period was of 0.025%. All these figures are statistically significant. No clear explanation has been found for this phenomenon so far, but the figures speak for themselves.

The January effect is also significant, as reported by Stambaugh and Blume (1983), along with a strong link with firm size. For the smallest firm size decile and for the period 1963 to 1980 they find average daily returns of 0.731% in January, which contrasts strongly with the average in the other 11 months of only 0.026%. At the same time, the firms in the largest decile have average daily returns of 0.082% and 0.03% in January and the remaining 11 months respectively. Again, it is not entirely clear so far why this happens. Although Chan (1986) claims that year-end tax-selling does not explain the effect, it is still the most plausible explanation. Yet, whatever the reason, the fact that the effect exists and constitutes an inefficiency seems obvious.

III. Data

In this part we attempt to compare some of the above studies of the U.S. market with newly run calculations using more recent data and the results obtained from Spanish returns. Available Spanish data include monthly values of the Madrid Stock Exchange Index for the period 1/2/1941 through 12/31/1989, and daily values of the same index for the period 1/2/1985 through 12/31/1989. There are three more regional stock exchanges in Spain, but Madrid's accounts for more than 80% of total capitalization and trading volume. The Madrid Stock Exchange Index is the index quoted in every major financial newspaper and is value-weighted once a year. Additionally, there is an equally weighted index, courtesy of IESE in Barcelona, Spain, constructed using more than fifty percent of all quoted companies (mutual funds excluded), representing more than 90% of the capitalization of Spain's equity markets. Unfortunately, a Spanish equally weighted index is currently not available before 1985. For the purpose of this paper, continuously compounded return series have been constructed in a similar fashion as the CRSP VW index return series. Using these monthly return series, indexes of returns by quarters and over holding periods of one through eight years have been constructed, always taking non-overlapping periods. Using the daily returns for the period 1985 to 1989, a weekly return series has also been constructed, again for non-overlapping weeks. For the U.S. market we have the return series of the CRSP files. We chose the same periods so as to allow a more accurate comparison between the two markets. Table 1 shows some general statistical measures of the sample series, such as means and standard deviations. All data are continuously compounded returns.

The inefficiency issue is approached in a systematic way: all existing correlations are first computed, both contemporaneous and lagged, in order to get an overview as to where the best chances for abnormal returns lie. Tables 2 and 3 show all the correlations found in the Spanish and U.S. markets. The following overall conclusions can be drawn:

- Madrid Stock Exchange:
- * Mean returns for the EW index are significantly higher than for the VW index, confirming the size effect reported in the literature on the U.S. market.
 - * All auto-correlations over short holding periods are found to be significant, except for the VW weekly index. Over long holding periods they are significant for yearly, 5-year and 8-year returns.
 - * For 5-year and 8-year returns, R-squared values are as high as 38% and 86% respectively.
 - * Lagged cross-correlations in daily and monthly returns between VW and EW indexes are all significant; in weekly returns only the lag $VW_{t-1} - EW_t$ is significant. A value of 50.7% stands out in monthly data.
- CRSP indexes:
- * A somewhat surprising result is that the VW index has larger standard deviation than the EW index in daily and weekly returns.
 - * All standard deviations are significantly smaller than in Spain, while mean returns are slightly lower.
 - * For short holding periods auto-correlations are significant only in daily and weekly returns, and only in the EW index.
 - * The same applies to the lagged cross-correlation $VW_{t-1} - EW_t$.

IV. Testing the Practical Use of Inefficiencies for Profitable Investment

1) *Strategies based on the existence of correlations.* Using these data on all existing correlations it was inferred that for the Spanish market the chances of finding a profitable investment rule are highest in making use of the existing lag in monthly returns of large companies over small companies, as embodied in the lag of the monthly VW index over the EW index. Nevertheless, some strategies based on pure auto-correlation were also checked. Although correlations in daily returns in Spain are also large, monthly is clearly preferred when including transaction costs. The same applies when considering investment rules for the U.S market: although the auto-correlation in daily data is even slightly higher than in weekly data, the impact of transaction costs is devastating, making investment strategies with weekly rebalancing more interesting. Tables 4 through 9 present some of these strategies; Tables 4, 6, and 8 refer to the Spanish market, while Tables 5, 7, and 9 refer to the U.S. market. They use monthly returns over the 5-year period 1985/1989. In all of them, the first 7 columns are the same: the first three columns contain the VW and EW return series, and the risk-free interest rates. The following three columns contain the corresponding indexes with basis one million on 12/31/1984, i.e., the money that somebody following the buy-and-hold strategy would earn, starting out in early 1985 with one million Ptas. One first observation is that the person that invested in EW earned net 4.2 million as compared to the 2.2 million in VW, which gives a good idea of the extent of the size effect in Spain.

Another observation to be made about all the following investment strategies in which short-selling is involved: this is not always possible in reality. For some companies short-selling is not available, at least not in an institutional fashion; this applies specially to all the banks. But all the remaining companies that are included in the Madrid Stock Exchange Index can be sold short. In these cases, only 50% of the proceeds from short-selling can be used; the remaining 50% stay in an account. Therefore, in the two strategies involving an arbitrage portfolio (strategies A and B in Tables 4 and 5), where the proceeds of short-selling one portfolio are used to acquire the long position of the other, it is always assumed that this other 50% is raised in the form of debt, at a cost of the interest rates quoted. In Spain, a flat rate of 1.25% is applied to the short-selling transaction, which contrasts with 0.25% for ordinary buying or selling of stocks, and 0.1% for fixed income instruments. Remuneration on the compensating account containing the 50% of the short position has been variable over the years. In all the strategies, a sensitivity analysis was run, trying various assumptions regarding the interest paid on these accounts, and its impact on the results was found to be negligible. All costs have been taken into account in subtracting them from the money balance every month-end. A negative balance in the columns containing transaction costs implies that interest earned on the disposable portion of the proceeds from short-selling (several strategies in Tables 6 through 9) completely offset the transaction costs for the month.

In Table 6, the last four columns contain strategies that attempt to make use exclusively of the lead-lag effect of large firms over small ones, that is, of VW over EW. The investment rules of these strategies are:

- A. **EW-T (VW-T). Buy EW whenever the VW return in the previous month was higher than the yield of T-Bills; otherwise buy T-Bills.** This strategy is perhaps the most intuitive and feasible, since it doesn't make use of short-selling. Taking into account all transaction costs applicable in Madrid, this strategy earns 3 net millions more than the buy-and-hold strategy, that is, almost twice as much. Total transaction costs are 466,000 pts.

- B. EW-SS (VW-T). Buy EW whenever the VW return in the previous month was higher than the yield of T-Bills; otherwise sell short the same amount of EW and buy T-Bills with the proceeds.** This strategy yields 3.3 million more than strategy A. Here, as well as in strategies C and D, the proceeds of the T-Bills more than wash out all the transaction costs.
- C. EW-SS (VW). Buy EW if VW was positive in the previous month; sell short EW if VW was negative.** This is the most profitable strategy of all, and at the same time the one that makes strongest use of the pure lead-lag effect.
- D. VW-SS (EW). Buy VW if EW was positive in the previous month; sell short VW if EW was negative.** This is exactly the opposite strategy, which has been added to confirm that small firms do not predict large firms' behavior. In fact, this strategy is worse than the buy-and-hold strategy.

Table 8 presents four more strategies that attempt to make use of existing auto-correlations. The decision rules are as follows:

- A. VW-SS (VW). Buy VW if its return was positive in the previous month; sell short VW if not.** This strategy gives 1.4 million more than the buy-and-hold strategy; it is thus still a sign that the market is inefficient even for the bigger corporations.
- B. VW-T (VW-T). Buy VW whenever its return in the previous month was higher than the yield of T-Bills; otherwise buy T-Bills.** This strategy is a soft version of A, using T-Bills. It is more conservative and realistic. Nevertheless, it still gives one million more than the buy-and-hold strategy for VW returns, almost 50% more.
- C. EW-SS (EW). Buy EW if its return was positive in the previous month; sell short EW if not.** This is the strategy one would expect to yield the highest return. In fact, it almost does, yielding 1.13 million ptas more than the buy-and-hold strategy. It certainly beats the strategies based on auto-correlation
- D. EW-T (EW-T). Buy EW whenever its return in the previous month was higher than the yield of T-Bills; otherwise buy T-Bills.** Here we have again the soft version of the previous strategy. Surprisingly enough, it turns out better than C. The reason is that in this case the proceeds of the T-Bills do not offset all of the increased costs related to short-selling, because portfolio rebalancing was necessary in more instances.

Overall, the general conclusion from both Tables is that, at least in the Spanish market, the inefficiency embodied in the first lag lead of large corporations over small ones is substantially stronger than the inefficiency inherent in, or coming from, pure auto-correlation.

Table 4 contains two "mixed" strategies in that they involve both indexes (VW and EW), thus having a mixed effect of auto-correlation and lagged cross-correlation between the indexes. Strategy A is exactly the opposite of strategy B. Both are based on a perfect arbitrage portfolio, where every position has the same magnitude: one million Ptas. in both the long position of one and the short position of the other. As mentioned before, since 50%

of the short position is not accessible, the remaining 50% needed for the long position is raised in the form of debt. Specifically, the investment rules are:

- A. **Long EW and short VW whenever EW had a higher return than VW in the previous month, and vice versa.** This would be a “direct” investment strategy (as opposed to “contrarian”), which makes more sense in the presence of positive auto-correlation. It is very interesting to observe, though, how, in spite of the existence of positive auto-correlation in both indexes, this strategy does very poorly. It is again a sign that the presence of the strong lead lag of VW over EW does away very powerfully with all the beneficial effect one could expect from auto-correlation. Whenever VW did very well, it is then longed, and EW shorted, while the lead-lag effect indicates that EW is expected to do well this time! Therefore, very often the portfolio is formed adversely, ending up with a loss.
- B. **Long VW and short EW whenever EW had a higher return than VW in the previous month, and vice versa.** This is the “contrarian” investment strategy, i.e., buy losers and sell winners. It is included here to confirm its inappropriateness in the presence of positive auto-correlation.

Now, looking at Tables 5, 7, and 9, we see the same strategies applied to the U.S. case for the same period, and also monthly data. The investment strategies are exactly the same. It is pretty clear that the message in this case is that the U.S. market is efficient for monthly data. Neither the lagged lead of VW over EW returns nor any of the auto-correlations is large enough to offset transaction costs.

Repeating this whole exercise once again for the same period, the U.S. VW and EW indexes, and weekly returns, we see that little has been gained. Although the correlations are larger and significant, transactions are necessary more often and the increased costs do away with the higher benefits. Graphs 1 through 4 contain the plots of the major results contained in Tables 6 through 9, respectively. The following two Tables contain a summary of the results obtained from Tables 4 through 9 altogether.

2) *Test of the Seasonal Effects: Year-end and Week-end effects:* The tests of the year-end and week-end effects are presented in Tables 10 through 16. The year-end effect is tested using monthly series for two periods: 1941 through 1989 and 1981 through 1989. Roughly speaking, the result is that there is a significant January effect for both the Spanish market and the U.S. EW series, but not for the U.S. VW series. Tables 10 and 11 contain the results of the monthly analysis for the long period 1941/1989 in Spain and the U.S., respectively, using the VW series. Tables 12, 13, and 14 refer to the shorter period 1981/1989: VW MSE series, VW CRSP series, and EW CRSP series, respectively.

The Z-statistic presented in the before-last column is used to test the null hypothesis that the monthly return is significantly different from the yearly average. It is computed as

$$Z_i = (R_i - R_m) / (s_i^2 + s_m^2); s_j - SSE_j / n_j \quad j=i, m \quad i=1, 2, \dots, 12$$

where R_i and s_i^2 are the mean return and standard deviation for the month, R_m and s_m^2 are the average monthly mean and standard deviation, and n_j is the number of data (number of

years for every i , number of months for the average). Under the null hypothesis Z_i it follows a standard normal distribution. The F-statistic is used to test the null hypothesis that the standard deviation of the returns of a certain month is statistically equal to the overall standard deviation of monthly returns. This test is necessary since the use of the Z-statistic is conditional on the validity of the latter hypothesis. It is computed as

$$F = s_i^2 / s_m^2$$

Under the null hypothesis, F follows an F distribution with (n_i, n_m) degrees of freedom, where n_i is again the number of years, n_m is the size of the sample. The footnote in the Tables gives the critical values for the two-sided tests at a confidence level of 95%. Significant statistics are reported in bold letters, and whenever the F-statistic is significant, the reported Z-statistic is adjusted for the ratio of standard deviations, i.e., the square root of the F-statistic. There now follow some general comments about the results:

- In the U.S.:
- * In the period 81/89 we find a significant January effect in the EW series, which is not present in the VW series. On the other hand, there is a significant negative September effect in the VW series, which is this time not found in the EW series.
 - * For the period 41/89 no effect can be traced.
- In Spain:
- * The January return is significantly different from the average monthly return in both periods, and it accounts roughly for 30% of the yearly return.
 - * The only other significant seasonality is a negative return in May for the period 41/89.

Turning now to the week-end effect, all of which is reported in Tables 15 and 16, the most noticeable results that can be derived are the following:

- In the U.S.:
- * For both VW and EW the five individual variances are significantly different from the average daily variance.
 - * Besides this, for the VW series no daily mean is significantly different from the daily average.
 - * The EW series, in turn, displays a significant negative return on Mondays, and a significant positive return on Fridays of 53.5% of the overall return.
- In Spain:
- * Monday's return is significantly different from the average daily return for both VW and EW.
 - * Furthermore, Monday's mean return accounts for 70.8% and 85.8% of the overall return for the EW and VW series, respectively, which implies a quite remarkable inefficiency, and thus an arbitrage opportunity.

V. Conclusions

The main conclusions to be drawn from these studies are that:

- * The U.S. equity market is very close to perfectly efficient in the weak form for large companies. The little inefficiencies that have been found throughout the tests presented here are small enough to make any attempt to gain abnormal returns impractical in the context of real transaction costs and constraints.
- * The EW series show that as soon as enough weight is given to smaller companies there are several significant inefficiencies even in the U.S. market. The week-end effect and the lead effect of large companies over smaller ones are noticeable. Less so are the year-end effect and the auto-correlations.
- * The Spanish equity market appears much less efficient than the U.S. American, as might be expected. Virtually every analyzed test shows the at times enormous potential for riskless arbitrage. The first lag lead of the VW index over the EW index and the Monday effect are particularly striking. But even the auto-correlations and the January effect are clearly significant, even in the presence of real transaction costs, specially for equally weighted returns.

A possible explanation for this phenomenon is the incompleteness and lack of adequate depth of the market. It was only recently that the first option trading operation started in Madrid, and then only on fixed income treasury securities. Several financial instruments that are relevant for the satisfactory completeness of a financial market are still missing. The lack of stock index futures and options constitutes probably the most important open slot, which would presumably be of great help in ridding Spain's capital markets of their inefficiencies. □

Table 1

Some general statistical parameters of the data series
(continuously compounded returns in percent)

A. Long series of monthly returns 1941/1989. Value-weighted indexes

| Index | Mean | Std. dev. | T-Value | Sample size |
|------------|-------|-----------|---------|-------------|
| CRSP V.-W. | 0.955 | 0.171 | 5.58 | 588 |
| MSE V.-W. | 0.996 | 0.201 | 4.95 | 588 |

B. Short series of daily returns 1985/1989. V-W and E-W indexes

| Index-daily returns | Mean | Std. dev. | T-Value | Sample size |
|---------------------|-------|-----------|---------|-------------|
| CRSP V.-W. | 0.069 | 0.031 | 2.21 | 1234 |
| CRSP E.-W. | 0.071 | 0.025 | 2.80 | 1234 |
| MSE V.-W. | 0.113 | 0.033 | 3.42 | 1234 |
| MSE E.-W. | 0.146 | 0.035 | 4.22 | 1234 |

Table 2

Correlation, Autocorrelation & Cross-Correlation with One-Month-Lag *
A Comparison between the U.S. and Spanish Equity Markets

| SHORT SERIES 1985/89: Value-Weighted and Equally-Weighted Indexes | | | |
|---|------------------------|------------------------|-----------------------|
| US and Spanish Market | Daily Ret. | Weekly Ret. | Monthly Ret. |
| Contemporaneous Cross-Correlations | | | |
| USA VW vs. EW | 89.42% 31.93 | 88.70% 14.31 | 88.92% 6.79 |
| SPAIN VW vs. EW | 85.39% 30.50 | 86.74% 13.99 | 89.90% 6.86 |
| 1st Order Auto-correlation | | | |
| USA VW | 8.96% 3.20 | 8.00% 1.29 | 10.41% 0.79 |
| USA EW | 22.40% 8.00 | 26.40% 4.26 | 18.10% 1.38 |
| SPAIN VW | 36.96% 13.20 | 9.98% 1.61 | 32.24% 2.46 |
| SPAIN EW | 49.77% 17.78 | 26.38% 4.25 | 38.95% 2.97 |
| Cross-Correlation with One-Month-Lag | | | |
| USA EW _{t-1} vs. VW _t | 1.60% 0.57 | 8.90% 1.44 | 13.70% 1.05 |
| USA VW _{t-1} vs. EW _t | 31.00% 11.07 | 23.70% 3.82 | 15.80% 1.21 |
| SPAIN EW _{t-1} vs. VW _t | 27.60% 9.86 | 10.79% 1.74 | 27.07% 2.07 |
| SPAIN VW _{t-1} vs. EW _t | 48.80% 17.43 | 23.82% 3.84 | 50.67% 3.87 |
| SE for the correlation in every period | 0.028 | 0.062 | 0.131 |

* Z-statistic under every correlation coefficient. Significant correlations in bold letters.

Table 3

Correlation, Autocorrelation & Cross-Correlation with One-Month-Lag *
A Comparison between the U.S. and Spanish Equity Markets

| LONG SERIES 1941/89: Value-Weighted and Equally-Weighted Indexes | | | |
|--|------------------------|------------------------|-----------------------|
| U.S. MARKET 1941/89 | Monthly Ret. | Quarterly Ret. | Annual Ret. |
| Contemporaneous Cross-Correlations | | | |
| USA VW vs. EW | 89.70% 21.73 | 89.70% 12.53 | 89.50% 6.20 |
| 1st Order Auto-correlation | | | |
| USA VW | 8.10% 1.96 | 10.80% 1.51 | -7.40% -0.51 |
| USA EW | 16.10% 3.90 | 3.40% 0.47 | 6.40% 0.44 |
| Cross-Correlation with One-Month-Lag | | | |
| USA EWt-1 vs. VWt | 7.20% 1.74 | 5.30% 0.74 | 2.00% 0.14 |
| USA VWt-1 vs. EWt | 16.90% 4.09 | 11.90% 1.66 | -11.90% -0.82 |
| SE for the correlation in every period | 0.041 | 0.072 | 0.144 |

| LONG SERIES 1941/89: Value-Weighted and Equally-Weighted Indexes | | | |
|--|-----------------------|----------------|-----------------------|
| SPAIN 1941/89 only VW | Monthly Ret. | Quarterly Ret. | Annual Ret. |
| 1st Order Auto-correlation | | | |
| SPAIN VW | 36.96% 8.95 | 9.98% 1.39 | 32.24% 2.23 |

* Z-statistic under every correlation coefficient. Significant correlations in bold letters.

