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THE PERFORMANCE OF TILTING STRATEGIES FOR THE TORONTO STOCK EXCHANGE 300 COMPOSITE INDEX

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ABSTRACT

The Performance of Tilting Strategies for the
Toronto Stock Exchange 300 Composite Index

John Garrett Murray

This research explores the performance of tilting strategies for the Toronto Stock Exchange 300 Composite Index during the period from February 1982 to December 1996. The emphasis is to create a rebalanced or tilted portfolio that has a significantly higher reward-to-risk ratio than the Toronto Stock Exchange 300 Composite Index. Passive tilting strategies are used in which the weights of all the stocks in the index are reallocated based on factors which empirical research have identified as being useful in predicting future returns. The factors studied are weight (size), earnings/price ratio, past return, and book-to-market ratio. The passive tilting portfolios are created by redistributing certain percentages of the total weight to increase holdings in stocks predicted to outperform and to decrease them for those stocks expected to underperform. Both single factor and multifactor strategies are examined. Both single factor and multifactor tilting strategies based on these variables do not perform well over the studied period. Similar results are also found for shorter subperiods. The results generally are not significant using the Jobson and Korkie test of significance for two portfolios. Therefore, based on these factors, the results suggest that the TSE 300 Index was efficient during the studied period.

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1. INTRODUCTION

Equity investments in both Canada and the United States have had tremendous growth in the last decade. The capitalization of the United States stock market was estimated by Standard & Poor's at $10 trillion in 1998, up from $4 trillion just six years prior (Bolton and Smith 1998). This increased popularity of equity investments has lead to an extensive collection of mutual funds. Consequently, selecting which mutual fund to invest in can be challenging for investors.

Many funds have been introduced in the last few years, and their manager's track record can only be assessed over a short period. Index funds are established objectively and are well diversified, so the fund manager is not as critical to its performance. Index funds also have lower operating expenses and turnover rates compared with other types of equity mutual funds. A comparison of fees between actively and passively managed funds by Wells Fargo Nikko Investment Advisors Canada Ltd. report a spread of 43 basis points (Taylor 1995). Active managers must recoup these additional expenses before their unit holders benefit. Moreover, analysis shows that, before management fees, the TSE 300 Index has outperformed the median manager by 0.10% to 3.10% for periods

ranging from one to eight years (Taylor 1995). This implies that many active managers have difficulty outperforming the TSE 300 Index consistently.

The first index equity fund was introduced in the United States in 1973 to track the S&P 500 Index. Since then, indexation has become increasingly popular in both the United States and Canada. It is estimated by The Leuthold Group that 15% of 1997's net inflows to United States equity mutual funds went to indexed investments, which is five times the rate of 1994 (Bolton and Smith 1998). A Greenwich Associates survey of nearly 300 large Canadian pension plans reported that 15% of the respondents used indexing for United States and Canadian equities in 1997 (Markovich 1998). As of September 30, 1999, index equity assets in the United States are estimated at US$700 billion on the S&P 500 Index alone (TSE information circular 2000).

The ideal situation for unit holders is to have both lower management fees and superior returns. Certain fund managers strive to provide such a mutual fund by creating index funds that redistribute weights among stocks of an index in an attempt to outperform that index. In doing so, these fund managers seek to preserve the characteristics of the underlying index.

This study examines the risk-adjusted performance of various tilting strategies for the TSE 300 Market Index. The strategies involve using screens to alter the investment weights for the 300 stocks of the index. The redistribution of the investment weights is based on screens for which empirical evidence suggests they may be useful in predicting

future returns. The results also test the efficiency of the TSE 300 Market Index. If the tilting strategies significantly improve the reward-to-risk ratio, the TSE 300 benchmark would not be located on the efficient frontier. This means that specific and easily implemented investment strategies can provide higher risk-adjusted returns than the TSE 300 Market Index. Such results would interest index fund managers, who are constantly searching for strategies to outperform their benchmark.

The structure of the remainder of the thesis is organized as follows. In the next section, the literature is briefly reviewed. In section three, the data and methodology are described. Section four presents the empirical results and section five is the conclusion.

2. LITERATURE REVIEW

In this section, a review of the literature that provides evidence on whether or not it may be possible to improve upon the passive return-to-risk ratio of the TSE 300 Index is presented. Given this focus, the literature can be divided into three general categories. The first category is the literature that deals with the efficiency of indexes. The second category is the literature that examines whether or not trading strategies based on individual factors can provide excess returns. The final category involves the literature of multifactor models that attempt to predict future stock returns.

2.1 Review of the Literature on the Efficiency of Stock Market Indexes

The studies on the efficiency of stock market indexes are very consistent and therefore easily summarized. Researchers find that market indexes do not seem to be ex post efficient. Haugen and Baker (1991) believe that indexes cannot be efficient due to real-life constraints, such as being unable to sell short and individual tax situations. They also point out that not all investment alternatives are included in market indexes. Ultimately, they conclude that the Wilshire 5000 index was not efficient during the 1972 to 1989 period.

Winston (1993) finds that minimum-variance portfolios would have beaten the S&P 500 in the 1975 to 1991 period. Moreover, it is reported that minimum-variance portfolios subject to the constraints mentioned by Haugen and Baker (1991) would have also beaten the S&P 500. The results of the minimum-variance portfolios are not very sensitive to the calculation method, but are sensitive to parameter changes such as the use of different risk prediction methods. Consequently, even if the minimum-variance portfolios perform better than the S&P 500, it cannot be concluded that the results are due to efficiency or due to errors in estimating the parameters. However, the fact that a minimum-variance portfolio outperforms the index does suggests that the index is not efficient.

Grinold (1992) finds most indexes from the U.S., U.K., Japan, Germany, and Australia are not efficient. Unlike the German index, which appears somewhat efficient,

the U.S., U.K., Japan, and Australia indexes do not appear to be efficient. If these market indexes are not efficient, it would be rather surprising to find that the market indexes for lesser developed markets are efficient.

Masters (1998) examines several emerging market indexes and finds conflicting results and a lack of a clear-cut index for emerging markets. The indexes used in the study had returns that vary dramatically from each other. The cap-weighted indexes for these markets increase holdings in stocks that have outperformed and reduce holdings for those that have underperformed, which is a buy high and sell low investment strategy. To avoid the problem of buying high and selling low, Masters believes that equally-weighted portfolios are superior, because portfolio rebalancing results in buying low and selling high.

2.2 *Review of the Literature on Factors Identified in Empirical Studies as Leading to Excess Returns*

Among the vast range of potential trading strategies studied, a few repeatedly appear in the literature because they seem to provide abnormal returns. Four such strategies are the ones based on size, earnings/price ratios, book-to-market ratios and past returns. These four strategies or screens are consistently reported as being able to beat market indexes.

Banz (1981) examines the size effect on firms from the New York Stock Exchange from 1926 to 1975. He finds that, on average, small firms have significantly larger risk-adjusted returns than larger firms. In addition, the size effect is not linear or predictable and is more pronounced for the smallest firms. Brown, Kleidon, and Marsh (1983) also find that the excess returns associated with the size effect are not stable since 1926, and are more pronounced since the late 1950's. Unlike Banz (1981), Brown, Kleidon, and Marsh (1983) find that the relationship between excess returns and size is linear in the log of size, and that different estimation methods can lead to different conclusions on the size effect.