Table 4
Several Strategies Using Lagged Correlation
Spanish Market, Value and Equally Weighted Indexes 1985/89

| Period | Continuously compounded monthly returns | | | 1 | | | 2 | | | 3 | | | A | | B | |
|--------|---|-----------|--------------|---------------------|---------------------|---------------------------|---------------------|---------------------|---------------------------|--|--|--|--|--------|--------|--------|
| | VWCRSP | EWCRSP | T-Bill 1 mth | Buy and hold VWCRSP | Buy and hold EWCRSP | Buy and hold T-Bill 1 mth | Buy and hold VWCRSP | Buy and hold EWCRSP | Buy and hold T-Bill 1 mth | VW vs. EW (Arbitr. portf. dep. on lag 1) | VW vs. EW (id. but contrarian weights) | VW vs. EW (Arbitr. portf. dep. on lag 1) | VW vs. EW (id. but contrarian weights) | | | |
| | 1/85 | 7.718 % | 10.910 % | 0.624 % | 1,077,539 | 1,112,487 | 1,003,743 | | | | 32,433 | -31,414 | 1 | 13,120 | 1 | 13,120 |
| Feb. | 1.629 % | 2.889 % | 0.603 % | 1,095,234 | 1,145,096 | 1,009,812 | | | | 32,412 | -57,220 | 0 | 3,014 | 1 | 13,014 | |
| Mar. | -0.002 % | -1.229 % | 0.672 % | 1,095,208 | 1,131,112 | 1,016,617 | | | | 17,105 | -48,647 | 1 | 13,358 | 0 | 3,358 | |
| Apr. | -0.308 % | -1.406 % | 0.619 % | 1,091,842 | 1,115,320 | 1,022,929 | | | | 14,813 | -73,047 | 0 | 3,095 | 1 | 13,095 | |
| May | 5.699 % | 3.330 % | 0.525 % | 1,155,875 | 1,153,088 | 1,028,315 | | | | 35,752 | -109,534 | 0 | 2,626 | 1 | 12,626 | |
| Jun. | 1.639 % | 1.158 % | 0.551 % | 1,174,975 | 1,166,518 | 1,033,994 | | | | 38,130 | -127,761 | 0 | 2,754 | 1 | 12,754 | |
| Jul. | -0.288 % | 1.756 % | 0.578 % | 1,171,598 | 1,187,185 | 1,039,983 | | | | 15,348 | -110,755 | 1 | 12,888 | 0 | 2,888 | |
| Aug. | -0.420 % | -0.679 % | 0.587 % | 1,166,690 | 1,179,152 | 1,046,107 | | | | -113 | -111,766 | 1 | 12,935 | 0 | 2,935 | |
| Sep. | -3.821 % | -5.112 % | 0.587 % | 1,122,948 | 1,120,393 | 1,052,265 | | | | -138 | -138,255 | 0 | 2,935 | 1 | 12,935 | |
| Oct. | 4.290 % | 2.732 % | 0.594 % | 1,172,172 | 1,151,423 | 1,058,529 | | | | 12,612 | -167,584 | 0 | 2,968 | 1 | 12,968 | |
| Nov. | 6.621 % | 5.767 % | 0.555 % | 1,252,410 | 1,219,779 | 1,064,417 | | | | 18,276 | -189,865 | 0 | 2,773 | 1 | 12,773 | |
| Dec. | 4.318 % | 3.564 % | 0.491 % | 1,307,673 | 1,264,041 | 1,069,652 | | | | 23,142 | -210,820 | 0 | 2,453 | 1 | 12,453 | |
| 1/86 | 0.668 % | 2.056 % | 0.539 % | 1,316,444 | 1,290,297 | 1,075,429 | | | | 7,022 | -200,695 | 1 | 12,693 | 0 | 2,693 | |
| Feb. | 7.023 % | 7.003 % | 0.536 % | 1,412,228 | 1,383,899 | 1,081,209 | | | | -5,904 | -204,266 | 1 | 12,680 | 0 | 2,680 | |
| Mar. | 5.384 % | 5.530 % | 0.521 % | 1,490,346 | 1,462,578 | 1,086,857 | | | | -20,136 | -206,494 | 1 | 12,605 | 0 | 2,605 | |
| Apr. | -1.309 % | -0.106 % | 0.453 % | 1,470,961 | 1,461,022 | 1,091,796 | | | | -20,790 | -231,711 | 0 | 2,691 | 1 | 12,267 | |
| May | 5.019 % | 3.783 % | 0.511 % | 1,546,668 | 1,517,355 | 1,097,391 | | | | -35,454 | -223,035 | 1 | 12,555 | 0 | 2,555 | |
| Jun. | 1.450 % | 0.295 % | 0.489 % | 1,569,265 | 1,521,837 | 1,102,769 | | | | -36,623 | -248,122 | 0 | 2,445 | 1 | 12,445 | |
| Jul. | -5.737 % | -7.699 % | 0.393 % | 1,481,777 | 1,469,073 | 1,107,107 | | | | -19,407 | -280,537 | 0 | 1,963 | 1 | 11,963 | |
| Aug. | 6.968 % | 4.862 % | 0.426 % | 1,588,711 | 1,479,280 | 1,111,830 | | | | -181 | -314,752 | 0 | 2,128 | 1 | 12,128 | |
| Sep. | -8.169 % | -5.323 % | 0.425 % | 1,464,083 | 1,402,592 | 1,116,562 | | | | -30,378 | -289,355 | 1 | 12,123 | 0 | 2,123 | |
| Oct. | 5.128 % | 3.510 % | 0.426 % | 1,541,121 | 1,452,701 | 1,121,333 | | | | -58,731 | -276,422 | 1 | 12,132 | 0 | 2,132 | |
| Nov. | 1.777 % | 0.042 % | 0.412 % | 1,568,755 | 1,453,305 | 1,125,965 | | | | -53,648 | -306,882 | 0 | 2,061 | 1 | 12,061 | |
| Dec. | -2.631 % | -2.532 % | 0.389 % | 1,528,024 | 1,416,972 | 1,130,357 | | | | -56,915 | -309,043 | 1 | 11,946 | 0 | 1,946 | |
| 1/87 | 12.151 % | 10.995 % | 0.447 % | 1,725,454 | 1,581,661 | 1,135,416 | | | | -80,665 | -301,040 | 1 | 12,233 | 0 | 2,233 | |
| Feb. | 4.119 % | 6.256 % | 0.446 % | 1,798,013 | 1,683,773 | 1,140,491 | | | | -114,456 | -283,026 | 1 | 12,230 | 0 | 2,230 | |
| Mar. | 2.486 % | 3.087 % | 0.432 % | 1,843,265 | 1,736,555 | 1,145,433 | | | | -121,208 | -302,458 | 0 | 2,162 | 1 | 12,162 | |
| Apr. | -1.540 % | -2.519 % | 0.209 % | 1,815,094 | 1,693,353 | 1,147,825 | | | | -133,371 | -294,295 | 1 | 11,043 | 0 | 1,043 | |
| May | 0.630 % | 0.548 % | 0.448 % | 1,826,557 | 1,702,658 | 1,152,975 | | | | -144,246 | -308,724 | 0 | 2,238 | 1 | 12,238 | |
| Jun. | 4.648 % | 3.064 % | 0.410 % | 1,913,453 | 1,755,643 | 1,157,707 | | | | -131,128 | -337,796 | 0 | 2,048 | 1 | 12,048 | |
| Jul. | 4.604 % | 4.521 % | 0.465 % | 2,003,615 | 1,836,838 | 1,163,108 | | | | -132,963 | -352,589 | 0 | 2,327 | 1 | 12,327 | |
| Aug. | 3.515 % | 1.962 % | 0.470 % | 2,075,304 | 1,873,223 | 1,168,592 | | | | -120,267 | -382,081 | 0 | 2,352 | 1 | 12,352 | |
| Sep. | -2.090 % | -1.388 % | 0.534 % | 2,032,381 | 1,847,399 | 1,174,845 | | | | -130,269 | -379,766 | 1 | 12,668 | 0 | 2,668 | |
| Oct. | -24.653 % | -31.191 % | 0.364 % | 1,588,348 | 1,352,390 | 1,179,128 | | | | -206,740 | -315,420 | 1 | 11,820 | 0 | 1,820 | |
| Nov. | -7.803 % | -5.570 % | 0.338 % | 1,469,100 | 1,279,123 | 1,183,116 | | | | -241,378 | -295,603 | 1 | 11,688 | 0 | 1,688 | |
| Dec. | 6.635 % | 4.557 % | 0.327 % | 1,569,879 | 1,338,759 | 1,186,997 | | | | -274,462 | -277,217 | 1 | 11,637 | 0 | 1,637 | |
| 1/88 | 4.449 % | 6.937 % | 0.271 % | 1,641,293 | 1,434,923 | 1,190,218 | | | | -311,452 | -254,133 | 1 | 11,355 | 0 | 1,355 | |
| Feb. | 4.842 % | 6.570 % | 0.454 % | 1,722,713 | 1,532,363 | 1,195,635 | | | | -306,842 | -284,751 | 0 | 2,270 | 1 | 12,270 | |
| Mar. | -2.250 % | 1.721 % | 0.425 % | 1,684,379 | 1,558,968 | 1,200,733 | | | | -269,915 | -337,083 | 0 | 2,127 | 1 | 12,127 | |
| Apr. | 1.072 % | 1.372 % | 0.450 % | 1,702,536 | 1,580,508 | 1,206,148 | | | | -270,265 | -353,904 | 0 | 2,250 | 1 | 12,250 | |
| May | 0.392 % | -1.498 % | 0.487 % | 1,709,231 | 1,557,009 | 1,212,039 | | | | -292,572 | -338,996 | 1 | 12,436 | 0 | 2,436 | |
| Jun. | 4.797 % | 5.511 % | 0.506 % | 1,793,219 | 1,645,217 | 1,218,184 | | | | -313,665 | -336,095 | 1 | 12,529 | 0 | 2,529 | |
| Jul. | -0.622 % | -0.601 % | 0.530 % | 1,782,096 | 1,635,363 | 1,224,653 | | | | -327,711 | -350,810 | 0 | 2,648 | 1 | 12,648 | |
| Aug. | -2.873 % | -2.992 % | 0.610 % | 1,731,625 | 1,587,161 | 1,232,142 | | | | -333,567 | -354,833 | 1 | 13,048 | 0 | 3,048 | |
| Sep. | 3.719 % | 2.825 % | 0.587 % | 1,797,236 | 1,632,630 | 1,239,391 | | | | -339,670 | -378,835 | 0 | 2,933 | 1 | 12,933 | |
| Oct. | 2.183 % | -0.260 % | 0.602 % | 1,836,908 | 1,628,398 | 1,246,872 | | | | -319,941 | -418,342 | 0 | 3,009 | 1 | 13,009 | |
| Nov. | -1.485 % | -3.273 % | 0.536 % | 1,809,825 | 1,575,964 | 1,253,576 | | | | -306,649 | -451,057 | 0 | 2,681 | 1 | 12,681 | |
| Dec. | 1.958 % | 2.516 % | 0.556 % | 1,845,618 | 1,616,119 | 1,260,561 | | | | -316,615 | -450,772 | 1 | 12,779 | 0 | 2,779 | |
| 1/89 | 6.528 % | 6.333 % | 0.788 % | 1,970,118 | 1,721,781 | 1,270,537 | | | | -333,946 | -456,363 | 1 | 13,942 | 0 | 3,942 | |
| Feb. | -1.851 % | -0.156 % | 0.754 % | 1,933,986 | 1,719,101 | 1,280,148 | | | | -367,328 | -446,515 | 1 | 13,768 | 0 | 3,768 | |
| Mar. | 2.135 % | 1.945 % | 0.868 % | 1,975,723 | 1,752,859 | 1,291,303 | | | | -386,320 | -452,875 | 1 | 14,338 | 0 | 4,338 | |
| Apr. | 4.654 % | 3.567 % | 0.847 % | 2,069,849 | 1,816,508 | 1,302,290 | | | | -393,135 | -481,899 | 0 | 4,236 | 1 | 14,236 | |
| May | 3.799 % | 3.077 % | 0.831 % | 2,149,993 | 1,873,272 | 1,313,158 | | | | -393,443 | -507,387 | 0 | 4,156 | 1 | 14,156 | |
| Jun. | -0.243 % | -0.214 % | 0.820 % | 2,144,771 | 1,869,271 | 1,323,966 | | | | -401,164 | -515,402 | 1 | 14,099 | 0 | 4,099 | |
| Jul. | 7.880 % | 4.337 % | 0.784 % | 2,320,627 | 1,952,130 | 1,334,391 | | | | -453,344 | -487,345 | 1 | 13,922 | 0 | 3,922 | |
| Aug. | 1.988 % | 1.861 % | 0.769 % | 2,367,223 | 1,988,797 | 1,344,689 | | | | -469,600 | -506,327 | 0 | 3,844 | 1 | 13,844 | |
| Sep. | -0.295 % | -0.010 % | 0.761 % | 2,360,247 | 1,988,604 | 1,354,955 | | | | -479,908 | -511,166 | 1 | 13,803 | 0 | 3,803 | |
| Oct. | -2.900 % | -5.733 % | 0.769 % | 2,292,791 | 1,877,807 | 1,365,413 | | | | -525,456 | -490,248 | 1 | 13,845 | 0 | 3,845 | |
| Nov. | 1.941 % | 0.200 % | 0.582 % | 2,337,723 | 1,881,561 | 1,373,387 | | | | -524,887 | -523,358 | 0 | 2,912 | 1 | 12,912 | |
| Dec. | 2.054 % | -0.301 % | 0.641 % | 2,380,267 | 1,871,210 | 1,380,841 | | | | -507,362 | -558,261 | 0 | 8,207 | 1 | 8,207 | |

EXPENSES: MARGINS AND COMMISSIONS

| A | | B | |
|--|--|--|--|
| VW vs. EW (Arbitr. portf. dep. on lag 1) | VW vs. EW (id. but contrarian weights) | VW vs. EW (Arbitr. portf. dep. on lag 1) | VW vs. EW (id. but contrarian weights) |
| 1 | 13,120 | 1 | 13,120 |
| 0 | 3,014 | 1 | 13,014 |
| 1 | 13,358 | 0 | 3,358 |
| 0 | 3,095 | 1 | 13,095 |
| 0 | 2,626 | 1 | 12,626 |
| 0 | 2,754 | 1 | 12,754 |
| 1 | 12,888 | 0 | 2,888 |
| 1 | 12,935 | 0 | 2,935 |
| 0 | 2,935 | 1 | 12,935 |
| 0 | 2,968 | 1 | 12,968 |
| 0 | 2,773 | 1 | 12,773 |
| 0 | 2,453 | 1 | 12,453 |
| 1 | 12,693 | 0 | 2,693 |
| 1 | 12,680 | 0 | 2,680 |
| 1 | 12,605 | 0 | 2,605 |
| 0 | 2,691 | 1 | 12,267 |
| 1 | 12,555 | 0 | 2,555 |
| 0 | 2,445 | 1 | 12,445 |
| 0 | 1,963 | 1 | 11,963 |
| 0 | 2,128 | 1 | 12,128 |
| 1 | 12,123 | 0 | 2,123 |
| 1 | 12,132 | 0 | 2,132 |
| 0 | 2,061 | 1 | 12,061 |
| 1 | 11,946 | 0 | 1,946 |
| 1 | 12,233 | 0 | 2,233 |
| 1 | 12,230 | 0 | 2,230 |
| 0 | 2,162 | 1 | 12,162 |
| 1 | 11,043 | 0 | 1,043 |
| 0 | 2,238 | 1 | 12,238 |
| 0 | 2,048 | 1 | 12,048 |
| 0 | 2,327 | 1 | 12,327 |
| 0 | 2,352 | 1 | 12,352 |
| 1 | 12,668 | 0 | 2,668 |
| 1 | 11,820 | 0 | 1,820 |
| 1 | 11,688 | 0 | 1,688 |
| 1 | 11,637 | 0 | 1,637 |
| 1 | 11,355 | 0 | 1,355 |
| 0 | 2,270 | 1 | 12,270 |
| 0 | 2,127 | 1 | 12,127 |
| 0 | 2,250 | 1 | 12,250 |
| 1 | 12,436 | 0 | 2,436 |
| 1 | 12,529 | 0 | 2,529 |
| 0 | 2,648 | 1 | 12,648 |
| 1 | 13,048 | 0 | 3,048 |
| 0 | 2,933 | 1 | 12,933 |
| 0 | 3,009 | 1 | 13,009 |
| 0 | 2,681 | 1 | 12,681 |
| 1 | 12,779 | 0 | 2,779 |
| 1 | 13,942 | 0 | 3,942 |
| 1 | 13,768 | 0 | 3,768 |
| 1 | 14,338 | 0 | 4,338 |
| 0 | 4,236 | 1 | 14,236 |
| 0 | 4,156 | 1 | 14,156 |
| 1 | 14,099 | 0 | 4,099 |
| 1 | 13,922 | 0 | 3,922 |

Table 5
Several Strategies Taking Advantage of Lagged Cross-Correlation
US Market, Value and Equally Weighted Indexes 1985/89

| Period | Continuously compounded monthly returns | | | Buy and hold | | | VW vs. EW | | EXPENSES: MARGINS AND COMMISSIONS | | | |
|--------|---|-----------|--------------|--------------|-----------|--------------|--------------------------------|------------------------------|-----------------------------------|--------|---|--------|
| | VWCRSP | EWCRSP | T-Bill 1 mth | VWCRSP | EWCRSP | T-Bill 1 mth | (Arbitr. portf. dep. on lag 1) | (id. but contrarian weights) | A | B | | |
| | 1 | 2 | 3 | A | B | A | B | A | B | | | |
| 1/85 | 7.718 % | 10.910 % | 0.624 % | 1,077,539 | 1,112,487 | 1,003,743 | 32,433 | -31,414 | 1 | 13,120 | 1 | 13,120 |
| Feb. | 1.629 % | 2.889 % | 0.603 % | 1,095,234 | 1,145,096 | 1,009,812 | 32,112 | -57,220 | 0 | 3,014 | 1 | 13,014 |
| Mar. | -0.002 % | -1.229 % | 0.672 % | 1,095,208 | 1,131,112 | 1,016,617 | 17,105 | -48,647 | 1 | 13,358 | 0 | 3,358 |
| Apr. | -0.308 % | -1.406 % | 0.619 % | 1,091,842 | 1,115,320 | 1,022,929 | 14,813 | -73,047 | 0 | 3,095 | 1 | 13,095 |
| May | 5.699 % | 3.330 % | 0.525 % | 1,155,875 | 1,153,088 | 1,028,315 | 35,752 | -109,534 | 0 | 2,626 | 1 | 12,626 |
| Jun. | 1.639 % | 1.158 % | 0.551 % | 1,174,975 | 1,166,518 | 1,033,994 | 38,130 | -127,761 | 0 | 2,754 | 1 | 12,754 |
| Jul. | -0.288 % | 1.756 % | 0.578 % | 1,171,598 | 1,187,185 | 1,039,983 | 15,348 | -110,755 | 1 | 12,888 | 0 | 2,888 |
| Aug. | -0.420 % | -0.679 % | 0.587 % | 1,166,690 | 1,179,152 | 1,046,107 | 113 | -111,766 | 1 | 12,935 | 0 | 2,935 |
| Sep. | -3.821 % | -5.112 % | 0.587 % | 1,122,948 | 1,120,393 | 1,052,265 | -138 | -138,255 | 0 | 2,935 | 1 | 12,935 |
| Oct. | 4.290 % | 2.732 % | 0.594 % | 1,172,172 | 1,151,423 | 1,058,529 | 12,612 | -167,584 | 0 | 2,968 | 1 | 12,968 |
| Nov. | 6.621 % | 5.767 % | 0.555 % | 1,252,410 | 1,219,779 | 1,064,417 | 18,276 | -189,865 | 0 | 2,773 | 1 | 12,773 |
| Dec. | 4.318 % | 3.564 % | 0.491 % | 1,307,673 | 1,264,041 | 1,069,652 | 23,142 | -210,820 | 0 | 2,453 | 1 | 12,453 |
| 1/86 | 0.668 % | 2.056 % | 0.539 % | 1,316,444 | 1,290,297 | 1,075,429 | 7,022 | -200,695 | 1 | 12,693 | 0 | 2,693 |
| Feb. | 7.023 % | 7.003 % | 0.536 % | 1,412,228 | 1,383,899 | 1,081,209 | -5,904 | -204,266 | 1 | 12,680 | 0 | 2,680 |
| Mar. | 5.384 % | 5.530 % | 0.521 % | 1,490,346 | 1,462,578 | 1,086,857 | -20,136 | -206,494 | 1 | 12,605 | 0 | 2,605 |
| Apr. | -1.309 % | -0.106 % | 0.453 % | 1,470,961 | 1,461,022 | 1,091,796 | -20,790 | -231,711 | 0 | 2,267 | 1 | 12,267 |
| May | 5.019 % | 3.783 % | 0.511 % | 1,546,668 | 1,517,355 | 1,097,391 | -35,454 | -223,035 | 1 | 12,555 | 0 | 2,555 |
| Jun. | 1.450 % | 0.295 % | 0.489 % | 1,569,265 | 1,521,837 | 1,102,769 | -36,623 | -248,122 | 0 | 2,445 | 1 | 12,445 |
| Jul. | -5.737 % | -7.699 % | 0.393 % | 1,481,777 | 1,409,073 | 1,107,107 | -19,407 | -280,537 | 0 | 1,963 | 1 | 11,963 |
| Aug. | 6.968 % | 4.862 % | 0.426 % | 1,588,711 | 1,479,280 | 1,111,830 | -181 | -314,752 | 0 | 2,128 | 1 | 12,128 |
| Sep. | -8.169 % | -5.323 % | 0.425 % | 1,464,083 | 1,402,592 | 1,116,562 | -30,378 | -289,355 | 1 | 12,123 | 0 | 2,123 |
| Oct. | 5.128 % | 3.510 % | 0.426 % | 1,541,121 | 1,452,701 | 1,121,333 | -58,731 | -276,422 | 1 | 12,132 | 0 | 2,132 |
| Nov. | 1.777 % | 0.042 % | 0.412 % | 1,568,755 | 1,453,305 | 1,125,965 | -53,648 | -306,882 | 0 | 2,061 | 1 | 12,061 |
| Dec. | -2.631 % | -2.532 % | 0.389 % | 1,528,024 | 1,416,972 | 1,130,357 | -56,915 | -309,043 | 1 | 11,946 | 0 | 1,946 |
| 1/87 | 12.151 % | 10.995 % | 0.447 % | 1,725,454 | 1,581,661 | 1,135,416 | -80,665 | -301,040 | 1 | 12,233 | 0 | 2,233 |
| Feb. | 4.119 % | 6.256 % | 0.446 % | 1,798,013 | 1,683,773 | 1,140,491 | -114,456 | -283,026 | 1 | 12,230 | 0 | 2,230 |
| Mar. | 2.486 % | 3.087 % | 0.432 % | 1,843,265 | 1,736,555 | 1,145,433 | -121,208 | -302,458 | 0 | 2,162 | 1 | 12,162 |
| Apr. | -1.540 % | -2.519 % | 0.209 % | 1,815,094 | 1,693,353 | 1,147,825 | -133,371 | -294,295 | 1 | 11,043 | 0 | 1,043 |
| May | 0.630 % | 0.548 % | 0.448 % | 1,826,557 | 1,702,658 | 1,152,975 | -144,246 | -308,724 | 0 | 2,238 | 1 | 12,238 |
| Jun. | 4.648 % | 3.064 % | 0.410 % | 1,913,453 | 1,753,643 | 1,157,707 | -131,128 | -337,796 | 0 | 2,048 | 1 | 12,048 |
| Jul. | 4.604 % | 4.521 % | 0.465 % | 2,003,645 | 1,836,838 | 1,163,108 | -132,963 | -352,589 | 0 | 2,327 | 1 | 12,327 |
| Aug. | 3.515 % | 1.962 % | 0.470 % | 2,075,304 | 1,873,223 | 1,168,592 | -120,267 | -382,081 | 0 | 2,352 | 1 | 12,352 |
| Sep. | -2.090 % | -1.388 % | 0.534 % | 2,032,381 | 1,847,399 | 1,174,845 | -130,269 | -379,766 | 1 | 12,668 | 0 | 2,668 |
| Oct. | -24.653 % | -31.191 % | 0.364 % | 1,588,318 | 1,352,390 | 1,179,128 | -206,740 | -315,420 | 1 | 11,820 | 0 | 1,820 |
| Nov. | -7.803 % | -5.570 % | 0.338 % | 1,469,100 | 1,279,123 | 1,183,116 | -241,378 | -295,603 | 1 | 11,688 | 0 | 1,688 |
| Dec. | 6.635 % | 4.557 % | 0.327 % | 1,569,879 | 1,338,759 | 1,186,997 | -274,462 | -277,217 | 1 | 11,637 | 0 | 1,637 |
| 1/88 | 4.449 % | 6.937 % | 0.271 % | 1,641,293 | 1,434,923 | 1,190,218 | -311,452 | -254,133 | 1 | 11,355 | 0 | 1,355 |
| Feb. | 4.842 % | 6.570 % | 0.454 % | 1,722,713 | 1,532,363 | 1,195,635 | -306,842 | -284,751 | 0 | 2,270 | 1 | 12,270 |
| Mar. | -2.250 % | 1.721 % | 0.425 % | 1,684,379 | 1,558,968 | 1,200,733 | -269,915 | -337,083 | 0 | 2,127 | 1 | 12,127 |
| Apr. | 1.072 % | 1.372 % | 0.450 % | 1,702,536 | 1,580,508 | 1,206,148 | -270,265 | -353,904 | 0 | 2,250 | 1 | 12,250 |
| May | 0.392 % | -1.498 % | 0.487 % | 1,709,231 | 1,557,009 | 1,212,039 | -292,572 | -338,996 | 1 | 12,436 | 0 | 2,436 |
| Jun. | 4.797 % | 5.511 % | 0.506 % | 1,793,219 | 1,645,217 | 1,218,184 | -313,665 | -336,095 | 1 | 12,529 | 0 | 2,529 |
| Jul. | -0.622 % | -0.601 % | 0.530 % | 1,782,096 | 1,635,363 | 1,224,653 | -327,711 | -350,810 | 0 | 2,648 | 1 | 12,648 |
| Aug. | -2.873 % | -2.992 % | 0.610 % | 1,731,625 | 1,587,161 | 1,232,142 | -333,567 | -354,833 | 1 | 13,048 | 0 | 3,048 |
| Sep. | 3.719 % | 2.825 % | 0.587 % | 1,797,236 | 1,632,630 | 1,239,391 | -339,670 | -378,835 | 0 | 2,933 | 1 | 12,933 |
| Oct. | 2.183 % | -0.260 % | 0.602 % | 1,836,908 | 1,628,398 | 1,246,872 | -319,941 | -418,342 | 0 | 3,009 | 1 | 13,009 |
| Nov. | -1.485 % | -3.273 % | 0.536 % | 1,809,825 | 1,575,964 | 1,253,576 | -306,649 | -451,057 | 0 | 2,681 | 1 | 12,681 |
| Dec. | 1.958 % | 2.516 % | 0.556 % | 1,845,618 | 1,616,119 | 1,260,561 | -316,615 | -450,772 | 1 | 12,779 | 0 | 2,779 |
| 1/89 | 6.528 % | 6.333 % | 0.788 % | 1,970,118 | 1,721,781 | 1,270,537 | -333,946 | -456,363 | 1 | 13,942 | 0 | 3,942 |
| Feb. | -1.851 % | -0.156 % | 0.754 % | 1,933,986 | 1,719,101 | 1,280,148 | -367,328 | -446,515 | 1 | 13,768 | 0 | 3,768 |
| Mar. | 2.135 % | 1.945 % | 0.868 % | 1,975,723 | 1,752,859 | 1,291,303 | -386,320 | -452,875 | 1 | 14,338 | 0 | 4,338 |
| Apr. | 4.654 % | 3.567 % | 0.847 % | 2,069,849 | 1,816,508 | 1,302,290 | -393,135 | -481,899 | 0 | 4,236 | 1 | 14,236 |
| May | 3.799 % | 3.077 % | 0.831 % | 2,149,993 | 1,873,272 | 1,313,158 | -393,443 | -507,387 | 0 | 4,156 | 1 | 14,156 |
| Jun. | -0.243 % | -0.214 % | 0.820 % | 2,144,771 | 1,869,271 | 1,323,966 | -401,164 | -515,402 | 1 | 14,099 | 0 | 4,099 |
| Jul. | 7.880 % | 4.337 % | 0.784 % | 2,320,627 | 1,952,130 | 1,334,391 | -453,344 | -487,345 | 1 | 13,922 | 0 | 3,922 |
| Aug. | 1.988 % | 1.861 % | 0.769 % | 2,367,223 | 1,988,797 | 1,344,689 | -469,600 | -506,327 | 0 | 3,844 | 1 | 13,844 |
| Sep. | -0.295 % | -0.010 % | 0.761 % | 2,360,247 | 1,988,604 | 1,354,955 | -479,908 | -511,166 | 1 | 13,803 | 0 | 3,803 |
| Oct. | -2.900 % | -5.733 % | 0.769 % | 2,292,791 | 1,877,807 | 1,365,413 | -525,456 | -490,248 | 1 | 13,845 | 0 | 3,845 |
| Nov. | 1.941 % | 0.200 % | 0.582 % | 2,337,723 | 1,881,561 | 1,373,387 | -524,887 | -523,358 | 0 | 2,912 | 1 | 12,912 |
| Dec. | 2.054 % | -0.301 % | 0.641 % | 2,380,267 | 1,871,210 | 1,380,841 | -507,362 | -558,261 | 0 | 8,207 | 1 | 8,207 |

Initial Investment in alternatives A, D, and E: 1,000,000
 Long and short positions in alternatives B and C: 1,000,000
Final Value of Investments: 2,380,267 1,871,210 1,380,841 -515,569 -566,468
Final Value after returning initial investment: 999,426 490,369 0 -515,569 -566,468
 (and its costs)
 Commissions: * reg'r tr'n w/ shares: 0.25% * reg'r tr'n w/ T-Bills: 0.10% * stock short-sell'g fee: 1.25%
 * short-sell'g margin: 50% * int. paid on margin: 0%

6 6.2
 Portfolio turnover per year
Total expenses: 468,098 468,098
 Columns of 0's and 1's account for:
 0 --> portfolio remains unchanged;
 1 --> portfolio is changed

Table 6
Several Strategies Using Lagged Correlation
Spanish Market, Value and Equally Weighted Indexes 1985/89