Basu (1983) finds that small stocks outperform larger ones on the New York Stock Exchange over the period from 1963 to 1979. After controlling for the earnings/price ratio and risk, Basu finds that the higher returns of the small stocks are attributable to differences in risk.

Fernholz, Garvy and Hannon (1998) use a strategy that shifts weights from larger to smaller stocks for the S&P 500 and Russell 1000. Over the period from 1979 to 1995, these portfolios earned about 50 basis points more than the indexes, while slightly reducing risk. They report that the annual tracking distance of their portfolio was closer to the two market indexes than they were to each other.

Bourgeois and Lussier (1994) examine the size effect on the Canadian market from 1973 to 1988, and conclude that the use of firm size as a single screen has

disappointing results since the best and worst performers seem to be smaller firms. They state that their sample may not be appropriate to test the size effect since they used the 300 corporations of the Toronto Stock Exchange with the largest total market capitalization. They believe that the TSE 300 Index may be more appropriate to test the size effect since it incorporates a larger number of smaller firms. The reason why it incorporates a larger number of smaller firms is that the capitalization of the stocks in the TSE 300 Index are calculated using shares outstanding which are freely-tradeable by the public (float capitalization) and not simply size based on total shares outstanding.

Davis (1994) argues that the COMPUSTAT database used in many research studies has a survival and look-ahead bias. Therefore he uses a "fresh" data set of stocks traded on the New York Stock Exchange from 1940 to 1962 to explore several explanatory variables of firm performance, including size. The results show a lack of explanatory power for firm size, but this sample only incorporates large firms. Fama and French (1992) conclude that size alone is helpful in explaining stock returns.

Dennis, Perfect, Snow and Wiles (1995) investigate the performance of portfolios constructed based on size and book-to-market ratios. The research spans a period of 26 years from 1963 to 1988 and uses stocks from the NYSE, AMEX, and NASDAQ. Their results support both a size and book-to-market effect, but they conclude that the book-to-market effect appears to dominate. Similar results are obtained for different rebalancing periods and after adjusting for transaction costs.

Keim (1990) researchs the size effect for stocks traded on the CRSP database over the 1951 to 1986 period. Keim finds that there is a significant size effect across all months. After examining the size effect in January and the other 11 months, Keim concludes that the size effect is present only in the month of January. Jensen, Johnson, and Mercer (1997) believe that Fed policy significantly affects stock returns. They find that small firms only outperform larger firms during expansive monetary policy periods. They also conclude that the extreme portfolios do not drive their results.

Berk (1995) does not believe in a size effect, although a negative relation between firm size and returns should be observed. His theory is founded on the argument that, for two firms with the same operating size, the lower market value firm will be riskier provided that operating size and risk are not positively correlated. Berk expands his theory to explain why size can be utilized to account for the return left unexplained by asset pricing models and how size should be used to detect incorrectly specified models.

The studies that examine the explanatory power of the earnings/price ratio (E/P) for future returns consistently show that E/P ratios can predict future returns. Basu (1983) finds that high E/P stocks seem to have significantly higher returns with little difference in risk, even after controlling for size. However, Basu does conclude that the strength of the E/P effect seems to vary inversely with market value, and therefore that the E/P and size effects are not totally independent. In earlier work, Basu (1977) finds that low P/E portfolios have significantly higher returns than higher P/E portfolios of

stocks on the New York Stock Exchange over the period from 1957 to 1971. Tax differences and higher risk do not completely explain these differences in return.

Lakonishok, Shleifer and Vishny (1994) find that low E/P stocks underperform high E/P stocks and that differences in risk cannot explain the larger returns. When Davis (1994) re-examines several explanatory variables on a "fresh" data set due to the suspected biases inherent in COMPUSTAT, he finds that E/P has explanatory power in explaining stock returns.

Bourgeois and Lussier (1994) examine the P/E effect on the Canadian market. They find that portfolios of lower P/Es stocks perform better than portfolios of higher P/E stocks on a risk-adjusted basis over a 16 year period. Bourgeois and Lussier conclude that the greater returns of the lower P/E stocks appears to be a result of the P/E's ability to reduce the number of extreme losers in the portfolio.

Keim (1990) also finds a significant E/P effect from 1951 to 1986 using CRSP and COMPUSTAT data. Keim (1990) finds that the E/P effect is particularly strong during the month of January except for the smallest size portfolio. In addition, a marginally significant E/P effect is also found for the smallest and largest size portfolios in the remainder of the year.

Trading strategies that use B/M ratios to predict future returns appear to be successful. Lakonishok, Shleifer and Vishny (1994) find that low B/M stocks have lower

returns than high B/M stocks on the NYSE and AMEX from 1968 to 1990. Davis (1994) finds similar results for stocks traded on the New York Stock Exchange from 1940 to 1962. Haugen and Baker (1993) conclude that higher B/M stocks have higher subsequent returns and lower subsequent risk. Fama and French (1992) conclude that B/M alone is helpful in explaining stock returns. They also conclude that B/M is the most consistent and powerful variable for explaining the cross-section of average stock returns. Reinganum (1988) observes that winners generally sell at prices below book value before substantial price increases.

Arshanapalli, Coggin, and Doukas (1998) examine the annualized value-growth spreads for portfolios in eighteen markets around the world from 1975 to 1995. They find that value stocks as determined by their book-to-market ratios perform better than growth stock in most of the markets studied. The results for Canada are an annualized value-growth spread of 10.73% over the twenty-one year period studied. They conclude that the higher returns could not be attributed to differences in risk. In fact, they find that the growth portfolios are riskier than the value portfolios. They control for their concern that the results may have been generated by up-market momentum and/or a size effect during the period studied. For Canada and the U.S. the excess return remains positive after controlling for both market movements and size.

To avoid the problem of survivorship bias in the COMPUSTAT database, Kothari, Shanken and Sloan (1995) use S&P data from 1947 to 1987 to study B/M ratios. They find that book-to-market ratios are only weakly related to average returns. Dennis,

Perfect, Snow and Wiles (1995) find B/M to be an important explanatory factor of expected returns. This remains the case after controlling for different rebalancing periods and transaction costs. They conclude that the economic rationale for the B/M effect is still an issue for researchers to debate.

Jensen, Johnson, and Mercer (1997) find a clear pattern of increasing returns as the price-to-book ratios decrease for stocks on the CRSP database from 1965 to 1994. This trend is present for all beta deciles, although only two are significant. After distinguishing between expansive and restrictive monetary periods, they find a much stronger P/B effect. In fact, 8 of the 10 beta deciles report significant differences between low-P/B portfolios and high-P/B portfolios at a 1% percent level during expansive monetary environments. In contrast, only three are significant at a 5 percent level during restrictive monetary times.

Much literature exists on the use of past returns to attempt to outperform the market. The primary reasons for the volume of this literature is the large number of possible strategies that can be tested, and an ability to predict future returns from past returns would violate the most basic form of market efficiency.

Jegadeesh and Titman (1993) examine the relative strength strategy of buying past winners and selling past losers. They find that significant abnormal returns are obtained in the following year but that these abnormal returns decrease over longer periods. The results are not due to risk factors or lead-lag effects but are consistent with the delayed

reaction of prices to firm-specific information. Using annual (monthly) intervals, Chopra, Lakonishok and Ritter (1992) find extreme losers outperform extreme winners by 6.5% (9.5%) per year. They also find that portfolios formed on one year past returns display return momentum. They conclude that these results are not due to a size effect.