| Period | Continuously compounded monthly returns | | | 1 | 2 | 3 | A | B | C | D |
|--------|---|-----------|----------|---------------------|---------------------|-----------------------|---|---|--|--|
| | VW MSE | EW MSE | Treasury | Buy and hold VW MSE | Buy and hold EW MSE | Buy and hold Treasury | EW-T(VW-T) | EW-SS(VW-T) | EW-SS(VW) | VW-SS(EW) |
| | | | | | | | EW vs. Treas (dep. on VW vs. Treas. in lag 1) | Buy or sell EW (dep. on VW vs. Treas. in lag 1) | Buy or sell EW (dep. on sign of VW in lag 1) | Buy or sell VW (dep. on sign of EW in lag 1) |
| 1/85 | 13.880 % | 8.140 % | 1.035 % | 1,146,028 | 1,082,088 | 1,007,875 | 1,007,875 | 1,082,088 | 1,082,088 | 1,146,028 |
| Feb. | -2.102 % | 0.643 % | 1.049 % | 1,122,188 | 1,089,063 | 1,018,507 | 1,010,821 | 1,089,063 | 1,089,063 | 1,122,188 |
| Mar. | -0.696 % | -1.883 % | 1.054 % | 1,114,407 | 1,068,744 | 1,029,297 | 1,017,955 | 1,091,457 | 1,091,457 | 1,114,407 |
| Apr. | -2.446 % | -2.069 % | 1.048 % | 1,087,475 | 1,046,857 | 1,040,140 | 1,028,678 | 1,131,890 | 1,131,890 | 1,123,163 |
| May | 0.521 % | -2.599 % | 1.060 % | 1,093,160 | 1,020,000 | 1,051,220 | 1,039,637 | 1,179,954 | 1,179,954 | 1,134,885 |
| Jun. | -3.067 % | -3.493 % | 1.077 % | 1,060,143 | 984,984 | 1,062,598 | 1,050,889 | 1,241,323 | 1,150,153 | 1,188,831 |
| Jul. | 5.224 % | 4.026 % | 1.127 % | 1,117,001 | 1,025,451 | 1,074,641 | 1,062,799 | 1,211,591 | 1,086,536 | 1,146,537 |
| Aug. | -1.285 % | 0.671 % | 1.119 % | 1,102,736 | 1,032,353 | 1,086,732 | 1,066,208 | 1,232,436 | 1,105,229 | 1,143,672 |
| Sep. | 0.901 % | -0.005 % | 1.086 % | 1,112,711 | 1,032,299 | 1,098,599 | 1,074,078 | 1,212,164 | 1,087,050 | 1,154,017 |
| Oct. | 10.798 % | 11.218 % | 0.987 % | 1,239,593 | 1,154,850 | 1,109,501 | 1,084,736 | 1,101,183 | 1,228,007 | 1,018,802 |
| Nov. | 6.661 % | 7.218 % | 0.953 % | 1,324,979 | 1,241,290 | 1,164,230 | 1,161,847 | 1,193,444 | 1,319,923 | 1,098,031 |
| Dec. | 2.197 % | 3.635 % | 0.967 % | 1,354,406 | 1,287,246 | 1,131,010 | 1,204,862 | 1,237,628 | 1,368,790 | 1,122,417 |
| 1/86 | 9.376 % | 13.314 % | 0.970 % | 1,487,542 | 1,470,563 | 1,142,038 | 1,376,447 | 1,413,879 | 1,563,720 | 1,232,749 |
| Feb. | 16.490 % | 14.529 % | 0.971 % | 1,754,225 | 1,700,530 | 1,153,183 | 1,591,695 | 1,634,981 | 1,808,254 | 1,453,753 |
| Mar. | 21.115 % | 19.892 % | 0.953 % | 2,166,641 | 2,074,784 | 1,164,230 | 1,941,997 | 1,994,809 | 2,206,216 | 1,795,529 |
| Apr. | 12.036 % | 25.239 % | 0.949 % | 2,443,752 | 2,670,457 | 1,175,329 | 2,499,547 | 2,567,522 | 2,839,624 | 2,025,175 |
| May | 1.436 % | -4.090 % | 0.903 % | 2,479,102 | 2,563,448 | 1,185,986 | 2,399,387 | 2,464,638 | 2,725,836 | 2,054,470 |
| Jun. | -6.134 % | -0.255 % | 0.868 % | 2,331,607 | 2,556,922 | 1,196,327 | 2,393,278 | 2,458,363 | 2,718,896 | 2,148,390 |
| Jul. | 1.522 % | 1.177 % | 0.909 % | 2,367,364 | 2,587,198 | 1,207,247 | 2,406,670 | 2,389,506 | 2,642,742 | 2,143,496 |
| Aug. | 11.407 % | 15.777 % | 0.908 % | 2,653,414 | 3,029,328 | 1,218,257 | 2,808,087 | 2,817,799 | 3,116,425 | 2,419,624 |
| Sep. | 1.016 % | 3.572 % | 0.877 % | 2,680,502 | 3,139,491 | 1,228,990 | 2,910,204 | 2,920,269 | 3,229,755 | 2,444,325 |
| Oct. | -7.833 % | -3.935 % | 0.806 % | 2,478,560 | 3,018,361 | 1,238,931 | 2,797,920 | 2,807,598 | 3,105,143 | 2,260,176 |
| Nov. | 4.551 % | 5.734 % | 0.816 % | 2,593,955 | 3,196,477 | 1,249,084 | 2,810,977 | 2,607,407 | 2,883,736 | 2,123,996 |
| Dec. | 8.404 % | 12.420 % | 0.821 % | 2,821,360 | 3,619,196 | 1,259,388 | 3,171,576 | 2,969,178 | 3,283,847 | 2,323,468 |
| 1/87 | 16.264 % | 27.651 % | 0.850 % | 3,319,645 | 4,771,976 | 1,270,140 | 4,181,781 | 3,914,916 | 4,329,813 | 2,733,819 |
| Feb. | 2.939 % | 8.150 % | 0.839 % | 3,418,652 | 5,177,176 | 1,280,839 | 4,536,866 | 4,247,341 | 4,697,467 | 2,815,354 |
| Mar. | -11.367 % | -14.827 % | 0.866 % | 3,051,338 | 4,463,771 | 1,291,978 | 3,911,695 | 3,662,065 | 4,050,165 | 2,512,861 |
| Apr. | -1.435 % | 2.813 % | 0.947 % | 3,007,861 | 4,591,118 | 1,304,276 | 3,935,108 | 3,501,740 | 3,872,849 | 2,507,121 |
| May | 2.859 % | 5.137 % | 1.050 % | 3,095,085 | 4,833,146 | 1,318,045 | 3,976,650 | 3,373,655 | 3,731,189 | 2,599,716 |
| Jun. | 8.011 % | 17.000 % | 1.033 % | 3,353,235 | 5,728,735 | 1,331,733 | 4,697,031 | 4,035,794 | 4,463,502 | 2,816,549 |
| Jul. | 15.091 % | 15.284 % | 1.060 % | 3,899,466 | 6,674,784 | 1,345,921 | 5,472,703 | 4,702,269 | 5,200,608 | 3,275,355 |
| Aug. | 8.343 % | 8.406 % | 1.074 % | 4,238,744 | 7,260,095 | 1,360,448 | 5,952,604 | 5,114,610 | 5,656,649 | 3,560,332 |
| Sep. | -0.551 % | 4.728 % | 1.111 % | 4,215,449 | 7,611,603 | 1,375,646 | 6,240,808 | 5,362,242 | 5,930,524 | 3,540,765 |
| Oct. | -33.483 % | -32.900 % | 1.109 % | 3,015,988 | 5,477,632 | 1,390,992 | 6,288,344 | 7,328,314 | 8,104,957 | 2,533,278 |
| Nov. | -2.912 % | -24.831 % | 1.044 % | 2,929,441 | 4,273,207 | 1,405,584 | 6,354,308 | 9,550,162 | 10,562,274 | 2,565,087 |
| Dec. | 4.912 % | 2.915 % | 1.029 % | 3,076,936 | 4,399,589 | 1,420,119 | 6,420,018 | 9,421,018 | 10,419,443 | 2,480,354 |
| 1/88 | 9.303 % | 12.147 % | 0.980 % | 3,376,937 | 4,962,805 | 1,434,105 | 7,223,805 | 10,732,779 | 11,870,223 | 2,746,502 |
| Feb. | 1.903 % | 0.668 % | 0.938 % | 3,441,813 | 5,001,106 | 1,447,616 | 7,272,229 | 10,804,725 | 11,949,793 | 2,799,267 |
| Mar. | 6.398 % | 10.559 % | 0.931 % | 3,669,217 | 5,558,033 | 1,461,156 | 8,082,070 | 12,007,947 | 13,280,531 | 2,984,217 |
| Apr. | -0.118 % | -0.198 % | 0.896 % | 3,664,883 | 5,547,066 | 1,474,306 | 8,066,122 | 11,984,253 | 13,254,326 | 2,980,692 |
| May | 3.946 % | 0.968 % | 0.917 % | 3,812,378 | 5,601,014 | 1,487,885 | 8,111,924 | 11,672,986 | 12,910,071 | 2,818,096 |
| Jun. | 5.579 % | 6.861 % | 0.890 % | 4,031,114 | 5,998,799 | 1,501,185 | 8,657,626 | 12,592,673 | 13,927,226 | 3,001,395 |
| Jul. | -1.616 % | -1.899 % | 0.880 % | 3,966,509 | 5,885,934 | 1,514,456 | 8,494,735 | 12,355,745 | 13,665,189 | 2,953,293 |
| Aug. | -3.513 % | -7.532 % | 0.864 % | 3,829,579 | 5,458,877 | 1,527,592 | 8,538,428 | 13,102,537 | 14,491,124 | 3,008,419 |
| Sep. | -0.525 % | -0.512 % | 0.877 % | 3,809,534 | 5,431,008 | 1,541,051 | 8,613,654 | 13,340,384 | 14,754,178 | 3,063,428 |
| Oct. | 3.163 % | 3.899 % | 0.962 % | 3,931,972 | 5,646,956 | 1,555,940 | 8,696,874 | 12,999,402 | 14,376,661 | 3,007,088 |
| Nov. | -3.057 % | -3.651 % | 0.975 % | 3,813,597 | 5,444,511 | 1,571,182 | 8,355,741 | 12,632,315 | 13,971,069 | 2,939,664 |
| Dec. | -2.568 % | -3.157 % | 0.994 % | 3,716,892 | 5,275,290 | 1,586,879 | 8,409,683 | 12,822,417 | 14,181,317 | 2,966,380 |
| 1/89 | 3.110 % | 4.959 % | 1.030 % | 3,834,319 | 5,543,513 | 1,603,301 | 8,496,711 | 12,383,954 | 13,696,387 | 2,918,413 |
| Feb. | -4.938 % | -3.695 % | 1.050 % | 3,649,578 | 5,342,407 | 1,620,226 | 8,159,809 | 12,041,424 | 13,317,556 | 2,802,643 |
| Mar. | 4.814 % | 6.479 % | 1.064 % | 3,829,579 | 5,700,004 | 1,637,559 | 8,218,235 | 11,099,771 | 12,276,108 | 2,626,841 |
| Apr. | 4.988 % | 7.480 % | 1.076 % | 4,025,426 | 6,142,713 | 1,655,271 | 8,825,533 | 12,075,045 | 13,354,740 | 2,787,304 |
| May | 5.243 % | 7.988 % | 1.077 % | 4,242,130 | 6,653,493 | 1,673,199 | 9,559,394 | 13,079,110 | 14,465,214 | 2,937,355 |
| Jun. | -1.172 % | -1.837 % | 1.058 % | 4,192,695 | 6,532,376 | 1,690,999 | 9,385,380 | 12,841,024 | 14,201,896 | 2,903,125 |
| Jul. | -1.799 % | -3.806 % | 1.063 % | 4,117,931 | 6,288,417 | 1,709,064 | 9,452,442 | 13,119,094 | 14,509,436 | 2,907,061 |
| Aug. | 5.179 % | 5.042 % | 1.107 % | 4,336,803 | 6,613,640 | 1,728,079 | 9,557,615 | 12,672,793 | 14,015,837 | 2,804,344 |
| Sep. | 1.574 % | 0.252 % | 1.090 % | 4,405,607 | 6,630,348 | 1,747,026 | 9,548,225 | 12,833,098 | 14,193,130 | 2,877,602 |
| Oct. | -5.478 % | -6.674 % | 1.083 % | 4,170,753 | 6,202,300 | 1,766,052 | 8,931,802 | 12,004,607 | 13,276,838 | 2,724,203 |
| Nov. | -1.347 % | -0.771 % | 1.102 % | 4,114,952 | 6,154,672 | 1,785,623 | 8,999,179 | 11,897,896 | 13,158,818 | 2,715,586 |
| Dec. | -2.405 % | -1.889 % | 1.125 % | 4,007,121 | 6,024,429 | 1,804,028 | 9,101,033 | 12,325,176 | 13,631,380 | 2,729,586 |

Initial investment in all alternatives:

1,000,000

Final value of investments:

| | | | | | | |
|-----------|-----------|-----------|-----------|------------|------------|-----------|
| 4,007,121 | 6,024,429 | 1,804,028 | 9,091,932 | 12,453,135 | 13,772,900 | 2,757,924 |
|-----------|-----------|-----------|-----------|------------|------------|-----------|

Final value net of costs

and risk free yield:

| | | | | | | |
|-----------|-----------|---|-----------|------------|------------|---------|
| 2,203,093 | 4,220,401 | 0 | 7,287,904 | 10,649,108 | 11,968,872 | 953,896 |
|-----------|-----------|---|-----------|------------|------------|---------|

Table 6 (continued)

EXPENSES: MARGINS AND COMMISSIONS

| | | A | B | C | D |
|---|--------|---|----------|---|----------|
| 1 | 3,528 | 0 | 0 | 0 | 0 |
| 1 | 3,538 | 1 | 17,970 | 1 | 17,970 |
| 0 | 0 | 0 | -17,253 | 0 | -17,253 |
| 0 | 0 | 0 | -17,792 | 0 | -17,792 |
| 0 | 0 | 0 | -18,756 | 1 | -11,086 |
| 0 | 0 | 0 | -20,045 | 1 | 18,978 |
| 1 | 3,720 | 1 | -12,605 | 1 | -11,304 |
| 1 | 3,732 | 1 | 20,335 | 1 | 18,236 |
| 0 | 0 | 0 | -19,747 | 1 | -40,643 |
| 1 | 3,797 | 1 | -9,153 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 33,899 |
| 1 | 8,376 | 1 | 40,563 | 1 | 44,862 |
| 1 | 8,423 | 1 | -17,035 | 1 | -18,841 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 9,793 | 1 | 46,325 | 1 | 51,235 |
| 1 | 9,838 | 1 | -14,974 | 1 | -16,561 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 13,691 | 1 | 60,424 | 1 | 66,828 |
| 0 | 0 | 0 | -49,762 | 0 | -55,036 |
| 1 | 13,918 | 1 | -31,213 | 1 | -34,521 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 21,843 | 1 | 88,477 | 1 | 97,854 |
| 0 | 0 | 0 | -121,954 | 0 | -134,878 |
| 0 | 0 | 0 | -149,486 | 0 | -165,329 |
| 1 | 22,470 | 1 | -84,148 | 1 | -93,066 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 28,231 | 1 | 197,740 | 1 | 218,696 |
| 1 | 28,392 | 1 | -84,658 | 1 | -93,630 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 29,732 | 1 | 203,870 | 1 | 225,476 |
| 0 | 0 | 0 | -169,742 | 0 | -187,731 |
| 0 | 0 | 0 | -175,527 | 0 | -194,129 |
| 1 | 30,439 | 1 | -102,985 | 1 | -113,899 |
| 1 | 29,245 | 1 | 208,433 | 1 | 230,523 |
| 0 | 0 | 0 | -191,203 | 0 | -211,466 |
| 1 | 29,738 | 1 | -110,750 | 1 | -122,487 |
| 1 | 28,559 | 1 | 198,683 | 1 | 219,740 |
| 1 | 28,764 | 1 | -105,017 | 1 | -116,146 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 32,849 | 1 | 211,877 | 1 | 234,331 |
| 0 | 0 | 0 | -209,107 | 0 | -231,268 |
| 1 | 33,452 | 1 | -127,965 | 1 | -141,527 |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 31,261 | 1 | 198,076 | 1 | 219,068 |
| 0 | 0 | 0 | -196,695 | 0 | -217,541 |
| 0 | 9,101 | 0 | -127,959 | 0 | -141,520 |

Commissions:
 * regular transaction with shares: **0.25%**
 * regular transaction with bonds: **0.10%**
 * stock short selling fee: **1.25%**
 * stock short selling margin: **50%**
 * interest paid on margin account: **0%**

Columns of 0's and 1's account for:

- * 0 --> portfolio remains unchanged;
- * 1--> portfolio is changed

<--- Turnover in average number of times per year

| | | | |
|---------|----------|----------|----------|
| 466,430 | -692,758 | -693,859 | -101,604 |
|---------|----------|----------|----------|

*Graph 1 - Madrid Stock Exchange, 1985/89
Several Investment Strategies Using Lagged Cross-correlation*

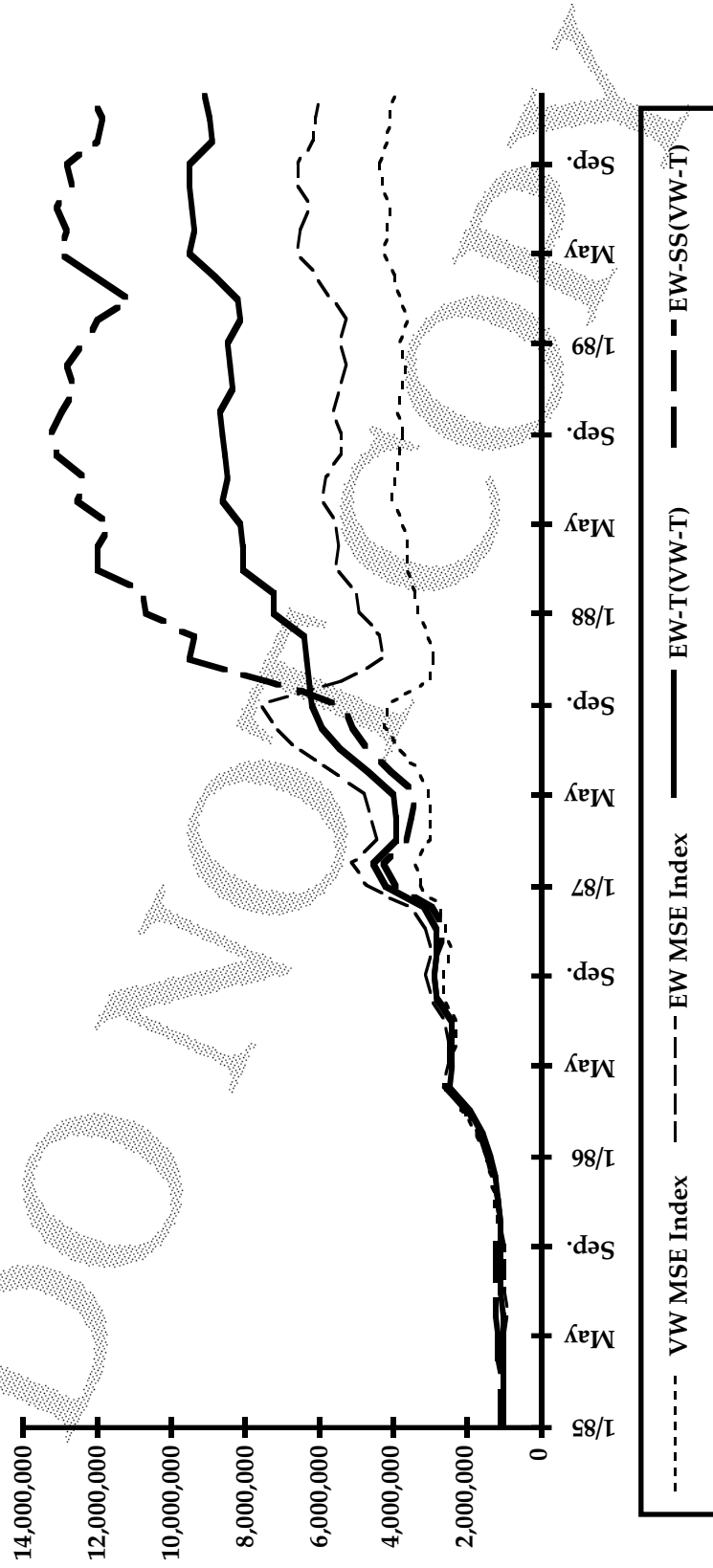


Table 7
Several Strategies Using Lagged Correlation
US Market, Value and Equally Weighted Indexes 1985/89

| Period | Continuously compounded monthly returns | | | 1 | 2 | 3 | A | B | C | D |
|--------|---|-----------|-------------|---------------------------|---------------------------|-----------------------|--|---|--|--|
| | VW CRSP | EW CRSP | T-B. 1 mth. | Buy and hold VW MSE Index | Buy and hold EW MSE Index | Buy and hold Treasury | EW-T(VW-T) | EW-SS(VW-T) | EW-SS(VW) | VW-SS(EW) |
| | | | | | | | EW vs. Treas. (dep. on VW vs. Treas. in lag 1) | Buy or sell EW (dep. on VW vs. Treas. in lag 1) | Buy or sell EW (dep. on sign of VW in lag 1) | Buy or sell VW (dep. on sign of EW in lag 1) |
| 1/85 | 7.718 % | 10.910 % | 0.624 % | 1,077,539 | 1,112,487 | 1,003,743 | 1,003,743 | 1,112,487 | 1,112,487 | 1,077,539 |
| Feb. | 1.629 % | 2.889 % | 0.603 % | 1,095,234 | 1,145,096 | 1,009,812 | 1,029,549 | 1,145,096 | 1,145,096 | 1,095,234 |
| Mar. | -0.002 % | -1.229 % | 0.672 % | 1,095,208 | 1,131,112 | 1,016,617 | 1,016,976 | 1,131,112 | 1,131,112 | 1,095,208 |
| Apr. | -0.308 % | -1.406 % | 0.619 % | 1,091,842 | 1,115,320 | 1,022,929 | 1,019,709 | 1,139,672 | 1,139,672 | 1,091,445 |
| May | 5.699 % | 3.330 % | 0.525 % | 1,155,875 | 1,153,088 | 1,028,315 | 1,025,078 | 1,112,919 | 1,112,919 | 1,040,872 |
| Jun. | 1.639 % | 1.158 % | 0.551 % | 1,174,975 | 1,166,518 | 1,033,994 | 1,033,387 | 1,127,727 | 1,127,727 | 1,059,806 |
| Jul. | -0.288 % | 1.756 % | 0.578 % | 1,171,598 | 1,187,185 | 1,039,983 | 1,051,696 | 1,147,707 | 1,147,707 | 1,056,760 |
| Aug. | -0.420 % | -0.679 % | 0.587 % | 1,166,690 | 1,179,152 | 1,046,107 | 1,054,186 | 1,148,015 | 1,148,015 | 1,052,333 |
| Sep. | -3.821 % | -5.112 % | 0.587 % | 1,122,948 | 1,120,393 | 1,052,265 | 1,060,392 | 1,219,217 | 1,219,217 | 1,062,218 |
| Oct. | 4.290 % | 2.732 % | 0.594 % | 1,172,172 | 1,151,423 | 1,058,529 | 1,066,704 | 1,197,153 | 1,197,153 | 1,050,071 |
| Nov. | 6.621 % | 5.767 % | 0.555 % | 1,252,410 | 1,219,779 | 1,064,417 | 1,126,075 | 1,271,648 | 1,271,648 | 1,124,981 |
| Dec. | 4.318 % | 3.564 % | 0.491 % | 1,307,673 | 1,264,041 | 1,069,652 | 1,166,937 | 1,317,792 | 1,317,792 | 1,174,621 |
| 1/86 | 0.668 % | 2.056 % | 0.539 % | 1,316,444 | 1,290,297 | 1,075,429 | 1,191,176 | 1,345,165 | 1,345,165 | 1,182,499 |
| Feb. | 7.023 % | 7.003 % | 0.536 % | 1,412,228 | 1,383,899 | 1,081,209 | 1,277,588 | 1,442,747 | 1,442,747 | 1,268,538 |
| Mar. | 5.384 % | 5.530 % | 0.521 % | 1,490,346 | 1,462,578 | 1,086,857 | 1,350,223 | 1,524,772 | 1,524,772 | 1,338,707 |
| Apr. | -1.309 % | -0.106 % | 0.453 % | 1,470,961 | 1,461,022 | 1,091,796 | 1,348,786 | 1,523,149 | 1,523,149 | 1,321,294 |
| May | 5.019 % | 3.783 % | 0.511 % | 1,546,668 | 1,517,355 | 1,097,391 | 1,350,952 | 1,457,069 | 1,457,069 | 1,248,451 |
| Jun. | 1.450 % | 0.295 % | 0.489 % | 1,569,265 | 1,521,837 | 1,102,769 | 1,350,201 | 1,463,451 | 1,463,451 | 1,268,492 |
| Jul. | -5.737 % | -7.699 % | 0.393 % | 1,481,777 | 1,409,073 | 1,107,107 | 1,250,155 | 1,355,014 | 1,355,014 | 1,197,772 |
| Aug. | 6.968 % | 4.862 % | 0.426 % | 1,588,711 | 1,479,280 | 1,111,830 | 1,251,094 | 1,282,315 | 1,282,315 | 1,109,890 |
| Sep. | -8.169 % | -5.323 % | 0.425 % | 1,464,083 | 1,402,592 | 1,116,562 | 1,182,083 | 1,215,956 | 1,215,956 | 1,022,924 |
| Oct. | 5.128 % | 3.510 % | 0.426 % | 1,541,121 | 1,452,701 | 1,121,333 | 1,182,979 | 1,166,382 | 1,166,382 | 965,473 |
| Nov. | 1.777 % | 0.042 % | 0.412 % | 1,568,755 | 1,453,305 | 1,125,965 | 1,179,329 | 1,166,995 | 1,166,995 | 982,892 |
| Dec. | -2.631 % | -2.532 % | 0.389 % | 1,528,024 | 1,416,922 | 1,130,357 | 1,149,846 | 1,137,820 | 1,137,820 | 957,372 |
| 1/87 | 12.151 % | 10.995 % | 0.447 % | 1,725,454 | 1,581,661 | 1,135,416 | 1,150,950 | 1,012,720 | 1,012,720 | 842,317 |
| Feb. | 4.119 % | 6.256 % | 0.446 % | 1,798,013 | 1,683,773 | 1,140,491 | 1,220,967 | 1,078,556 | 1,078,556 | 878,109 |
| Mar. | 2.486 % | 3.087 % | 0.432 % | 1,843,265 | 1,736,555 | 1,145,433 | 1,259,240 | 1,112,366 | 1,112,366 | 900,209 |
| Apr. | -1.540 % | -2.519 % | 0.209 % | 1,815,094 | 1,693,353 | 1,147,825 | 1,227,913 | 1,084,692 | 1,084,692 | 886,451 |
| May | 0.630 % | 0.548 % | 0.448 % | 1,826,557 | 1,702,658 | 1,152,975 | 1,229,106 | 1,071,753 | 1,071,753 | 875,162 |
| Jun. | 4.648 % | 3.064 % | 0.410 % | 1,913,453 | 1,755,643 | 1,157,707 | 1,262,919 | 1,105,590 | 1,105,590 | 917,200 |
| Jul. | 4.604 % | 4.521 % | 0.465 % | 2,003,615 | 1,836,838 | 1,163,108 | 1,321,326 | 1,156,721 | 1,156,721 | 960,419 |
| Aug. | 3.515 % | 1.962 % | 0.470 % | 2,075,304 | 1,873,223 | 1,168,592 | 1,347,500 | 1,179,635 | 1,179,635 | 994,782 |
| Sep. | -2.090 % | -1.388 % | 0.534 % | 2,032,381 | 1,847,399 | 1,174,845 | 1,328,923 | 1,163,372 | 1,163,372 | 974,207 |
| Oct. | -24.653 % | -31.191 % | 0.364 % | 1,588,318 | 1,352,390 | 1,179,128 | 1,329,101 | 1,578,866 | 1,578,866 | 1,238,474 |
| Nov. | -7.803 % | -5.570 % | 0.338 % | 1,469,100 | 1,279,123 | 1,183,116 | 1,333,596 | 1,678,719 | 1,678,719 | 1,346,530 |
| Dec. | 6.635 % | 4.557 % | 0.327 % | 1,569,879 | 1,338,759 | 1,186,997 | 1,337,970 | 1,612,334 | 1,612,334 | 1,266,683 |
| 1/88 | 4.449 % | 6.937 % | 0.271 % | 1,641,293 | 1,434,923 | 1,190,218 | 1,429,058 | 1,725,688 | 1,725,688 | 1,322,418 |
| Feb. | 4.842 % | 6.570 % | 0.454 % | 1,722,713 | 1,532,363 | 1,195,635 | 1,526,100 | 1,842,872 | 1,842,872 | 1,388,019 |
| Mar. | -2.250 % | 1.721 % | 0.425 % | 1,684,379 | 1,558,968 | 1,200,733 | 1,552,596 | 1,874,868 | 1,874,868 | 1,357,133 |
| Apr. | 1.072 % | 1.372 % | 0.450 % | 1,702,536 | 1,580,508 | 1,206,148 | 1,554,140 | 1,837,296 | 1,837,296 | 1,371,763 |
| May | 0.392 % | -1.498 % | 0.487 % | 1,709,231 | 1,557,009 | 1,212,039 | 1,525,674 | 1,810,838 | 1,810,838 | 1,377,157 |
| Jun. | 4.797 % | 5.511 % | 0.506 % | 1,793,219 | 1,645,217 | 1,218,184 | 1,528,042 | 1,702,611 | 1,702,611 | 1,304,123 |
| Jul. | -0.622 % | -0.601 % | 0.530 % | 1,782,096 | 1,635,363 | 1,224,653 | 1,513,575 | 1,694,680 | 1,694,680 | 1,297,769 |
| Aug. | -2.873 % | -2.992 % | 0.610 % | 1,731,625 | 1,587,161 | 1,232,142 | 1,517,500 | 1,734,798 | 1,734,798 | 1,326,913 |
| Sep. | 3.719 % | 2.825 % | 0.587 % | 1,797,236 | 1,632,630 | 1,239,391 | 1,526,429 | 1,702,419 | 1,702,419 | 1,290,552 |
| Oct. | 2.183 % | -0.260 % | 0.602 % | 1,836,908 | 1,628,398 | 1,246,872 | 1,517,144 | 1,702,410 | 1,702,410 | 1,322,461 |
| Nov. | -1.485 % | -3.273 % | 0.536 % | 1,809,825 | 1,575,964 | 1,253,576 | 1,468,292 | 1,647,593 | 1,647,593 | 1,333,526 |
| Dec. | 1.958 % | 2.516 % | 0.556 % | 1,845,618 | 1,616,119 | 1,260,561 | 1,471,306 | 1,596,212 | 1,596,212 | 1,318,532 |
| 1/89 | 6.528 % | 6.333 % | 0.788 % | 1,970,118 | 1,721,781 | 1,270,537 | 1,562,014 | 1,704,166 | 1,704,166 | 1,410,451 |
| Feb. | -1.851 % | -0.156 % | 0.754 % | 1,933,986 | 1,719,101 | 1,280,148 | 1,559,582 | 1,701,513 | 1,701,513 | 1,384,583 |
| Mar. | 2.135 % | 1.945 % | 0.868 % | 1,975,723 | 1,752,859 | 1,291,303 | 1,567,666 | 1,657,897 | 1,657,897 | 1,346,524 |
| Apr. | 4.654 % | 3.567 % | 0.847 % | 2,069,849 | 1,816,508 | 1,302,290 | 1,618,905 | 1,730,036 | 1,730,036 | 1,420,475 |
| May | 3.799 % | 3.077 % | 0.831 % | 2,149,993 | 1,873,272 | 1,313,158 | 1,669,494 | 1,784,097 | 1,784,097 | 1,475,476 |
| Jun. | -0.243 % | -0.214 % | 0.820 % | 2,144,771 | 1,869,271 | 1,323,966 | 1,665,928 | 1,780,287 | 1,780,287 | 1,471,892 |
| Jul. | 7.880 % | 4.337 % | 0.784 % | 2,320,627 | 1,952,130 | 1,334,391 | 1,673,169 | 1,693,641 | 1,693,641 | 1,351,510 |
| Aug. | 1.988 % | 1.861 % | 0.769 % | 2,367,223 | 1,988,797 | 1,344,689 | 1,698,630 | 1,735,213 | 1,735,213 | 1,386,445 |
| Sep. | -0.295 % | -0.010 % | 0.761 % | 2,360,247 | 1,988,604 | 1,354,955 | 1,698,465 | 1,735,044 | 1,735,044 | 1,382,360 |
| Oct. | -2.900 % | -5.733 % | 0.769 % | 2,292,791 | 1,877,807 | 1,365,413 | 1,705,584 | 1,825,475 | 1,825,475 | 1,413,780 |
| Nov. | 1.941 % | 0.200 % | 0.582 % | 2,337,723 | 1,881,561 | 1,373,387 | 1,715,545 | 1,843,545 | 1,843,545 | 1,403,132 |
| Dec. | 2.054 % | -0.301 % | 0.641 % | 2,380,267 | 1,871,210 | 1,380,841 | 1,704,396 | 1,842,640 | 1,842,640 | 1,415,726 |

Initial investment in all alternatives: **1,000,000**

| | | | | | | | |
|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Final value of investments: | 2,380,267 | 1,871,210 | 1,380,841 | 1,702,692 | 1,830,663 | 2,054,582 | 1,406,524 |
| Final value net of costs and risk free yield: | 999,426 | 490,369 | 0 | 321,851 | 449,822 | 673,742 | 25,683 |

Table 7 (continued)

EXPENSES: MARGINS AND COMMISSIONS

| | A | B | C | D |
|---|-------|---------|---------|---------|
| 1 | 3,513 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 3,559 | 7,352 | 7,352 | 7,119 |
| 0 | 0 | -10,934 | -10,934 | -10,472 |
| 1 | 3,588 | -1,824 | -1,824 | -1,706 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 3,681 | 7,460 | 7,460 | 0 |
| 0 | 0 | -10,447 | -10,447 | 6,840 |
| 0 | 0 | -11,093 | -11,093 | -9,883 |
| 1 | 3,733 | -3,232 | -3,232 | -2,835 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 4,721 | 9,900 | 9,900 | 8,588 |
| 1 | 4,728 | -2,072 | -2,072 | -1,775 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 4,376 | 8,808 | 8,808 | 7,786 |
| 1 | 4,379 | -126 | -126 | -109 |
| 1 | 4,137 | -7,904 | -7,904 | 6,649 |
| 1 | 4,140 | -127 | -127 | -105 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 4,024 | 7,396 | 7,396 | 6,223 |
| 1 | 4,028 | -428 | -428 | -356 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 4,298 | 7,051 | 7,051 | 5,762 |
| 1 | 4,302 | -471 | -471 | -384 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 4,651 | 7,562 | 7,562 | 6,332 |
| 0 | 0 | -8,906 | -8,906 | -6,986 |
| 0 | 0 | -8,785 | -8,785 | -7,047 |
| 1 | 4,683 | 2,296 | 2,296 | 1,804 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 5,434 | 12,187 | 12,187 | 0 |
| 1 | 5,439 | -872 | -872 | 0 |
| 1 | 5,340 | 11,770 | 0 | 8,952 |
| 1 | 5,348 | -2,279 | 0 | -1,746 |
| 1 | 5,298 | 11,015 | 12,363 | 8,435 |
| 0 | 0 | -16,393 | -18,398 | -12,539 |
| 1 | 5,343 | -4,415 | -4,955 | -3,347 |
| 0 | 0 | 0 | 0 | 8,596 |
| 1 | 5,139 | 10,709 | 12,019 | -11,082 |
| 1 | 5,150 | -3,373 | -3,786 | -2,787 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 5,459 | 11,060 | 12,413 | 9,000 |
| 1 | 5,487 | -11,519 | -12,928 | -9,355 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 5,831 | 11,572 | 12,987 | 9,567 |
| 1 | 5,856 | -9,580 | -10,752 | -7,645 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 5,945 | 11,278 | 12,657 | 8,985 |
| 0 | 0 | -21,756 | -24,417 | -16,849 |
| 1 | 6,004 | -4,656 | -5,226 | -3,544 |
| 0 | 1,704 | 11,977 | 13,442 | 9,202 |

Commissions:
 * regular transaction with shares: 0.25%
 * regular transaction with bonds: 0.10%
 * stock short selling fee: 0.25%
 * stock short selling margin: 50%
 * interest paid on margin account: 5%

Columns of 0's and 1's account for: <--- Turnover in average number of times per year

* 0 --> portfolio remains unchanged;
 * 1--> portfolio is changed

| | | | |
|---------|--------|--------|-------|
| 149,318 | 24,008 | 14,018 | 9,289 |
|---------|--------|--------|-------|

*Graph 2 - CRSP, 1985/89
Several Investment Strategies Using Lagged Cross-correlation*



Table 8

Several Strategies Using Only Autocorrelation
Spanish Market, Value and Equally Weighted Indexes 1985/89