De Bondt and Thaler (1987) conclude that excess returns in the test period for losers are negatively related to both long-term and short-term formation periods. The winner-loser effect is not explained by risk as measured by beta. This is consistent with their earlier work [De Bondt and Thaler (1985)] in which they find that winners (losers) over the past three year period become losers (winners) over the subsequent three year period for the NYSE from 1933 to 1980. Similar results are found using five year formation and test periods. The results for a one year formation period are quite different (i.e., a significant negative CAR for the one year test period). This indicates that stocks selected based on a short formation period of one year display return momentum over the subsequent one-year period. In addition, loser portfolios have extremely large excess returns in January.

Chan (1988) finds that the abnormal returns for contrarian strategies are sensitive to the chosen model and estimation methods. He conjectures that, since the risk for the loser (winner) portfolio increases during the ranking period, the beta of the test period is underestimated (overestimated). Therefore, if changes in the portfolio's beta are accounted for over the ranking and test periods, only a small abnormal return is found. Chan finds that losers have a larger capitalization than winners at the beginning of the

ranking period. This is not only consistent with the size effect but it also implies that larger firms become losers in the future.

The results by Jegadeesh (1990) show a negative first-order serial correlation in monthly returns that are statistically significant. He finds significant positive serial correlation for longer lags, especially for lags of twelve months, even after controlling for size. Reinganum (1988) finds that most winner stocks have a relative strength ranking of 70 or more, which suggests that past return changes are helpful in predicting future winners.

Kryzanowski and Zhang (1992) test the overreaction hypothesis using three performance measures (CAR's, Sharpe (1966), and Jensen (1968)) for stocks listed on the Toronto Stock Exchange for a 39-year period from 1950 to 1988. They find no statistical support for the overreaction hypothesis, but find statistically significant momentum for one year test periods and often for two year test periods for winners and losers. They also report an insignificant reversal for longer periods up to ten years for winners and losers. Kryzanowski and Zhang report a significant decrease in systematic risks for winners over all test periods, but only finds significant increases for the losers over the 12-month formation/test periods.

2.3 *Review of the Literature on Multifactor Models*

In this section studies that use multifactor strategies to predict future stock returns are reviewed. Fama and French (1992) explore the ability of beta, size, leverage, E/P, B/M, and a combination of these factors to explain stock returns. The relation between beta and returns is not present from 1963 to 1990 for stocks traded on the NYSE, AMEX, and NASDAQ. The combination of size and B/M seem to absorb the information provided by leverage and E/P. The B/M factor results are consistent with B/M acting as a proxy for relative distress. Fama and French find that B/M may capture the difference between the two leverage measures, Asset/Market and Asset/Book. When E/P is the only factor, it has a positive relation with returns for firms with positive earnings. They also find higher returns for stocks that have negative E/P (U-shaped relation). Finally, Fama and French find that adding size and B/M to the regression eliminates the relation between E/P and returns.

Dennis, Perfect, Snow and Wiles (1995) create portfolios based on size and book-to-market ratio. They find that portfolios consisting of the highest B/M-smallest size stocks outperform the market even after including transaction costs of up to 2 percent. They also conclude that the B/M effect appears to be stronger than the size effect.

Kryzanowski, Galler, and Wright (1993) used Artificial Neural Networks to predict if a stock will have a positive or negative return in the next year. A three outcome model is also used to predict whether a stock will have a positive, neutral, or negative

return in the following twelve months. For each firm, 88 factors which include financial ratios, industry ratios and macroeconomic factors are used. The two outcome model is able to predict 71.7% of the outcomes accurately and the three outcome model is accurate 65.5% of the time. Both models perform better than what would be expected from chance alone.

Reinganum (1988) examines the characteristics of previous stock market winners and uses these characteristics as filters to create a nine and four screen trading strategy. Both strategies outperform the S&P 500 for one and two year holding periods. The four filter strategy uses P/B, quarterly earnings, relative-strength, and shares outstanding as screens, which are similar to those studied in this research.

Arshanapalli, Coggin, and Doukas (1998) test the Fama-French three-factor model on six industries in four global regions. The results conclude that most of the variation in returns can be explained by size and the book-to-market ratio. Moreover, the market risk coefficient did not vary much and remained close to one. The relation between size and excess stock returns is negative in all cases and largely significant in most. There is a mixed relation between book-to-market and excess stock returns, which depends on the industry and to a lesser extent on the region being examined. For half of the industries, significant relationships are found that also hold for all regions.

Dowen and Bauman (1986) use a multifactor model with three factors to outperform their sample portfolio and the CRSP value-weighted index in 10 of the 14

years in the period from 1969 to 1983. The portfolios are constructed by sorting the stocks and selecting the third that have the smallest capitalization. From this third, only the third that are the most neglected by institutions are selected. A final third, consisting of the lowest P/E ratios are selected for inclusion in the portfolio. This means that the final portfolio consists of 1/27 of the original portfolio. Of the 10 years in which this strategy outperforms the two benchmark portfolios, 7 are years with bull markets. Moreover, the three years with the largest difference are the ones that have the strongest bull markets. These results imply that the strategy is much more effective during bull markets.

Jones (1990) finds that a twelve factor model provides significant results for the American market and most sectors of the economy from 1969 to 1987. Among the factors used are P/E, capitalization, and price momentum. Of the twelve sectors investigated, only utilities and transportation yield no significant results. These two sectors are linked to fuel prices that are largely influenced by the OPEC crisis during much of the studied period. The findings also indicate that the factors that provide the best results vary from one sector of the economy to the next. Jones (1990) also examines sector-specific and style-specific models and concludes that the added benefits of these specific models appear to be smaller than the benefits of simply using a multifactor model initially.

3. DATA AND METHODOLOGY

This study assesses the efficiency of the TSE 300 Index by examining if passive tilting strategies can outperform the TSE 300 Index. The TSE 300 Composite Index was introduced in 1977 to give investors a barometer for measuring the performance of the Canadian stock market. The TSE 300 Index is a float capitalization-weighted index of 300 firms currently consisting of 14 industries. The stocks are represented in the index in proportion to the aggregate value of the freely-tradable shares outstanding for all 300 stocks.

The variables selected in an attempt to outperform the TSE 300 are market capitalization, the E/P ratio, past returns, and the B/M ratio. The studied time period covers 15 years, starting in January 1982 and ending in December 1996. The only variable that is not available for the complete 15 years is the B/M ratio, which is available only back to 1989. The past return strategy is based on four different formation periods; namely, the past quarter, the past two quarters, the past three quarters, and the past year. The portfolios are formed initially at the end of January 1982, and their returns are determined monthly. The portfolios are rebalanced each year at the end of January.

There is no theoretical or empirical reason for using the closing numbers at the end of January to form the tilted portfolios. Originally, it was hoped that the study would go back to the inception of the TSE 300 Index in 1977. The first available data for the

TSE 300 Index was at the close of January 1977. Due to difficulties in obtaining reliable data, the time frame for the study was shortened to begin in 1982. All stocks of the TSE 300 are used to avoid any survivorship bias.

The list of stocks included in the TSE 300 Index and the relative weight of each stock are obtained from the Toronto Stock Exchange Review. Due to rounding, the weights in the Toronto Stock Exchange Review did not sum to 100% for all months. For calculation purposes it is important that the weights do total 100%. To correct this, the weight of each individual stock is divided by the total weight of the 300 stocks. This causes only slight changes to the individual weights and forces them to sum 100%.

The earnings/price ratio is calculated using data from the Toronto Stock Exchange Review. The P/E ratios are available directly from the Toronto Stock Exchange Review, but stocks with negative earnings cannot have a P/E. Therefore, the E/P ratio is used because it is capable of handling negative earnings. The E/P ratio is calculated by simply dividing the earnings per share by the closing price. Any earnings that are in US$ are converted into CDN$ using the exchange rate provided by the Toronto Stock Exchange Review for that month.

The only source for book values that contains essentially all of the TSE 300 stocks is The Globe and Mail Report on Business. From 1992 to 1996 obtaining all the book values for the stocks of the TSE 300 was possible. One stock had no book value in 1990 and 1991, and 11 firms had no book values in 1989. Missing values are replaced with a

book value of zero. In doing so, they are likely to end up in the first or second decile when sorted. Consequently, when the tilted portfolios are formed their weights will be reduced. Most of the missing book values in 1989 are for firms that were delisted. Any bias introduced is believed to be small and only present in 1989.

A common problem with accounting-based ratios is timing. Book values are available only in annual reports and not all firms have fiscal years that end at the same point in calendar time. Consequently, last year's book value had to be used to calculate some B/M ratios. The market value used to calculate the B/M is the closing price for January.

The returns for both individual stocks and the TSE 300 Index are obtained from the Canadian Financial Market Research Center TSE Database (CFMRC), formerly the TSE/Western Database. There are situations for which total monthly returns are not available from this source. The two most common reasons are when firms restructure and when a stock is not frequently traded. The latter problem is solved by using the prices from the Toronto Stock Exchange Review and the dividend information from the Financial Post Annual Dividend Record and Moody's Dividend Record. In these cases, the last available prices are used to calculate the monthly total return.

Dealing with firms that restructured is more challenging. The two general guidelines used are to remain invested in equities when possible and to try to reflect as accurately as possible the particular situation. Unfortunately, this involves a subjective

element. The information used to decide how to handle these situations is obtained from the Toronto Stock Exchange Review, The Financial Post Annual Dividend Record, and Moody's Dividend Record. Since relatively few cases occur, the impact of these adjustments on the results is not expected to be significant.

Occasionally, when firms are delisted the last return(s) is calculated using prices from the Toronto Stock Exchange Review and information from The Financial Post Annual Dividend Record, and Moody's Dividend Record. This is required because the Canadian Financial Market Research Center TSE Database (CFMRC) had stopped reporting the firm's data a few months before they were delisted. Any delisted stock is assumed to have monthly returns of 0% for the remainder of the year.

Ideally we want the difference between the TSE 300 Index and the portfolio that reallocates 0% of the weights to differ as little as possible. Two main reasons caused the two portfolios to differ somewhat. The passive tilting strategy did not change its holdings as stocks were dropped from the index and new ones were added. The turnover in the index averaged about 9% annually over the 15 years. The annual turnover ranged from a low of 4.33% to a high of 12.66%. The shorter period used to test the book-to-market ratio strategy displayed a similar turnover. The other potential difference is due to the treatment of mergers, acquisitions, and the like. The difference between the TSE 300 Index and the 0% weight reallocation portfolio is small for the total period, but varies somewhat by subperiod.

The past returns are calculated using continuously compounded returns for each selected interval (-Q1, -Q2, -Q3, and -Q4) prior to the point that each portfolio is formed. The past returns are calculated using the same data set used for the stocks. The data set was extended back one year and was also extended to include stocks that were not in the TSE 300 during the previous year. If it was not possible to obtain the returns a full year back, the missing monthly returns were assumed to be zero. It should be noted that continuously compounded returns assume that all dividends are reinvested.

The tilted portfolios are formed by sorting the stocks by a variable and then forming deciles. The first decile consists of stocks expected to do poorly and the tenth decile has the stocks expected to outperform. Several portfolios are then created based on the percentage X of the total weight of the portfolio that was redistributed. The portfolios examined are the ones that redistributed 0, 5, 10, 15, 20, 25, 40, 50, 75, 100, 150, and 200 percent of the total weight. Therefore, for each variable, there are twelve portfolios consisting of 300 stocks which vary only with respect to the weight assigned to each stock.

The weights are redistributed in the following manner. The initial weight of the decile i is W_i, where i = 1, 2, 3, ..., 10. Next, a denominator D is calculated as follows $D = \Sigma\, i^2 W_i$. The weight of decile i is then modified from W_i to W_i', where

$$W_i' = W_i (1 - X) + X (i^2 W_i / D),$$

and X is the percentage reallocated (equivalent to the percentage reduction). Consequently, as the decile number increases, the percentage added back increases. The

final step is to calculate the return of the portfolio for each month it is held. This is accomplished by multiplying the weight and the return of each stock and adding up all 300 products.

Using this method creates a series of monthly returns from February 1982 to December 1996 for each strategy (except for B/M). These series are compared with the returns of the TSE 300 Index for the whole period and for three five-year subperiods. The average return, standard deviation, correlation, and Sharpe measure are calculated. To test if the Sharpe measures of the tilted portfolios are statistically different from that of the underlying index, the Jobson and Korkie test of significance for two portfolios is used. The null hypothesis is Ho: $Sh_{in} = 0$, where Sh is the transformed difference of the Sharpe measure. The transformed difference is found by multiplying the return of the tilted portfolio and the standard deviation of the TSE 300 Index and subtracting the product of the return of the TSE 300 and the standard deviation of the tilted portfolio. The Z statistic is found by dividing the transformed difference by the square root of the estimated variance of the transformed difference. The Type I error level is set at $\alpha = 0.05$ to accept or reject the null hypothesis.

4. EMPIRICAL RESULTS

4.1 Tests of a Passive Tilting Strategy Using E/P as the Screen

The first results examined are for the earnings/price ratio tilting strategy. These results are presented in Table I. The statistics for the market, represented by the TSE 300, are presented in the first row. The first column reports the percentages of the portfolio that are redistributed. The second and third columns report the average monthly returns and standard deviations, respectively, of the various portfolios. The fourth column reports the correlation of the tilted portfolio to that of the TSE 300 Index. The fifth column contains the *Z*-statistic calculated using the Jobson and Korkie test of significance for the passive tilted portfolio and the market index. In the last column, the Sharpe measure is presented for each portfolio. Based on these results, this strategy did not provide any significant results from February 1982 to December 1996.

The initial portfolio that does not redistribute any of the investment weights has a slightly higher average return than that of the TSE 300. As the weights are redistributed to increase holdings in the stocks with higher earning/price ratios, the average monthly return increases, and the standard deviations decrease, except for the last two portfolios. While this is precisely what is desired, the *Z*-statistic shows that the results are never significant on a risk-adjusted basis. Except for the last portfolio, the Sharpe measure continuously

increases. The correlation of the titled portfolios with the market decrease as larger percentages are redistributed, as expected, but always remain strong. These results imply that the desired trends are present for this tilting strategy, but are not sufficiently strong to be statistically significant.