| Period | Continuously compounded monthly returns | | | 1 | 2 | 3 | A | B | C | D |
|--------|---|-----------|----------|---------------------|---------------------|-----------------------|--|---|--|--|
| | VW MSE | EW MSE | Treasury | Buy and hold VW MSE | Buy and hold EW MSE | Buy and hold Treasury | VW-SS(VW) | VW-T(VW-T) | EW-SS(EW) | EW-T(EW-T) |
| | | | | | | | Buy or sell VW (dep. on sign of VW in lag 1) | VW vs. Treas. (dep. on VW vs Treas. in lag 1) | Buy or sell EW (dep. on sign of EW in lag 1) | EW vs. Treas. (dep. on EW vs. Treas. in lag 1) |
| 1/85 | 13.880 % | 8.140 % | 1.035 % | 1,146,028 | 1,082,088 | 1,007,875 | 1,146,028 | 1,146,028 | 1,082,088 | 1,082,088 |
| Feb. | -2.102 % | 0.643 % | 1.049 % | 1,122,188 | 1,089,063 | 1,018,507 | 1,122,188 | 1,122,188 | 1,089,063 | 1,089,063 |
| Mar. | -0.696 % | -1.883 % | 1.054 % | 1,114,407 | 1,068,744 | 1,029,297 | 1,111,377 | 1,130,106 | 1,068,744 | 1,096,748 |
| Apr. | -2.446 % | -2.069 % | 1.048 % | 1,087,475 | 1,046,857 | 1,040,140 | 1,156,904 | 1,142,011 | 1,072,614 | 1,108,302 |
| May | 0.521 % | -2.599 % | 1.060 % | 1,093,160 | 1,020,000 | 1,051,220 | 1,168,977 | 1,154,177 | 1,118,736 | 1,120,109 |
| Jun. | -3.067 % | -3.493 % | 1.077 % | 1,060,143 | 984,984 | 1,062,598 | 1,144,321 | 1,166,670 | 1,176,944 | 1,132,232 |
| Jul. | 5.224 % | 4.026 % | 1.127 % | 1,117,001 | 1,025,451 | 1,074,641 | 1,068,153 | 1,179,891 | 1,148,060 | 1,145,064 |
| Aug. | -1.285 % | 0.671 % | 1.119 % | 1,102,736 | 1,032,353 | 1,086,732 | 1,065,483 | 1,160,747 | 1,167,781 | 1,148,736 |
| Sep. | 0.901 % | -0.005 % | 1.086 % | 1,112,711 | 1,032,299 | 1,098,599 | 1,038,509 | 1,169,315 | 1,167,720 | 1,157,216 |
| Oct. | 10.798 % | 11.218 % | 0.987 % | 1,239,593 | 1,154,850 | 1,109,501 | 1,168,257 | 1,180,919 | 1,026,735 | 1,168,699 |
| Nov. | 6.661 % | 7.218 % | 0.953 % | 1,324,979 | 1,241,290 | 1,120,129 | 1,248,729 | 1,257,845 | 1,114,027 | 1,251,779 |
| Dec. | 2.197 % | 3.635 % | 0.967 % | 1,354,406 | 1,287,246 | 1,131,010 | 1,276,462 | 1,285,780 | 1,155,271 | 1,298,123 |
| 1/86 | 9.376 % | 13.314 % | 0.970 % | 1,487,542 | 1,470,563 | 1,142,038 | 1,401,937 | 1,412,172 | 1,319,793 | 1,482,989 |
| Feb. | 16.490 % | 14.529 % | 0.971 % | 1,754,225 | 1,700,530 | 1,153,183 | 1,653,272 | 1,665,342 | 1,526,183 | 1,714,899 |
| Mar. | 21.115 % | 19.892 % | 0.953 % | 2,166,641 | 2,074,784 | 1,164,230 | 2,041,954 | 2,056,861 | 1,862,066 | 2,092,315 |
| Apr. | 12.036 % | 25.239 % | 0.949 % | 2,443,752 | 2,670,457 | 1,175,329 | 2,303,118 | 2,319,932 | 2,396,668 | 2,693,022 |
| May | 1.436 % | -4.090 % | 0.903 % | 2,479,102 | 2,563,448 | 1,185,986 | 2,336,434 | 2,353,491 | 2,300,630 | 2,585,109 |
| Jun. | -6.134 % | -0.255 % | 0.868 % | 2,331,607 | 2,556,922 | 1,196,327 | 2,197,427 | 2,213,469 | 2,263,739 | 2,598,523 |
| Jul. | 1.522 % | 1.177 % | 0.909 % | 2,367,364 | 2,587,198 | 1,207,247 | 2,128,528 | 2,225,855 | 2,270,692 | 2,622,241 |
| Aug. | 11.407 % | 15.777 % | 0.908 % | 2,653,414 | 3,029,328 | 1,218,257 | 2,402,728 | 2,486,075 | 2,680,623 | 3,059,614 |
| Sep. | 1.016 % | 3.572 % | 0.877 % | 2,680,502 | 3,139,491 | 1,228,990 | 2,427,257 | 2,511,455 | 2,778,105 | 3,170,878 |
| Oct. | -7.833 % | -3.935 % | 0.806 % | 2,478,560 | 3,018,361 | 1,238,931 | 2,244,394 | 2,322,249 | 2,670,918 | 3,048,537 |
| Nov. | 4.551 % | 5.734 % | 0.816 % | 2,593,955 | 3,196,477 | 1,249,084 | 2,109,164 | 2,333,086 | 2,474,590 | 3,062,763 |
| Dec. | 8.404 % | 12.420 % | 0.821 % | 2,821,360 | 3,619,196 | 1,259,388 | 2,307,243 | 2,528,739 | 2,821,757 | 3,455,662 |
| 1/87 | 16.264 % | 27.651 % | 0.850 % | 3,319,645 | 4,771,976 | 1,270,140 | 2,714,729 | 2,975,344 | 3,720,539 | 4,556,353 |
| Feb. | 2.939 % | 8.150 % | 0.839 % | 3,418,652 | 5,177,176 | 1,280,839 | 2,795,695 | 3,064,082 | 4,036,459 | 4,943,244 |
| Mar. | -11.367 % | -14.827 % | 0.866 % | 3,051,338 | 4,463,771 | 1,291,978 | 2,495,313 | 2,734,864 | 3,480,242 | 4,262,074 |
| Apr. | -1.435 % | 2.813 % | 0.947 % | 3,007,861 | 4,591,118 | 1,304,276 | 2,489,614 | 2,751,234 | 3,315,335 | 4,287,585 |
| May | 2.859 % | 5.137 % | 1.050 % | 3,095,085 | 4,833,146 | 1,318,045 | 2,453,835 | 2,780,278 | 3,524,911 | 4,497,814 |
| Jun. | 8.011 % | 17.000 % | 1.033 % | 3,353,235 | 5,728,735 | 1,331,733 | 2,683,097 | 3,001,628 | 4,178,082 | 5,331,266 |
| Jul. | 15.091 % | 15.284 % | 1.060 % | 3,899,466 | 6,674,784 | 1,345,921 | 3,120,165 | 3,490,583 | 4,868,054 | 6,211,676 |
| Aug. | 8.343 % | 8.406 % | 1.074 % | 4,238,744 | 7,260,095 | 1,360,448 | 3,391,639 | 3,794,286 | 5,294,933 | 6,756,377 |
| Sep. | -0.551 % | 4.728 % | 1.111 % | 4,215,449 | 7,611,603 | 1,375,646 | 3,372,999 | 3,773,433 | 5,551,295 | 7,083,497 |
| Oct. | -33.483 % | -32.900 % | 1.109 % | 3,015,988 | 5,477,632 | 1,390,992 | 4,636,654 | 3,802,175 | 3,994,947 | 5,097,584 |
| Nov. | -2.912 % | -24.831 % | 1.044 % | 2,929,441 | 4,273,207 | 1,405,584 | 4,853,078 | 3,842,059 | 5,013,126 | 5,133,028 |
| Dec. | 4.912 % | 2.915 % | 1.029 % | 3,076,936 | 4,399,589 | 1,420,119 | 4,692,766 | 3,881,790 | 4,947,158 | 5,186,109 |
| 1/88 | 9.303 % | 12.147 % | 0.980 % | 3,376,937 | 4,967,805 | 1,434,105 | 5,196,312 | 4,245,353 | 5,638,399 | 5,835,411 |
| Feb. | 1.903 % | 0.668 % | 0.938 % | 3,441,813 | 5,001,106 | 1,447,616 | 5,296,141 | 4,326,913 | 5,676,195 | 5,874,528 |
| Mar. | 6.398 % | 10.559 % | 0.931 % | 3,669,217 | 5,558,033 | 1,461,156 | 5,646,063 | 4,612,797 | 6,308,301 | 5,908,722 |
| Apr. | -0.118 % | -0.198 % | 0.896 % | 3,664,883 | 5,547,066 | 1,474,306 | 5,639,394 | 4,607,348 | 6,295,853 | 5,876,423 |
| May | 3.946 % | 0.968 % | 0.917 % | 3,812,378 | 5,601,014 | 1,487,885 | 5,331,765 | 4,633,510 | 6,139,185 | 5,909,791 |
| Jun. | 5.579 % | 6.861 % | 0.890 % | 4,031,114 | 5,998,799 | 1,501,185 | 5,678,563 | 4,882,211 | 6,621,095 | 6,307,351 |
| Jul. | -1.616 % | -1.899 % | 0.880 % | 3,966,509 | 5,885,934 | 1,514,456 | 5,587,555 | 4,803,966 | 6,496,521 | 6,188,680 |
| Aug. | -3.513 % | -7.532 % | 0.864 % | 3,829,579 | 5,458,877 | 1,527,592 | 5,691,853 | 4,828,676 | 6,894,653 | 6,220,513 |
| Sep. | -0.525 % | -0.512 % | 0.877 % | 3,809,534 | 5,431,008 | 1,541,051 | 5,795,927 | 4,871,218 | 7,011,032 | 6,275,317 |
| Oct. | 3.163 % | 3.899 % | 0.962 % | 3,931,972 | 5,646,956 | 1,555,940 | 5,689,333 | 4,918,280 | 6,822,329 | 6,335,945 |
| Nov. | -3.057 % | -3.651 % | 0.975 % | 3,813,597 | 5,444,511 | 1,571,182 | 5,561,768 | 4,753,516 | 6,626,143 | 6,087,419 |
| Dec. | -2.568 % | -3.157 % | 0.994 % | 3,716,892 | 5,275,290 | 1,586,879 | 5,612,315 | 4,784,203 | 6,735,033 | 6,126,717 |
| 1/89 | 3.110 % | 4.959 % | 1.030 % | 3,834,319 | 5,543,513 | 1,603,301 | 5,521,562 | 4,833,713 | 6,496,077 | 6,190,120 |
| Feb. | -4.938 % | -3.695 % | 1.050 % | 3,649,578 | 5,342,407 | 1,620,226 | 5,302,529 | 4,584,717 | 6,313,783 | 5,944,677 |
| Mar. | 4.814 % | 6.479 % | 1.064 % | 3,829,579 | 5,700,004 | 1,637,559 | 4,969,917 | 4,617,545 | 5,825,746 | 5,987,241 |
| Apr. | 4.988 % | 7.480 % | 1.076 % | 4,025,426 | 6,142,713 | 1,655,271 | 5,273,507 | 4,836,701 | 6,339,268 | 6,429,677 |
| May | 5.243 % | 7.988 % | 1.077 % | 4,242,130 | 6,653,493 | 1,673,199 | 5,557,401 | 5,097,080 | 6,866,391 | 6,964,318 |
| Jun. | -1.172 % | -1.837 % | 1.058 % | 4,192,695 | 6,532,376 | 1,690,999 | 5,492,638 | 5,037,681 | 6,741,399 | 6,837,543 |
| Jul. | -1.799 % | -3.806 % | 1.063 % | 4,117,931 | 6,288,417 | 1,709,064 | 5,500,086 | 5,073,677 | 6,885,735 | 6,886,400 |
| Aug. | 5.179 % | 5.042 % | 1.107 % | 4,336,803 | 6,613,640 | 1,728,079 | 5,305,747 | 5,130,129 | 6,651,498 | 6,963,022 |
| Sep. | 1.574 % | 0.252 % | 1.090 % | 4,405,607 | 6,630,348 | 1,747,026 | 5,444,349 | 5,193,279 | 6,738,789 | 6,956,181 |
| Oct. | -5.478 % | -6.674 % | 1.083 % | 4,170,753 | 6,202,300 | 1,766,052 | 5,154,122 | 4,916,436 | 6,303,741 | 7,007,323 |
| Nov. | -1.347 % | -0.771 % | 1.102 % | 4,114,952 | 6,154,672 | 1,785,623 | 5,137,819 | 4,953,523 | 6,236,007 | 7,084,980 |
| Dec. | -2.405 % | -1.889 % | 1.125 % | 4,007,121 | 6,024,429 | 1,804,028 | 5,349,892 | 5,009,588 | 6,474,258 | 7,165,169 |

Initial investment in all alternatives: 1,000,000

| | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Final Value of Investments: | 4,007,121 | 6,024,429 | 1,804,028 | 5,418,809 | 5,004,578 | 6,557,659 | 7,158,004 |
| Final value net of costs and risk free yield: | 2,203,093 | 4,220,401 | 0 | 3,614,781 | 3,200,551 | 4,753,632 | 5,353,976 |

Table 8 (continued)

EXPENSES: MARGINS AND COMMISSIONS

| | A | B | C | D |
|---|---------|--------|----------|--------|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 18,516 | 3,928 | 0 | -3,812 |
| 0 | -17,568 | 0 | 18,096 | 0 |
| 0 | -18,185 | 0 | -17,421 | 0 |
| 1 | -10,983 | 0 | -17,804 | 0 |
| 1 | 18,881 | 0 | -18,283 | 0 |
| 1 | -11,113 | 4,130 | -11,913 | 4,008 |
| 1 | 17,580 | 4,063 | 0 | 4,021 |
| 1 | -10,168 | 0 | 19,094 | 0 |
| 0 | 0 | 4,133 | -9,714 | 4,090 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 42,654 | 9,048 |
| 1 | 36,258 | 7,747 | -33,839 | 0 |
| 1 | -15,175 | 7,790 | -18,695 | 9,178 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 37,032 | 8,128 | 50,301 | 10,670 |
| 1 | -12,113 | 8,166 | -17,589 | 10,720 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 41,173 | 9,572 | 70,324 | 14,917 |
| 0 | -35,379 | 0 | -33,060 | 15,007 |
| 1 | -22,703 | 9,731 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 55,654 | 13,207 | 0 | 0 |
| 0 | -77,160 | 0 | 84,110 | 17,842 |
| 0 | -75,964 | 0 | -80,346 | 0 |
| 1 | -41,916 | 13,586 | -46,322 | 18,151 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 20,561 |
| 0 | 0 | 0 | 0 | 20,681 |
| 1 | 93,050 | 16,126 | 96,961 | 20,567 |
| 1 | -38,668 | 16,217 | -42,860 | 20,684 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 92,195 | 16,814 | 102,113 | 21,660 |
| 0 | -73,737 | 0 | -80,586 | 0 |
| 0 | -76,260 | 0 | -82,568 | 0 |
| 1 | -45,074 | 17,214 | -50,197 | 22,176 |
| 1 | 91,769 | 16,637 | 100,442 | 21,306 |
| 0 | -83,689 | 0 | -91,359 | 0 |
| 1 | -49,379 | 16,918 | -55,358 | 21,665 |
| 1 | 87,492 | 16,047 | 98,087 | 20,806 |
| 1 | -47,021 | 16,161 | -56,646 | 20,955 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 90,629 | 17,632 | 112,819 | 23,931 |
| 0 | -87,667 | 0 | -109,763 | 0 |
| 1 | -53,576 | 17,955 | -70,310 | 24,371 |
| 0 | 0 | 0 | 0 | 24,347 |
| 1 | 85,043 | 17,208 | 115,621 | 0 |
| 0 | -84,938 | 0 | -117,129 | 0 |
| 0 | -68,917 | 5,010 | -83,401 | 7,165 |

5 4.6 4.6 5.2

<--- Turnover in average number of times per year

Columns of 0's and 1's account for:
 * 0 --> portfolio remains unchanged;
 * 1 --> portfolio is changed

| | | | |
|----------|---------|----------|---------|
| -292,080 | 284,119 | -234,541 | 412,339 |
|----------|---------|----------|---------|

Commissions:
 * regular transaction with shares:
 * regular transaction with bonds:
 * stock short selling fee:
 * stock short selling margin:
 * interest paid on margin account:

0.25%
 0.10%
 1.25%
 50%
 0%

*Graph 3 - Madrid Stock Exchange, 1985/89
Several Investment Strategies Using Auto-correlation*