To gain further insight, the above strategy also is examined for three subperiods. This enables us to determine if the relative performance of the strategy varies over time. The results for the first subperiod from February 1982 to January 1987 are reported in Table I (a). The reported desired trends of Table I are also found for this subperiod. However, the results present a significant relative performance only when 100% of the portfolio is redistributed. Table I (b) present the findings for the second subperiod from February 1987 to January 1992. No significant risk-adjusted relative performance is achieved with the passive portfolios tilted based on E/P ratios in this period. The results of the final subperiod from February 1992 to December 1996 are reported in Table I (c). Table I (c) reports a decreasing average monthly return and standard deviation as larger percentages (investment proportions) are redistributed for the passive tilted portfolios based on the E/P ratios. Ultimately, none of the Sharpe measures are different statistically from those of the TSE 300 for this period.

Summarizing, the Earnings/Price tilting strategy provides better returns and lower risks than the TSE 300 over the 15-year time horizon. The results are not significant, but they do demonstrate the desired trend. The subperiod results for this tilting strategy vary somewhat but do not differ materially from those for the total period.

The U-shaped relation between E/P and stock returns referred to by Fama and French (1992) is examined next. The results from simply sorting the earning/price ratios provide the desired trend, but the results are generally not significant. If the earnings/price ratios are sorted to reflect the U-shaped relationship, obtaining more convincing results may be possible. The earnings/price ratios are first sorted so that the weights for zero and negative earnings/price ratios are increased. Then they are sorted a second time (excluding the zero and negative E/Ps) so that the weights of larger earnings/price ratios are increased. Table I (d) reports the results of the U-shaped earnings/price ratio tilting strategy from February 1982 to December 1996.

The results for this strategy are similar to that for the market. There are only slight changes in the standard deviation, and average monthly return decreases. This decreases the Sharpe measure as tilting is increased. The strategy provides similar findings for each of the five year subperiods (not reported). The results are not consistent with the U-shaped patterns described by Fama and French (1992). Our findings suggest that stocks with negative earnings/price ratios underperform the TSE 300 from February 1982 to December 1996.

4.2 Tests of a Passive Tilting Strategy Using Size as the Screen

The second tilting strategy investigated is based on the weights (size) of the TSE 300 Composite Index. The stocks are sorted as to decrease holdings in larger firms and to

increase holdings for smaller firms. The results for this tilting strategy over the period from February 1982 to December 1996 are summarized in Table II. The monthly returns and standard deviations increase as more weights are shifted to smaller firms. The declining Sharpe measure implies that investors are not sufficiently rewarded for taking on this increased risk. The correlations between the tilted passive portfolios and the TSE 300 decline much faster than they did for the previous tilting strategy. Even if this strategy significantly outperforms the index, it is difficult to use for indexing purposes due to its lack of correlation with the market.

For the period from February 1982 to January 1987, the results reported in Table II (a) indicate a much greater difference in returns between the tilted passive portfolios and the market benchmark. For the larger redistributions of the weights, returns are about 1% higher per month than for the TSE 300 Index. Unfortunately, this is accompanied with a much larger standard deviation. The Sharpe measure indicates that the greater returns are not sufficient enough to compensate for the increased risk. In addition, the correlations between the passive tilted portfolios and the TSE 300 Index are relatively weak.

The results for the period from February 1987 to January 1992 are presented in Table II (b). The table reports a decrease in average monthly returns and an increase in standard deviations as greater percentages are redistributed. This return/risk relationship is inconsistent with traditional financial belief. Based on the decreasing values of the Sharpe measure, this strategy performs poorly. However, the Sharpe measures for the tilted passive portfolios and the TSE 300 Index are not significantly different. The correlations of these

tilted passive portfolios with the market index for the second five year subperiod are relatively high. The results for the last five year period from February 1992 to December 1996 are presented in Table II (c). They are mixed in that a slightly decreasing average monthly return and risk is found initially. This increases the Sharpe measure by a small amount. For redistributions of 75% or greater, returns continue to decline but the standard deviation increases. Consequently, the Sharpe measure declines and no significant results are reported. The correlations between the tilted passive portfolios and the market benchmark are strong.

It appears based on this tilting strategy that the behavior of smaller stocks is volatile. They tend to be riskier than larger stocks. Thus, overweighting a portfolio with such stocks does not appear to provide additional returns to compensate for the increased risk. Moreover, the strategy does not result in portfolios that track the TSE 300 Index very well. This tilting strategy leads to poor relative performance during the 15-year period studied herein. The results are consistent with the findings of Bourgeois and Lussier (1994), who conclude that size as a single screen has disappointing results. It appears that the results are similar using the TSE 300 Index, which they conjecture could provide better results.

Masters (1998) believes that equally-weighted portfolios should be used to avoid the buying high and selling low problem with capitalization-weighted indexes. The previous strategy based on index weights attempts to correct this problem by shifting weights from the larger stocks to the smaller ones. While this strategy did poorly, better results may be

possible by simply equally weighting the stocks of the TSE 300 Index as suggested by Masters.

The results for such equally-weighted stock portfolios are presented in Table II (d) for the period from February 1982 to December 1996. The TSE 300 has a slightly higher average monthly return and Sharpe measure than the equally-weighted portfolio. However, the differences are not statistically significant. The relatively low correlations between the equally-weighted portfolio and the market benchmark is consistent with the results reported for the tilted portfolios based on index weights. Moreover, the equally-weighted portfolio does not perform significantly better in any of the five year subperiods. These findings indicate that the equally-weighted portfolios perform no better than the portfolios formed using value weighted portfolios for this tilting strategy. As a further test, we redistribute negative percentages. This allows us to take short positions in the smaller companies, and to use the proceeds of short-selling to reinvest in the larger ones. The unreported results indicate that such a strategy does not generate Sharpe measures significantly different than that of the TSE 300 Index.

4.3 Tests of a Passive Tilting Strategy Using Momentum as the Screen

A momentum-based tilting strategy that sorts stocks on past returns is examined next for four different formation periods. Stocks are first sorted based on their quarterly

returns for the previous year. Weights are redistributed so as to increase the weights of the better performers and to decrease the weights of those stocks that did poorly in the past.

Results using a tilting strategy based on the return for the last quarter are reported in Table III. The return and risk performances of the tilted passive portfolios are similar to that of the TSE 300 Index. Sharpe measures for the tilted passive portfolios and the benchmark are not significantly different, and the high correlations indicate that the tilted portfolios track the TSE 300 well. These results are robust for the subperiods.

The results using a tilting strategy based on the returns of the prior two quarters are reported in Table IV. While the returns of the passive portfolios using this tilting strategy increase as more weights are redistributed, their corresponding standard deviations decline slightly up to a 75% redistribution of weights. Except for the last portfolio, the Sharpe measures consistently increase, but none are statistically different from those of the TSE 300 Index. These results are robust for the subperiods from 1982 to 1987 (Table IV (a)) and from 1992 to 1996 (Table IV (c)). In contrast, over the subperiod from 1987 to 1992 (Table IV (b)) the returns of the passive portfolios using this tilting strategy steadily decline and their standard deviations increase. The decreases in the Sharpe measures of these portfolios are not significant. The correlations between the returns on these portfolios and the market benchmark are high for all of the studied periods.

The results for a tilting strategy based on the returns of the last three quarters are reported in Table V. For the total period, returns for the passive portfolios tilted using this

strategy increase modestly while risk remains stable. Sharpe measures for these portfolios exhibit no statistically significant changes. The correlations between the passive tilted portfolio and the TSE 300 are strong. These results are robust for all subperiods.

The results using a tilting strategy based on the returns of the previous year are reported in Table VI. They are similar to those discussed using the returns for past periods of one to three quarters. No significant changes occur in the returns, standard deviations, or Sharpe measures of the passive portfolios as tilting based on four-quarter past returns is increased. Only one subperiod displays some differences in results. Over the 1982 to 1987 period, whose results are reported in Table VI (a), the returns increase and standard deviations decrease as larger proportions are reallocated. Nevertheless, the increases in the Sharpe measure approach statistical significance only for the passive portfolio that redistributes 200% of the weights. For the other two subperiods, whose results are reported in Table VI (b) and Table VI (c), the returns decline and risks increase with greater tilting, while the correlations remain high. This produces a nonsignificant reduction in the performance of the passive portfolios based on this tilting strategy.

4.4 Tests of a Passive Tilting Strategy Using Book-to-Market Ratio as the Screen

The last strategy tested for tilting passive portfolios involves screening stocks based on their book-to-market ratios. Studies find that stocks with high book-to-market ratios perform better than stocks with low book-to-market ratios. Therefore, a tilting strategy that

reallocates weights from stocks with lower book-to-market ratios to those with higher book-to-market ratios could potentially be profitable. The period studied is shorter than for the other tilting strategies, due to the difficulty in obtaining book values for the sample of stocks for the entire time period. The results for the passive portfolios tilted at various intensities based on book-to-market ratios over the period from February 1989 to December 1996 are reported in Table VII. While both the average returns and the standard deviations of these portfolios increase as larger percentages are redistributed, their Sharpe measures never exceed those of the TSE 300 Index.

Table VII (a) reports the results for the subperiod from 1989 to 1993. The passive portfolios tilted on this factor exhibit a poor performance because their mean returns fall quite dramatically and their standard deviations increase as larger amounts are reallocated. Nevertheless, none of the decreases in performance are statistically significant. The components of overall performance differ for the subperiod from 1993 to 1996 as reported in table VII (b). The passive portfolios tilted on book-to-market ratios perform better than that of the market benchmark. As more weight is placed on stocks with larger book-to-market ratios, the mean returns and standard deviations of the passive portfolios using this tilting strategy increase and decrease, respectively. However, none of the increased performances reach statistical significance. The correlations between the returns on the various passive tilted portfolios and the market benchmark are high and similar for all the studied periods.

4.5 Tests of Passive Tilting Strategies Using Multiple Screens

While many of the passive portfolios tilted using single factor tilting display Sharpe measures that exceed that of the market benchmark, none of these tilting strategies produced a superior performance. However, the performance of each strategy can vary dramatically from one period to the next. For example, Banz (1981), Brown, Kleidon, and Marsh (1983), among others, report that the size effect is not stable over time. Thus, the lack of significant results may be due to the use of single factor tilting strategies. In this section, we test whether the use of multifactor tilting strategies for the same data set generate portfolios with superior reward-to-risk performances.

We reduce the large number of possible combinations by using only the past year return for the momentum strategy. We use only the past year returns because all of the highly correlated past return strategies provide similar results. Moreover, we do not want to overweigh past returns in the multifactor tilting strategies. Finally, we use the original earnings/price tilting strategy, not the U-shaped earnings/price tilting strategy for these tests.

The formation of the passive portfolios based on the multifactor tilting strategies is as before. Each stock is sorted and ranked from 1 to 300 for each factor of the multifactor tilting strategy. The sum of the ranks is calculated for each stock and used to re-sort the stocks again. Thus, the stocks are sorted by average rank. Weights are reallocated so as to decrease the weights for stocks that have lower average rankings and increase the weights of

those with higher average rankings. The redistributions are done using the same method as before.

In total 11 possible combinations are tested. They include six two-factor strategies, four three-factor strategies, and one four-factor tilting strategy. As above, the tilting strategies that use the book-to-market ratio as a factor are only examined over the period from February 1989 to December 1996. Each combination is examined for both the total period and subperiods. Only 4 of the 11 combinations generate results of some interest, Thus, to conserve space, the results for the other seven combinations are not presented herein.

The results for the passive tilting portfolio strategy with market capitalizations, earnings/price ratios, and one year past returns as factors are reported in Table VIII. For the total period, their mean returns and Sharpe measures increase and their standard deviations decrease as larger amounts are reallocated. Nevertheless, the Sharpe measures are not statistically different from that of the TSE 300 Index. For the period from 1982 to 1987 (Table VIII (a)), the trends are similar to those for the total period, but the Sharpe measures are significant for the last three portfolios. Moreover, these portfolios track the TSE 300 Index reasonably well. For the other two subperiods, which are reported in Table VIII (b) and Table VIII (c), both the mean returns and standard deviations decline as tilting intensifies. The resulting Sharpe measures are not statistically significant for any of the passive tilted portfolios with these three factors.

The results for the tilting strategy that employs the earnings/price ratio and past one year returns are reported in Table IX. This strategy yields similar results to that of the three-factor tilting strategy discussed above. For the total period, returns increase and the standard deviations decrease. Despite this, none of the managed passive portfolios report significant differences in performance based on the Sharpe measure. Significant performance results are observed only in the subperiod from 1982 to 1987 (Table IX (a)). The higher mean returns and lower standard deviations result in three portfolios having higher Sharpe performances than the market benchmark. For the portfolios in the other two subperiods that are reported in Table IX (b) and Table IX (c), the mean return, risk and Sharpe measures decrease as more weights are redistributed. No statistically significant performance is reported for these two subperiods. The tilting strategy does well at tracking the TSE 300 Index in all periods.

The result for the two-factor tilting strategy using weights and the earnings/price ratios are reported in Table X. The results exhibit mean returns and Sharpe measures that increase and risks that decrease for the February 1982 to December 1996 period. However, there are no portfolios with significant performances. For the subperiod from 1982 to 1987, whose results are reported in Table X (a), only the portfolio with 150% of the weight reallocated has a significantly different performance. The results for the other two subperiods that are presented in Table X (b) and Table X (c) report declining mean returns, standard deviations, and Sharpe measures as larger percentages are reallocated. None of the Sharpe measures are significantly different from that for the market benchmark. The two-

factor tilting strategy using weights and the earnings/price ratios tracks the market benchmark reasonably well in all periods.

The final strategy also involves two-factor tilting based on book-to-market ratios and weights. For the full period reported in Table XI, this tilting strategy generates declining returns, increasing standard deviations, and decreasing Sharpe measures. None of the passive tilted portfolios have results that are statistically different from that of the TSE 300 Index. Over the subperiod from February 1989 to January 1993 (Table XI (a)), this tilting strategy generates increasing standard deviations, declining mean returns and Sharpe measures. The performances of the passive tilting strategy are significantly inferior to that of the market benchmark for all the portfolios that redistribute weights. For the other subperiods, whose results are presented in Table XI (b), the tilting strategy generates portfolios whose mean returns increase, standard deviations decrease and Sharpe measures increase. However, none of the results for the subperiod are statistically significant at the 0.05 level. The correlations between the passive tilted portfolios and the TSE 300 are high in all periods.