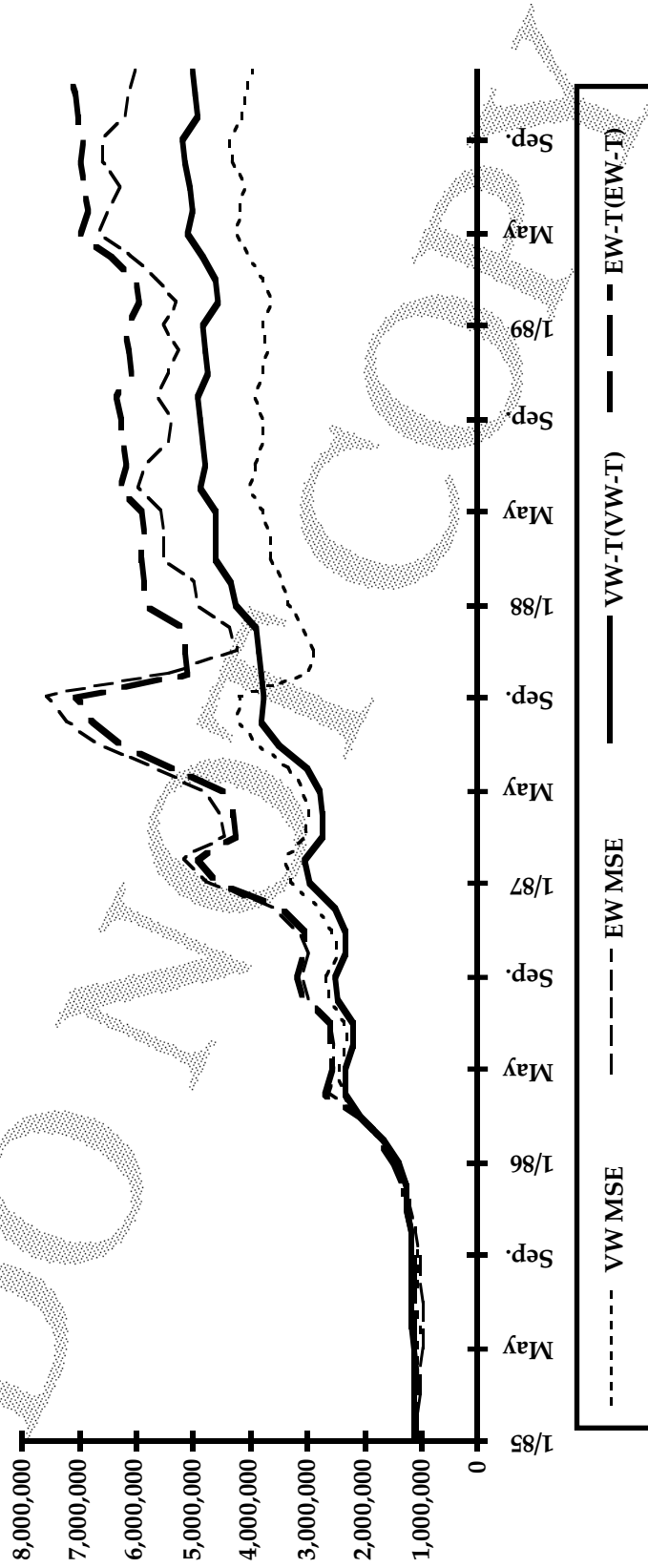


Table 9

**Several Strategies Using Only Autocorrelation
US Market, Value and Equally Weighted Indexes 1985/89**

| Period | Continuously compounded monthly returns | | | 1 | 2 | 3 | A | B | C | D |
|--------|---|-----------|------------|----------------------|----------------------|-----------------------|--|---|--|--|
| | VW CRSP | EW CRSP | T-B 1 mth. | Buy and hold VW CRSP | Buy and hold EW CRSP | Buy and hold Treasury | VW-SS(VW) | VW-T(VW-T) | EW-SS(EW) | EW-T(EW-T) |
| | | | | | | | Buy or sell VW (dep. on sign of VW in lag 1) | VW vs. Treas. (dep. on VW vs Treas. in lag 1) | Buy or sell EW (dep. on sign of EW in lag 1) | EW vs. Treas. (dep. on EW vs. Treas. in lag 1) |
| 1/85 | 7.718 % | 10.910 % | 0.624 % | 1,077,539 | 1,112,487 | 1,003,743 | 1,077,539 | 1,077,539 | 1,112,487 | 1,112,487 |
| Feb. | 1.629 % | 2.889 % | 0.603 % | 1,095,234 | 1,145,096 | 1,009,812 | 1,095,234 | 1,095,234 | 1,145,096 | 1,145,096 |
| Mar. | -0.002 % | -1.229 % | 0.672 % | 1,095,208 | 1,131,112 | 1,016,617 | 1,095,208 | 1,095,208 | 1,131,112 | 1,131,112 |
| Apr. | -0.308 % | -1.406 % | 0.619 % | 1,091,842 | 1,115,320 | 1,022,929 | 1,091,445 | 1,098,152 | 1,139,672 | 1,134,152 |
| May | 5.699 % | 3.330 % | 0.525 % | 1,155,875 | 1,153,088 | 1,028,315 | 1,040,872 | 1,103,933 | 1,112,868 | 1,140,123 |
| Jun. | 1.639 % | 1.158 % | 0.551 % | 1,174,975 | 1,166,518 | 1,033,994 | 1,059,806 | 1,118,247 | 1,127,721 | 1,149,365 |
| Jul. | -0.288 % | 1.756 % | 0.578 % | 1,171,598 | 1,187,185 | 1,039,983 | 1,056,760 | 1,115,033 | 1,147,700 | 1,169,728 |
| Aug. | -0.420 % | -0.679 % | 0.587 % | 1,166,690 | 1,179,152 | 1,046,107 | 1,054,308 | 1,117,673 | 1,139,935 | 1,161,814 |
| Sep. | -3.821 % | -5.112 % | 0.587 % | 1,122,948 | 1,120,393 | 1,052,265 | 1,105,343 | 1,112,253 | 1,191,772 | 1,164,563 |
| Oct. | 4.290 % | 2.732 % | 0.594 % | 1,172,172 | 1,151,423 | 1,058,529 | 1,068,560 | 1,130,945 | 1,169,964 | 1,171,496 |
| Nov. | 6.621 % | 5.767 % | 0.555 % | 1,252,410 | 1,219,779 | 1,064,417 | 1,144,789 | 1,204,133 | 1,242,770 | 1,236,699 |
| Dec. | 4.318 % | 3.564 % | 0.491 % | 1,307,673 | 1,264,041 | 1,069,652 | 1,195,303 | 1,257,265 | 1,287,867 | 1,281,575 |
| 1/86 | 0.668 % | 2.056 % | 0.539 % | 1,316,444 | 1,290,297 | 1,075,429 | 1,203,320 | 1,265,698 | 1,314,618 | 1,308,196 |
| Feb. | 7.023 % | 7.003 % | 0.536 % | 1,412,228 | 1,383,899 | 1,081,209 | 1,290,873 | 1,357,790 | 1,409,985 | 1,403,097 |
| Mar. | 5.384 % | 5.530 % | 0.521 % | 1,490,346 | 1,462,578 | 1,086,857 | 1,362,278 | 1,432,896 | 1,490,146 | 1,482,867 |
| Apr. | -1.309 % | -0.106 % | 0.453 % | 1,470,961 | 1,461,022 | 1,091,796 | 1,344,559 | 1,414,258 | 1,488,561 | 1,481,289 |
| May | 5.019 % | 3.783 % | 0.511 % | 1,546,668 | 1,517,355 | 1,097,391 | 1,270,432 | 1,416,530 | 1,424,026 | 1,483,668 |
| Jun. | 1.450 % | 0.295 % | 0.489 % | 1,569,265 | 1,521,837 | 1,102,769 | 1,290,826 | 1,432,195 | 1,430,349 | 1,482,843 |
| Jul. | -5.737 % | -7.699 % | 0.393 % | 1,481,777 | 1,409,073 | 1,107,107 | 1,218,861 | 1,352,349 | 1,324,364 | 1,483,466 |
| Aug. | 6.968 % | 4.862 % | 0.426 % | 1,588,711 | 1,479,280 | 1,111,830 | 1,129,432 | 1,353,364 | 1,252,325 | 1,489,795 |
| Sep. | -8.169 % | -5.323 % | 0.425 % | 1,464,083 | 1,402,592 | 1,116,562 | 1,040,935 | 1,242,833 | 1,187,540 | 1,407,617 |
| Oct. | 5.128 % | 3.510 % | 0.426 % | 1,541,121 | 1,452,701 | 1,121,333 | 982,472 | 1,243,775 | 1,137,744 | 1,408,684 |
| Nov. | 1.777 % | 0.042 % | 0.412 % | 1,568,755 | 1,453,305 | 1,125,965 | 1,000,198 | 1,261,646 | 1,138,371 | 1,404,337 |
| Dec. | -2.631 % | -2.532 % | 0.389 % | 1,528,024 | 1,416,972 | 1,130,357 | 974,229 | 1,228,889 | 1,109,912 | 1,404,880 |
| 1/87 | 12.151 % | 10.995 % | 0.447 % | 1,725,454 | 1,581,661 | 1,135,416 | 857,148 | 1,230,069 | 986,162 | 1,411,168 |
| Feb. | 4.119 % | 6.256 % | 0.446 % | 1,798,013 | 1,683,773 | 1,140,491 | 893,570 | 1,277,309 | 1,050,463 | 1,497,015 |
| Mar. | 2.486 % | 3.087 % | 0.432 % | 1,843,265 | 1,736,555 | 1,145,433 | 916,059 | 1,309,457 | 1,083,392 | 1,543,942 |
| Apr. | -1.540 % | -2.519 % | 0.209 % | 1,815,094 | 1,693,353 | 1,147,825 | 902,059 | 1,289,444 | 1,056,439 | 1,505,532 |
| May | 0.630 % | 0.548 % | 0.448 % | 1,826,557 | 1,702,658 | 1,152,975 | 890,572 | 1,290,697 | 1,040,934 | 1,506,994 |
| Jun. | 4.648 % | 3.064 % | 0.410 % | 1,913,453 | 1,755,643 | 1,157,707 | 933,350 | 1,347,368 | 1,074,009 | 1,548,452 |
| Jul. | 4.604 % | 4.521 % | 0.465 % | 2,003,617 | 1,836,838 | 1,163,108 | 977,329 | 1,410,856 | 1,123,680 | 1,620,065 |
| Aug. | 3.515 % | 1.962 % | 0.470 % | 2,075,304 | 1,873,223 | 1,168,592 | 1,012,298 | 1,461,336 | 1,145,939 | 1,652,156 |
| Sep. | -2.090 % | -1.388 % | 0.534 % | 2,032,381 | 1,847,399 | 1,174,845 | 991,360 | 1,431,112 | 1,130,141 | 1,629,380 |
| Oct. | -24.653 % | -31.191 % | 0.364 % | 1,588,318 | 1,352,390 | 1,179,128 | 1,260,280 | 1,431,302 | 1,529,333 | 1,629,597 |
| Nov. | -7.803 % | -5.570 % | 0.338 % | 1,469,100 | 1,279,123 | 1,183,116 | 1,370,238 | 1,436,143 | 1,626,651 | 1,635,108 |
| Dec. | 6.635 % | 4.557 % | 0.327 % | 1,569,879 | 1,338,759 | 1,186,997 | 1,288,986 | 1,440,853 | 1,562,367 | 1,640,471 |
| 1/88 | 4.449 % | 6.937 % | 0.271 % | 1,641,293 | 1,434,923 | 1,190,218 | 1,345,702 | 1,501,125 | 1,672,089 | 1,752,154 |
| Feb. | 4.842 % | 6.570 % | 0.454 % | 1,722,713 | 1,532,363 | 1,195,635 | 1,412,459 | 1,575,592 | 1,785,634 | 1,871,136 |
| Mar. | -2.250 % | 1.721 % | 0.425 % | 1,684,379 | 1,558,968 | 1,200,733 | 1,381,029 | 1,540,532 | 1,816,637 | 1,903,622 |
| Apr. | 1.072 % | 1.372 % | 0.450 % | 1,702,536 | 1,580,508 | 1,206,148 | 1,357,419 | 1,542,063 | 1,841,737 | 1,929,925 |
| May | 0.392 % | -1.498 % | 0.487 % | 1,709,231 | 1,557,009 | 1,212,039 | 1,363,403 | 1,542,708 | 1,814,354 | 1,901,231 |
| Jun. | 4.797 % | 5.511 % | 0.506 % | 1,793,219 | 1,645,217 | 1,218,184 | 1,430,398 | 1,545,103 | 1,705,383 | 1,904,182 |
| Jul. | -0.622 % | -0.601 % | 0.530 % | 1,782,096 | 1,635,363 | 1,224,653 | 1,421,526 | 1,530,144 | 1,697,703 | 1,886,153 |
| Aug. | -2.873 % | -2.992 % | 0.610 % | 1,731,625 | 1,587,161 | 1,232,142 | 1,453,449 | 1,534,113 | 1,736,630 | 1,891,045 |
| Sep. | 3.719 % | 2.825 % | 0.587 % | 1,797,236 | 1,632,630 | 1,239,391 | 1,413,621 | 1,543,140 | 1,705,636 | 1,902,172 |
| Oct. | 2.183 % | -0.260 % | 0.602 % | 1,836,908 | 1,628,398 | 1,246,872 | 1,448,572 | 1,571,683 | 1,706,136 | 1,890,601 |
| Nov. | -1.485 % | -3.273 % | 0.536 % | 1,809,825 | 1,575,964 | 1,253,576 | 1,427,214 | 1,548,510 | 1,750,203 | 1,894,112 |
| Dec. | 1.958 % | 2.516 % | 0.556 % | 1,845,618 | 1,616,119 | 1,260,561 | 1,390,439 | 1,551,689 | 1,722,066 | 1,904,667 |
| 1/89 | 6.528 % | 6.333 % | 0.788 % | 1,970,118 | 1,721,781 | 1,270,537 | 1,487,370 | 1,650,564 | 1,838,943 | 2,022,092 |
| Feb. | -1.851 % | -0.156 % | 0.754 % | 1,933,986 | 1,719,101 | 1,280,148 | 1,460,092 | 1,620,293 | 1,836,080 | 2,018,944 |
| Mar. | 2.135 % | 1.945 % | 0.868 % | 1,975,723 | 1,752,859 | 1,291,303 | 1,419,957 | 1,628,691 | 1,787,849 | 2,029,408 |
| Apr. | 4.654 % | 3.567 % | 0.847 % | 2,069,849 | 1,816,508 | 1,302,290 | 1,497,941 | 1,700,311 | 1,867,381 | 2,095,739 |
| May | 3.799 % | 3.077 % | 0.831 % | 2,149,993 | 1,873,272 | 1,313,158 | 1,555,941 | 1,766,147 | 1,925,735 | 2,161,229 |
| Jun. | -0.243 % | -0.214 % | 0.820 % | 2,144,771 | 1,869,271 | 1,323,966 | 1,552,162 | 1,761,857 | 1,921,622 | 2,156,613 |
| Jul. | 7.880 % | 4.337 % | 0.784 % | 2,320,627 | 1,952,130 | 1,334,391 | 1,425,215 | 1,769,515 | 1,826,634 | 2,165,986 |
| Aug. | 1.988 % | 1.861 % | 0.769 % | 2,367,223 | 1,988,797 | 1,344,689 | 1,462,056 | 1,798,727 | 1,873,426 | 2,198,946 |
| Sep. | -0.295 % | -0.010 % | 0.761 % | 2,360,247 | 1,988,604 | 1,354,955 | 1,457,747 | 1,793,427 | 1,873,245 | 2,198,733 |
| Oct. | -2.900 % | -5.733 % | 0.769 % | 2,292,791 | 1,877,807 | 1,365,413 | 1,490,881 | 1,800,944 | 1,968,638 | 2,207,949 |
| Nov. | 1.941 % | 0.200 % | 0.582 % | 2,337,723 | 1,881,561 | 1,373,387 | 1,479,653 | 1,811,461 | 1,990,972 | 2,220,844 |
| Dec. | 2.054 % | -0.301 % | 0.641 % | 2,380,267 | 1,871,210 | 1,380,841 | 1,514,172 | 1,842,579 | 1,990,573 | 2,235,132 |

Initial investment in all alternatives: 1,000,000

| | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Final value of investments: | 2,380,267 | 1,871,210 | 1,380,841 | 1,508,115 | 1,840,737 | 1,982,611 | 2,232,897 |
| Final value net of costs and risk free yield: | 999,426 | 490,369 | 0 | 127,274 | 459,896 | 601,770 | 852,056 |

Table 9 (continued)

EXPENSES: MARGINS AND COMMISSIONS

| | A | B | C | D |
|---|---------|-------|---------|-------|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 7,119 | 3,833 | 7,352 | 3,959 |
| 0 | -10,472 | 0 | -10,881 | 0 |
| 1 | -1,706 | 3,864 | -1,869 | 3,990 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 6,869 | 3,903 | 0 | 0 |
| 0 | -9,594 | 0 | 7,552 | 4,066 |
| 0 | -10,057 | 0 | -10,595 | 0 |
| 1 | -2,885 | 3,958 | -3,163 | 4,100 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 8,740 | 4,950 | 9,628 | 5,185 |
| 1 | -1,806 | 4,958 | -2,110 | 5,193 |
| 0 | 0 | 0 | 0 | 5,190 |
| 1 | 7,923 | 4,733 | 9,643 | 0 |
| 1 | -111 | 4,737 | -146 | 5,214 |
| 1 | 6,766 | 4,350 | 9,150 | 4,927 |
| 1 | -107 | 4,353 | -154 | 4,930 |
| 0 | 0 | 0 | 0 | 4,915 |
| 1 | 6,332 | 4,301 | 9,132 | 0 |
| 1 | -362 | 4,305 | -596 | 4,939 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 5,863 | 4,513 | 9,786 | 5,269 |
| 1 | -391 | 4,517 | -662 | 5,274 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 6,444 | 5,009 | 10,591 | 5,703 |
| 0 | -7,109 | 0 | -9,193 | 0 |
| 0 | -7,171 | 0 | -8,557 | 0 |
| 1 | 1,836 | 5,043 | 2,337 | 5,742 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 8,977 | 5,392 | 0 | 0 |
| 1 | -644 | 5,397 | 0 | 0 |
| 0 | 0 | 5,399 | 12,358 | 6,654 |
| 0 | 0 | 5,408 | -2,549 | 6,665 |
| 1 | 9,240 | 5,356 | 12,260 | 6,602 |
| 0 | -13,734 | 0 | -17,869 | 0 |
| 1 | -3,666 | 5,401 | -4,933 | 6,658 |
| 0 | 0 | 0 | 12,289 | 6,617 |
| 1 | 9,277 | 5,420 | -15,741 | 0 |
| 1 | -2,938 | 5,431 | -4,025 | 6,666 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 9,491 | 5,671 | 13,123 | 7,066 |
| 1 | -9,866 | 5,700 | -14,100 | 7,103 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 10,089 | 6,167 | 14,018 | 7,548 |
| 1 | -8,062 | 6,193 | -12,252 | 7,581 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 9,475 | 6,277 | 14,292 | 7,696 |
| 0 | -17,768 | 0 | -26,314 | 0 |
| 1 | -3,737 | 6,340 | -5,609 | 0 |
| 0 | 6,057 | 1,843 | 7,962 | 2,235 |

Commissions:
 * regular transaction with shares: 0.25%
 * regular transaction with bonds: 0.10%
 * stock short selling fee: 0.25%
 * stock short selling margin: 50%
 * interest paid on margin account: 5%

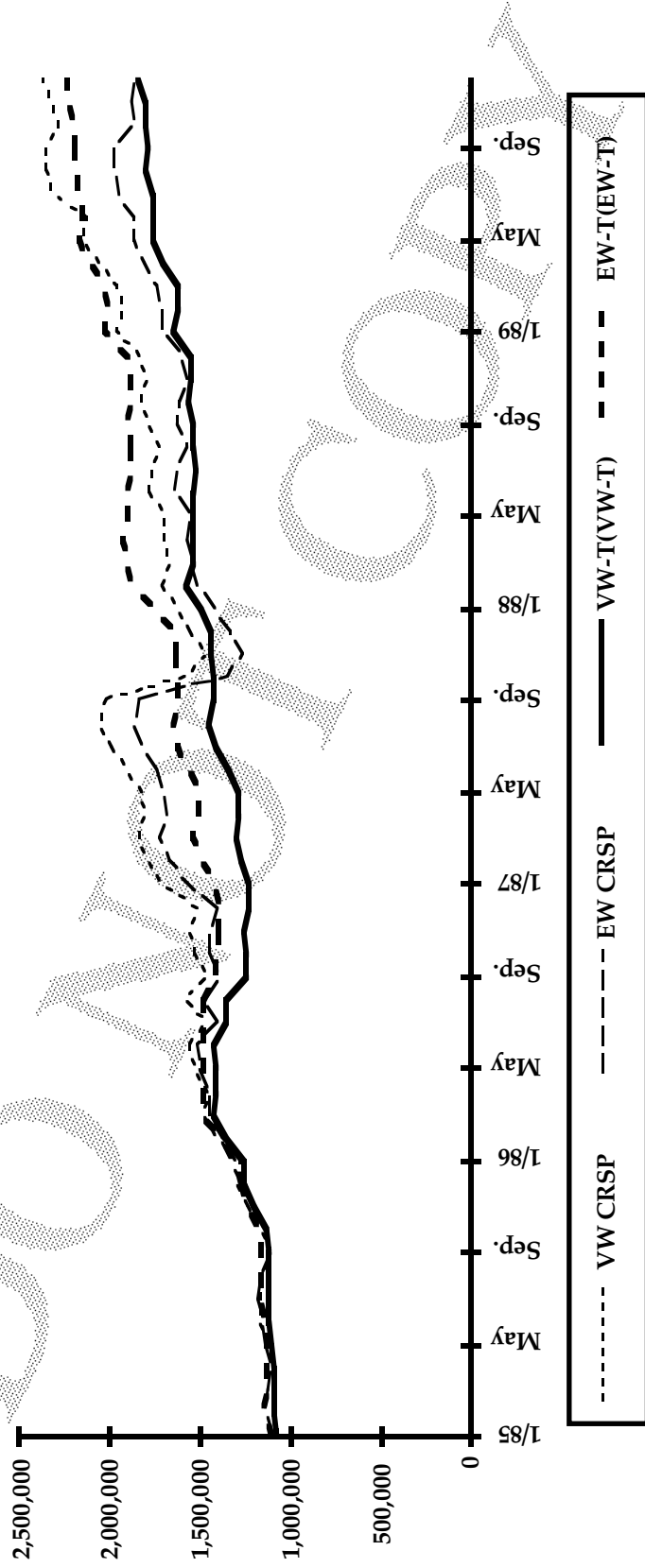
Columns of 0's and 1's account for:

- * 0 --> portfolio remains unchanged;
- * 1 --> portfolio is changed

<--- Turnover in average number of times per year

| | | | |
|-------|---------|--------|---------|
| 8,310 | 152,722 | 10,153 | 157,688 |
|-------|---------|--------|---------|

*Graph 4 - CRSP, 1985/89
Several Investment Strategies Using Only Auto-correlation*



SUMMARY TABLES, 4, 6, 8

Several Investment Strategies
 SPAIN 1985/89: Value-Weighted and Equally-Weighted Indexes

| | | Initial Investment | Gross Value after costs | Net Value * after costs | Transaction costs |
|--|----------------------------------|--------------------|-------------------------|-------------------------|-------------------|
| BUY | VW MSE | 1,000,000 | 4,007,121 | 2,203,093 | 0 |
| | | | | | |
| AND | EW MSE | 1,000,000 | 6,024,429 | 4,220,401 | 0 |
| | | | | | |
| HOLD | Spanish T-Bill | 1,000,000 | 1,804,028 | 0 | 0 |
| ARBITRAGE | VW vs. EW | 0 | -1,389,060 | -1,389,060 | 861,763 |
| | (dep. on lag 1) | | | | |
| PORTFOLIOS | VW vs. EW | 0 | -880,426 | -880,426 | 941,763 |
| | (id. but contrarian) | | | | |
| REGULAR INVESTMENT STRATEGIES BASED ON WHAT HAPPENED IN THE PREVIOUS MONTH | EW vs. Treas. | 1,000,000 | 9,091,932 | 7,287,904 | 466,430 |
| | (dep. on VW vs. Treas. in lag 1) | | | | |
| | Buy or sell EW | 1,000,000 | 12,453,135 | 10,649,108 | -692,758 |
| | (dep. on VW vs. Treas. in lag 1) | | | | |
| | Buy or sell EW | 1,000,000 | 13,772,900 | 11,968,872 | -693,859 |
| | (dep. on sign of VW in lag 1) | | | | |
| | Buy or sell VW | 1,000,000 | 2,757,924 | 953,896 | -1,016,04 |
| | (dep. on sign of EW in lag 1) | | | | |
| | Buy or sell VW | 1,000,000 | 5,418,809 | 3,614,781 | -292,080 |
| | (dep. on sign of VW in lag 1) | | | | |
| VW vs. Treas. | 1,000,000 | 5,004,578 | 3,200,551 | 284,119 | |
| (dep. on VW vs. Treas. in lag 1) | | | | | |
| Buy or sell EW | 1,000,000 | 6,557,659 | 4,753,632 | -234,541 | |
| (dep. on sign of EW in lag 1) | | | | | |
| EW vs. Treas. | 1,000,000 | 7,158,004 | 5,353,976 | 412,339 | |
| (dep. on EW vs. Treas. in lag 1) | | | | | |

* Net Value = Gross Value - Equivalent Treasury Investment Value

| | |
|---|-------|
| Commissions: Regular transaction with shares: | 0.25% |
| Regular transaction with bonds: | 0.10% |
| Stock short selling fee: | 1.25% |
| Stock short selling margin: | 50% |
| Interest paid on margin account: | 0% |