5. CONCLUSION

The research on the passive tilting strategies did not provide any evidence that they could consistently perform better than the TSE 300 Index. The subperiod results demonstrate the robustness of the findings with relatively few significant results. These results imply that the TSE 300 Index is an "efficient" benchmark.

One possible explanation for the lack of significant results is the test used in the study. The Jobson and Korkie test of significance for two portfolios incorporates the return, risk, and correlation of the two portfolios compared. Therefore, more emphasis is placed on the reward-to-risk ratio and tracking. This makes it a more rigorous test than simply comparing differences in returns. Moreover, unlike many other studies, all the stocks in the index are included in the passive tilting strategies.

The tilting strategies studied in this research did not take into account the impact of taxes. The added risk-adjusted return earned by a passive tilting strategy must be sufficient to cover not only fees and trading costs but also taxes for a taxable investor. The practice of passive tilting converts an unrealized capital gain into an immediate realized gain and an associated tax liability. Unfortunately, the very activity that is intended to enhance risk-adjusted returns, the intensity and frequency of tilting, also generate tax liabilities. Thus, the results are more relevant to nontaxable investors such as pension funds.

When taxable investors are considered, the performance of certain passive tilting strategies can improve or become worse depending upon the relative tax attractiveness of dividends and capital gains to the investor. For example, due to the dividend tax credit, passive tilting that generate a higher dividend yield may become more attractive to investors in the lower marginal tax brackets. Similarly, due to the more favorable tax treatment of capital gains, passive tilting based on growth may become more attractive to investors in high marginal tax brackets. However, the incorporation of tax considerations into the analysis must be left for a subsequent study.

Of the four variables used to sort the stocks, the most consistent appears to be the earnings/price ratio. The earnings/price ratio was included in all the significant portfolios that had the desired results. It is interesting to note that all of the positive significant results are reported in the bullish period from February 1982 to January 1987. This would be consistent with the success of the strategies varying with the state of the market. The research was not designed to examine how the performances of the strategies differ depending on the state of the market. However, it would be interesting to pursue this aspect in future studies.

The results often display the appearance of a violation of the expected positive relation between risk and return since in several cases returns and risks moved in opposite directions. However, such findings are due to our use of variance of return to measure risk since we were comparing the effect of moving away from fully diversified portfolios

to achieve better returns. As expected in reasonably efficient markets, there is little support that the passive tilting strategies examined in this study enhance the risk-adjusted return performance of passive portfolios.

Table I : The Performance of the E/P Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their E/P ratio and a percentage of the total weight is reallocated such that low E/P stocks have their weights reduced and high E/P stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.066%	0.0418	0.9818	0.4722	0.2546
10%	1.068%	0.0416	0.9824	0.5889	0.2565
15%	1.070%	0.0415	0.9828	0.7035	0.2582
20%	1.073%	0.0413	0.9830	0.8142	0.2600
25%	1.075%	0.0411	0.9830	0.9193	0.2617
40%	1.083%	0.0406	0.9817	1.1863	0.2665
50%	1.088%	0.0403	0.9797	1.3147	0.2696
75%	1.100%	0.0398	0.9709	1.4636	0.2762
100%	1.112%	0.0395	0.9561	1.4397	0.2813
150%	1.136%	0.0397	0.9092	1.1879	0.2865
200%	1.161%	0.0407	0.8426	0.8785	0.2849

Table I (a) : The Performance of the E/P Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by their E/P ratio and a percentage of the total weight is reallocated such that low E/P stocks have their weights reduced and high E/P stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
5%	1.648%	0.0478	0.9654	0.5536	0.3445
10%	1.658%	0.0476	0.9674	0.6641	0.3487
15%	1.668%	0.0473	0.9693	0.7768	0.3527
20%	1.678%	0.0470	0.9710	0.8910	0.3568
25%	1.687%	0.0468	0.9724	1.0055	0.3608
40%	1.717%	0.0461	0.9752	1.3396	0.3725
50%	1.736%	0.0457	0.9758	1.5411	0.3800
75%	1.785%	0.0449	0.9724	1.9037	0.3973
100%	1.834%	0.0445	0.9616	2.0322 *	0.4120
150%	1.931%	0.0447	0.9176	1.8557	0.4320
200%	2.029%	0.0463	0.8484	1.5183	0.4387

Table I (b) : The Performance of the E/P Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by their E/P ratio and a percentage of the total weight is reallocated such that low E/P stocks have their weights reduced and high E/P stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
5%	0.452%	0.0438	0.9961	-0.3650	0.1032
10%	0.453%	0.0436	0.9958	-0.3345	0.1039
15%	0.454%	0.0434	0.9952	-0.3038	0.1046
20%	0.456%	0.0433	0.9945	-0.2734	0.1053
25%	0.457%	0.0431	0.9937	-0.2435	0.1060
40%	0.461%	0.0427	0.9902	-0.1597	0.1080
50%	0.464%	0.0424	0.9870	-0.1107	0.1093
75%	0.470%	0.0419	0.9761	-0.0154	0.1122
100%	0.477%	0.0416	0.9608	0.0446	0.1147
150%	0.490%	0.0415	0.9170	0.0943	0.1181
200%	0.503%	0.0421	0.8576	0.0937	0.1195

Table I (c) : The Performance of the E/P Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their E/P ratio and a percentage of the total weight is reallocated such that low E/P stocks have their weights reduced and high E/P stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
5%	1.097%	0.0320	0.9943	-0.0618	0.3434
10%	1.093%	0.0318	0.9935	-0.0507	0.3437
15%	1.090%	0.0317	0.9925	-0.0419	0.3439
20%	1.086%	0.0316	0.9913	-0.0355	0.3441
25%	1.082%	0.0314	0.9899	-0.0315	0.3442
40%	1.070%	0.0311	0.9845	-0.0325	0.3440
50%	1.062%	0.0309	0.9798	-0.0426	0.3436
75%	1.043%	0.0306	0.9641	-0.0921	0.3411
100%	1.023%	0.0304	0.9427	-0.1637	0.3367
150%	0.985%	0.0306	0.8838	-0.3350	0.3222
200%	0.946%	0.0314	0.8077	-0.5139	0.3012

Table I (d) : The Performance of the U-Shape E/P Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their E/P ratio and a percentage of the total weight is reallocated such that low positive E/P stocks have their weights reduced and negative, zero, and high E/P stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
25%	1.049%	0.0418	0.9856	0.2531	0.2507
50%	1.034%	0.0418	0.9865	0.0516	0.2476
75%	1.019%	0.0418	0.9837	-0.2036	0.2436
100%	1.005%	0.0421	0.9773	-0.4488	0.2388
150%	0.976%	0.0430	0.9546	-0.8292	0.2268