SUMMARY TABLES, 5, 7, 9

Several Investment Strategies
U.S. 1985/89: Value-Weighted and Equally-Weighted Indexes

| | | Initial Investment | Gross Value after costs | Net Value * after costs | Transaction costs |
|--|----------------------------------|--------------------|-------------------------|-------------------------|-------------------|
| BUY AND HOLD | VW CRSP | 1,000,000 | 2,380,267 | 999,426 | 8,451 |
| | EW CRSP | 1,000,000 | 1,871,210 | 490,369 | 7,178 |
| | U.S. T-Bill | 1,000,000 | 1,380,841 | 0 | 2,381 |
| ARBITRAGE | VW vs. EW | 0 | -515,569 | -515,569 | 468,098 |
| | (dep. on lag 1) | | | | |
| PORTFOLIOS | VW vs. EW | 0 | -566,468 | -566,468 | 468,098 |
| (id. but contrarian) | | | | | |
| REGULAR INVESTMENT STRATEGIES BASED ON WHAT HAPPENED IN THE PREVIOUS MONTH | EW vs. Treas. | 1,000,000 | 1,702,692 | 321,851 | 149,318 |
| | (dep. on VW vs. Treas. in lag 1) | | | | |
| | Buy or sell EW | 1,000,000 | 1,830,663 | 449,822 | 24,008 |
| | (dep. on VW vs. Treas. in lag 1) | | | | |
| | Buy or sell EW | 1,000,000 | 2,054,582 | 673,742 | 14,018 |
| | (dep. on sign of VW in lag 1) | | | | |
| | Buy or sell VW | 1,000,000 | 1,406,524 | 25,683 | 9,289 |
| | (dep. on sign of EW in lag 1) | | | | |
| | Buy or sell VW | 1,000,000 | 1,508,115 | 127,274 | 8,310 |
| | (dep. on sign of VW in lag 1) | | | | |
| VW vs. Treas. | 1,000,000 | 1,840,737 | 459,896 | 152,722 | |
| (dep. on VW vs. Treas. in lag 1) | | | | | |
| Buy or sell EW | 1,000,000 | 1,982,611 | 601,770 | 10,153 | |
| (dep. on sign of EW in lag 1) | | | | | |
| EW vs. Treas. | 1,000,000 | 2,232,897 | 852,056 | 157,688 | |
| (dep. on EW vs. Treas. in lag 1) | | | | | |

* Net Value = Gross Value - Equivalent Treasury Investment Value

Comissions: Regular transaction with shares: 0.25%
 Regular transaction with bonds: 0.10%
 Stock short selling fee: 1.25%
 Stock short selling margin: 50%
 Interest paid on margin account: 0%

Table 10**JANUARY EFFECT**

**Mean and standard deviation of continuously compounded returns by months of the year
Value Weighted Index
Madrid Stock Exchange 1941/1989**

| Month | Mean | Std. dev. | %age of avge annual return | Z-statistic (1) | F-statistic (2) |
|---|-------------|------------------|---------------------------------------|------------------------|------------------------|
| January | 3.48% | 5.09% | 28.67% | 3.27 | 1.09 |
| February | 1.56% | 5.14% | 12.87% | 0.72 | 1.11 |
| March | 1.06% | 6.46% | 8.76% | 0.06 | 1.75 |
| April | 1.28% | 4.33% | 10.57% | 0.42 | 0.79 |
| May | -0.62% | 3.53% | -5.09% | -3.00 | 0.52 |
| June | 0.56% | 3.84% | 4.65% | -0.76 | 0.62 |
| July | 2.32% | 4.59% | 19.12% | 1.91 | 0.89 |
| August | 2.26% | 4.26% | 18.62% | 1.95 | 0.76 |
| September | -0.23% | 4.70% | -1.87% | -1.77 | 0.93 |
| October | -0.60% | 6.24% | -4.94% | -1.76 | 1.63 |
| November | -0.07% | 4.42% | -0.58% | -1.63 | 0.82 |
| December | 1.14% | 3.72% | 9.43% | 0.23 | 0.58 |
| Jan-Dec | 1.01% | 4.88% | 8.33% | 0.00 | 1.00 |
| Feb-Dec | 0.79% | 4.80% | 7.07% | -0.31 | 0.97 |
| Jan | 3.48% | 5.09% | 28.67% | 3.27 | 1.09 |
| January vs. Feb. - Dec.: Ho: μ and s of the returns are equal | | | | 3.56 | 1.12 |

(1) These statistics correspond to the null hypothesis that the monthly mean for the period is equal to the monthly mean for the whole period 41-89 (Z Zcrit=1.96 for 95% confidence).

(2) These statistics correspond to the null hypothesis that the monthly standard deviation for the period is equal to the monthly standard deviation for the whole period 41-89 (0.68 F 1.38 for 95% confidence).

Table 11**JANUARY EFFECT**

**Mean and standard deviation of continuously compounded returns by months of the year
Value Weighted Index
Center for Research of Security Prices 1941/1989**

| Month | Mean | Std. dev. | %age over avge annual return | Z-statistic (1) | F-statistic (2) |
|---|-------------|------------------|---|------------------------|------------------------|
| January | 1.81% | 4.84% | 15.75% | 1.19 | 1.36 |
| February | 0.28% | 3.34% | 2.44% | -1.33 | 0.65 |
| March | 1.30% | 3.59% | 11.34% | 0.64 | 0.75 |
| April | 1.01% | 4.16% | 8.81% | 0.09 | 1.00 |
| May | 0.78% | 3.69% | 6.82% | -0.31 | 0.79 |
| June | 0.66% | 3.57% | 5.80% | -0.54 | 0.74 |
| July | 0.91% | 4.07% | 7.96% | -0.07 | 0.96 |
| August | 1.01% | 4.26% | 8.84% | 0.09 | 1.05 |
| September | -0.45% | 4.11% | -3.94% | -2.30 | 0.98 |
| October | 0.42% | 5.75% | 3.62% | -0.64 | 1.92 |
| November | 1.69% | 4.55% | 14.75% | 1.09 | 1.20 |
| December | 1.94% | 3.05% | 16.92% | 2.11 | 0.54 |
| Jan-Dec | 0.96% | 4.15% | 8.33% | 0.00 | 1.00 |
| Feb-Dec | 0.88% | 4.08% | 8.36% | -0.13 | 0.97 |
| Jan | 1.81% | 4.84% | 15.75% | 1.19 | 1.36 |
| January vs. Feb. - Dec.: Ho: μ and s of the returns are equal | | | | 1.30 | 1.41 |

(1) These statistics correspond to the null hypothesis that the monthly mean for the period is equal to the monthly mean for the whole period 41-89 (Z Zcrit=1.96 for 95% confidence).

(2) These statistics correspond to the null hypothesis that the monthly standard deviation for the period is equal to the monthly standard deviation for the whole period 41-89 (0.68 F 1.38 for 95% confidence).

Table 12**JANUARY EFFECT**

**Mean and standard deviation of continuously compounded returns by months of the year
Value-Weighted Index
Madrid Stock Exchange 1981/1989**

| Month | Mean | Std. dev. | %age over avge annual return | Z-statistic (1) | F-statistic (2) |
|--|-------------|------------------|---|------------------------|------------------------|
| January | 8.80% | 4.68% | 31.61% | 3.84 | 0.49 |
| February | 3.47% | 5.70% | 12.45% | 0.57 | 0.72 |
| March | 3.52% | 9.06% | 12.63% | 0.39 | 1.82 |
| April | 1.85% | 4.61% | 6.63% | -0.28 | 0.47 |
| May | 3.02% | 2.47% | 10.85% | 0.67 | 0.14 |
| June | 2.15% | 6.13% | 7.71% | -0.08 | 0.84 |
| July | 4.73% | 6.37% | 16.97% | 1.08 | 0.90 |
| August | 1.68% | 6.45% | 6.02% | -0.29 | 0.92 |
| September | 0.08% | 4.59% | 0.29% | -1.35 | 0.47 |
| October | -3.03% | 12.89% | -10.89% | -1.23 | 3.69 |
| November | 1.36% | 3.29% | 4.87% | -0.76 | 0.24 |
| December | 0.24% | 4.29% | 0.85% | -1.33 | 0.41 |
| Jan-Dec | 2.32% | 6.71% | 8.33% | 0.00 | 1.00 |
| Feb-Dec | 1.73% | 6.57% | 6.78% | -0.26 | 0.96 |
| Jan | 8.80% | 4.68% | 31.61% | 3.84 | 0.49 |
| : Ho: μ and s of the returns are equal | | | | 4.18 | 0.51 |

(1) These statistics correspond to the null hypothesis that the monthly mean for the period is equal to the monthly mean for the whole period 81-89 ($Z_{crit}=1.96$ for 95% confidence).

(2) These statistics correspond to the null hypothesis that the monthly standard deviation for the period is equal to the monthly standard deviation for the whole period 81-89 ($F_{crit}=2.03$ for 95% confidence).

Table 13**JANUARY EFFECT**

**Mean and standard deviation of continuously compounded returns by months of the year
Value-Weighted Index
Center for Research of Security Prices 1981/1989**

| Month | Mean | Std. dev. | %age over avge annual return | Z-statistic (1) | F-statistic (2) |
|---|--------|-----------|---------------------------------|-----------------|-----------------|
| January | 3.05% | 5.31% | 21.63% | 1.03 | 1.27 |
| February | 1.24% | 4.10% | 8.77% | 0.04 | 0.75 |
| March | 1.79% | 2.48% | 12.67% | 0.65 | 0.28 |
| April | 1.40% | 3.14% | 9.93% | 0.20 | 0.44 |
| May | 1.03% | 3.55% | 7.30% | -0.12 | 0.56 |
| June | 1.70% | 2.47% | 12.03% | 0.55 | 0.27 |
| July | -0.13% | 4.08% | -0.91% | -0.91 | 0.75 |
| August | 3.00% | 5.89% | 21.29% | 0.91 | 1.55 |
| September | -1.55% | 3.93% | -11.02% | -1.97 | 0.69 |
| October | -0.15% | 10.14% | -1.06% | -0.39 | 4.61 |
| November | 1.33% | 4.31% | 9.46% | 0.11 | 0.83 |
| December | 1.40% | 3.11% | 9.91% | 0.20 | 0.43 |
| Jan-Dec | 1.18% | 4.72% | 8.33% | 0.00 | 1.00 |
| Feb-Dec | 1.01% | 4.66% | 7.77% | -0.11 | 0.97 |
| Jan | 3.05% | 5.31% | 21.63% | 1.03 | 1.27 |
| January vs. Feb. - Dec.: Ho: μ and s of the returns are equal | | | | 1.12 | 1.30 |

(1) These statistics correspond to the null hypothesis that the monthly mean for the period is equal to the monthly mean for the whole period 81-89 (Z Zcrit=1.96 for 95% confidence).

(2) These statistics correspond to the null hypothesis that the monthly standard deviation for the period is equal to the monthly standard deviation for the whole period 81-89 (0.33 F 2.03 for 95% confidence).

Table 14**JANUARY EFFECT USA 81/89**

Mean and standard deviation of continuously compounded returns by months of the year
Equally-Weighted Index

Center for Research of Security Prices 1981/1989

| Month | Mean | Std. dev. | %age over avge annual return | Z-statistic (1) | F-statistic (2) |
|---|--------|-----------|------------------------------|-----------------|-----------------|
| January | 4.77% | 4.75% | 35.42% | 2.19 | 0.81 |
| February | 2.15% | 4.63% | 15.97% | 0.63 | 0.77 |
| March | 2.78% | 2.93% | 20.63% | 1.50 | 0.31 |
| April | 1.45% | 3.11% | 10.80% | 0.29 | 0.35 |
| May | 1.22% | 3.85% | 9.05% | 0.07 | 0.53 |
| June | 1.47% | 2.50% | 10.93% | 0.36 | 0.22 |
| July | -0.85% | 3.96% | -6.32% | -1.40 | 0.56 |
| August | 1.73% | 5.78% | 12.88% | 0.31 | 1.20 |
| September | -1.42% | 3.81% | -10.54% | -1.86 | 0.52 |
| October | -1.87% | 12.46% | -13.89% | -0.72 | 5.59 |
| November | 1.20% | 4.66% | 8.95% | 0.05 | 0.78 |
| December | 0.82% | 2.49% | 6.12% | -0.31 | 0.22 |
| Jan-Dec | 1.12% | 5.27% | 8.33% | 0.00 | 1.00 |
| Feb-Dec | 0.79% | 5.21% | 6.40% | -0.18 | 0.98 |
| Jan | 4.77% | 4.75% | 35.42% | 2.19 | 0.81 |
| January vs. Feb. - Dec.: Ho: μ and s of the returns are equal | | | | 2.39 | 0.83 |

(1) These statistics correspond to the null hypothesis that the monthly mean for the period is equal to the monthly mean for the whole period 81-89 (Z Zcrit=1.96 for 95% confidence).

(2) These statistics correspond to the null hypothesis that the monthly standard deviation for the period is equal to the monthly standard deviation for the whole period 81-89 (0.33 F 2.03 for 95% confidence).

Table 15

WEEK-END-EFFECT SPAIN 85/89

Mean and standard deviation of continuously compounded returns by days of the week
Value weighted and equally weighted stock market indexes
Madrid Stock Exchange 1985/1989

| | EW MSE | VW MSE |
|----------------------------------|---------|---------|
| Overall daily mean return | 0.15% | 0.11% |
| Weekly mean return | 0.73% | 0.56% |
| Maximum | 6.44% | 6.94% |
| Minimum | -10.28% | -9.73% |
| Cumulative return (cont. comp.) | 180.08% | 137.84% |
| Cumulative return (simply comp.) | 605.47% | 396.85% |
| Daily standard deviation | 1.22% | 1.16% |

| EW MSE index | Monday | Tuesday | Wednesdays | Thursday | Friday | Tue-Fri |
|---|---------|---------|------------|----------|--------|---------|
| Mean return for the day | 0.52% | -0.03% | 0.00% | 0.08% | 0.11% | 0.05% |
| Day's mean/overall mean | 353.92% | 20.07% | -2.39% | 54.65% | 72.23% | 35.81% |
| %age of average weekly return | 70.78% | 4.01% | -0.48% | 10.93% | 14.45% | 7.16% |
| Standard deviation | 1.33% | 1.25% | 1.12% | 1.27% | 1.01% | 1.17% |
| Count | 249 | 251 | 249 | 239 | 246 | 985 |
| Standard error of the mean | 0.08% | 0.08% | 0.07% | 0.08% | 0.06% | 0.04% |
| TEST OF MEAN EQUALITY | | | | | | |
| Z-statistic (Ho: μ day = μ overall) | 5.05 | -0.26 | -0.69 | 0.30 | 0.71 | |
| TEST OF VARIANCE EQUALITY | | | | | | |
| F-statistic (Ho: s day = s overall) | 1.29 | 1.15 | 0.92 | 1.19 | 0.75 | |

| VW MSE index | Monday | Tuesday | Wednesdays | Thursday | Friday | Tue-Fri |
|---|---------|---------|------------|----------|---------|---------|
| Mean return for the day | 0.48% | -0.05% | -0.03% | 0.01% | 0.14% | 0.02% |
| Day's mean/overall mean | 429.16% | -42.47% | -24.88% | 6.79% | 129.16% | 16.79% |
| %age of average weekly return | 85.83% | -8.49% | -4.98% | 1.36% | 25.83% | |
| Standard deviation | 1.38% | 1.15% | 0.97% | 1.13% | 1.06% | 1.08% |
| Count | 249 | 251 | 249 | 239 | 246 | 985 |
| Standard error of the mean | 0.09% | 0.07% | 0.06% | 0.07% | 0.07% | 0.03% |
| TEST OF MEAN EQUALITY | | | | | | |
| Z-statistic (Ho: μ day = μ overall) | 4.92 | -0.82 | -0.66 | -0.14 | 1.66 | |
| TEST OF VARIANCE EQUALITY | | | | | | |
| F-statistic (Ho: s day = s overall) | 1.62 | 1.14 | 0.80 | 1.09 | 0.96 | |

(Critical values for 95% confidence: $-1.96 \leq z \leq 1.96$; $0.84 \leq F \leq 1.19$)

Table 16

WEEK-END-EFFECT USA 85/89

Mean and standard deviation of continuously compounded returns by days of the week
Value weighted and equally weighted stock market indexes
Centre for Research of Security Prices 1985/1989

| | EW CRSP | VW CRSP |
|----------------------------------|---------|---------|
| Overall daily mean return | 0.07% | 0.07% |
| Weekly mean return | 0.35% | 0.35% |
| Maximum | 9.38% | 8.48% |
| Minimum | -15.30% | -19.90% |
| Cumulative return (cont. comp.) | 89.27% | 87.41% |
| Cumulative return (simply comp.) | 244.18% | 239.68% |
| Daily standard deviation | 0.89% | 1.10% |

| EW CRSP index | Monday | Tuesday | Wednesdays | Thursday | Friday | Mon-Fri |
|---|----------|---------|------------|----------|---------|---------|
| Mean return for the day | -0.17% | 0.03% | 0.17% | 0.12% | 0.19% | 0.07% |
| Day's mean/overall mean | -242.56% | 49.03% | 242.63% | 166.14% | 267.65% | 100.00% |
| %age of average weekly return | -48.51% | 9.81% | 48.53% | 33.23% | 53.53% | 20.00% |
| Standard deviation | 1.32% | 0.72% | 0.78% | 0.69% | 0.77% | 0.89% |
| Count | 241 | 259 | 259 | 253 | 251 | 1263 |
| Standard error of the mean | 0.09% | 0.04% | 0.05% | 0.04% | 0.05% | 0.03% |
| TEST OF MEAN EQUALITY | | | | | | |
| Z-statistic (Ho: μ day = μ overall) | -2.72 | -0.71 | 1.84 | 0.94 | 2.16 | |
| TEST OF VARIANCE EQUALITY | | | | | | |
| F-statistic (Ho: s day = s overall) | 2.21 | 0.65 | 0.77 | 0.59 | 0.75 | |

| VW CRSP index | Monday | Tuesday | Wednesdays | Thursday | Friday | Mon-Fri |
|---|----------|---------|------------|----------|---------|---------|
| Mean return for the day | -0.10% | 0.12% | 0.16% | 0.05% | 0.10% | 0.07% |
| Day's mean/overall mean | -151.46% | 179.50% | 237.26% | 70.76% | 147.24% | 100.00% |
| %age of average weekly return | -30.29% | 35.90% | 47.45% | 14.15% | 29.45% | |
| Standard deviation | 1.65% | 0.85% | 0.90% | 0.93% | 1.00% | 1.10% |
| Count | 241 | 259 | 259 | 253 | 251 | 1263 |
| Standard error of the mean | 0.11% | 0.05% | 0.06% | 0.06% | 0.06% | 0.03% |
| TEST OF MEAN EQUALITY | | | | | | |
| Z-statistic (Ho: μ day = μ overall) | -1.58 | 0.90 | 1.48 | -0.31 | 0.47 | |
| TEST OF VARIANCE EQUALITY | | | | | | |
| F-statistic (Ho: s day = s overall) | 2.25 | 0.60 | 0.68 | 0.71 | 0.82 | |

(Critical values for 95% confidence: $-1.96 \leq z \leq 1.96$; $0.84 \leq F \leq 1.19$)

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