Table II : The Performance of the Capitalization Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their index weight ratio and a percentage of the total weight is reallocated such that larger stocks have their weights reduced and smaller stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.066%	0.0423	0.9746	0.2661	0.2519
10%	1.068%	0.0426	0.9667	0.1767	0.2506
15%	1.070%	0.0430	0.9576	0.0900	0.2490
20%	1.072%	0.0434	0.9473	0.0070	0.2470
25%	1.075%	0.0439	0.9360	-0.0720	0.2448
40%	1.082%	0.0457	0.8972	-0.2865	0.2368
50%	1.086%	0.0471	0.8684	-0.4127	0.2305
75%	1.098%	0.0515	0.7918	-0.6800	0.2133
100%	1.109%	0.0567	0.7160	-0.8911	0.1957
150%	1.133%	0.0689	0.5842	-1.1930	0.1644
200%	1.156%	0.0826	0.4833	-1.3905	0.1400

Table II (a) : The Performance of the Capitalization Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by their index weight ratio and a percentage of the total weight is reallocated such that larger stocks have their weights reduced and smaller stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
5%	1.663%	0.0488	0.9487	0.4087	0.3410
10%	1.688%	0.0496	0.9321	0.3613	0.3407
15%	1.713%	0.0505	0.9139	0.3088	0.3395
20%	1.738%	0.0515	0.8941	0.2542	0.3377
25%	1.763%	0.0526	0.8733	0.1994	0.3352
40%	1.838%	0.0566	0.8073	0.0426	0.3247
50%	1.887%	0.0597	0.7627	-0.0520	0.3163
75%	2.012%	0.0686	0.6577	-0.2502	0.2935
100%	2.136%	0.0786	0.5679	-0.4008	0.2717
150%	2.385%	0.1009	0.4341	-0.6045	0.2363
200%	2.634%	0.1248	0.3443	-0.7310	0.2111

Table II (b) : The Performance of the Capitalization Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by their index weight ratio and a percentage of the total weight is reallocated such that larger stocks have their weights reduced and smaller stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
5%	0.433%	0.0440	0.9961	-0.5455	0.0984
10%	0.416%	0.0441	0.9954	-0.6884	0.0944
15%	0.399%	0.0442	0.9944	-0.8206	0.0903
20%	0.382%	0.0443	0.9930	-0.9400	0.0862
25%	0.365%	0.0445	0.9912	-1.0460	0.0821
40%	0.314%	0.0450	0.9837	-1.2881	0.0698
50%	0.280%	0.0454	0.9771	-1.3982	0.0617
75%	0.194%	0.0467	0.9554	-1.5643	0.0417
100%	0.109%	0.0483	0.9280	-1.6494	0.0226
150%	-0.062%	0.0525	0.8627	-1.7290	-0.0117
200%	-0.232%	0.0578	0.7931	-1.7637	-0.0402

Table II (c) : The Performance of the Capitalization Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their index weight ratio and a percentage of the total weight is reallocated such that larger stocks have their weights reduced and smaller stocks have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
5%	1.100%	0.0319	0.9952	-0.0253	0.3444
10%	1.099%	0.0318	0.9951	0.0207	0.3457
15%	1.098%	0.0317	0.9946	0.0615	0.3469
20%	1.098%	0.0315	0.9937	0.0962	0.3479
25%	1.097%	0.0314	0.9924	0.1240	0.3488
40%	1.094%	0.0312	0.9860	0.1666	0.3507
50%	1.092%	0.0311	0.9796	0.1659	0.3512
75%	1.087%	0.0311	0.9563	0.1014	0.3498
100%	1.083%	0.0314	0.9231	-0.0057	0.3448
150%	1.074%	0.0330	0.8339	-0.2457	0.3254
200%	1.064%	0.0357	0.7296	-0.4679	0.2983

Table II (d) : The Performance of the Equally-Weighted Tilting Strategy for the Period From February 1982 to December 1996

The weights of the 300 stocks of the TSE 300 Index are reallocated to be equally-weighted. The portfolios are rebalanced each year at the end of January. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
Equal	1.036%	0.0526	0.7844	-0.9908	0.1971

Table III : The Performance of the Past Quarter Momentum Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past quarter and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.062%	0.0420	0.9826	0.3600	0.2527
10%	1.060%	0.0420	0.9840	0.3609	0.2525
15%	1.058%	0.0419	0.9851	0.3572	0.2523
20%	1.057%	0.0419	0.9860	0.3486	0.2521
25%	1.055%	0.0419	0.9868	0.3345	0.2518
40%	1.050%	0.0419	0.9879	0.2590	0.2505
50%	1.047%	0.0420	0.9876	0.1833	0.2495
75%	1.038%	0.0422	0.9837	-0.0539	0.2460
100%	1.030%	0.0427	0.9751	-0.2913	0.2414
150%	1.014%	0.0442	0.9459	-0.6654	0.2295
200%	0.997%	0.0464	0.9047	-0.9383	0.2150

Table IV : The Performance of the Past Two Quarters Momentum Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past two quarters and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.066%	0.0419	0.9826	0.4506	0.2542
10%	1.069%	0.0418	0.9838	0.5475	0.2555
15%	1.072%	0.0417	0.9849	0.6444	0.2568
20%	1.074%	0.0416	0.9858	0.7400	0.2580
25%	1.077%	0.0416	0.9865	0.8323	0.2592
40%	1.086%	0.0414	0.9872	1.0706	0.2624
50%	1.091%	0.0413	0.9866	1.1814	0.2643
75%	1.105%	0.0412	0.9814	1.2681	0.2680
100%	1.119%	0.0414	0.9708	1.1701	0.2703
150%	1.147%	0.0424	0.9350	0.8270	0.2704
200%	1.175%	0.0443	0.8840	0.4983	0.2655

Table IV (a) : The Performance of the Past Two Quarters Momentum Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by their returns for the past two quarters and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
5%	1.643%	0.0478	0.9661	0.5375	0.3437
10%	1.647%	0.0475	0.9688	0.6321	0.3470
15%	1.651%	0.0471	0.9713	0.7293	0.3502
20%	1.655%	0.0468	0.9736	0.8282	0.3533
25%	1.659%	0.0465	0.9755	0.9279	0.3564
40%	1.670%	0.0457	0.9797	1.2173	0.3652
50%	1.678%	0.0453	0.9809	1.3854	0.3705
75%	1.698%	0.0445	0.9777	1.6318	0.3821
100%	1.718%	0.0440	0.9652	1.6120	0.3903
150%	1.758%	0.0445	0.9121	1.2224	0.3954
200%	1.798%	0.0466	0.8294	0.8039	0.3861

Table IV (b) : The Performance of the Past Two Quarters Momentum Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by their returns for the past two quarters and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels. respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
5%	0.450%	0.0440	0.9964	-0.4060	0.1021
10%	0.449%	0.0441	0.9962	-0.4161	0.1018
15%	0.449%	0.0442	0.9959	-0.4252	0.1015
20%	0.448%	0.0443	0.9955	-0.4334	0.1012
25%	0.448%	0.0444	0.9950	-0.4405	0.1009
40%	0.446%	0.0447	0.9926	-0.4564	0.0998
50%	0.445%	0.0449	0.9903	-0.4632	0.0990
75%	0.442%	0.0456	0.9827	-0.4716	0.0969
100%	0.439%	0.0464	0.9724	-0.4748	0.0945
150%	0.433%	0.0484	0.9454	-0.4808	0.0894
200%	0.427%	0.0509	0.9123	-0.4913	0.0839

Table IV (c) : The Performance of the Past Two Quarters Momentum Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past two quarters and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
5%	1.106%	0.0321	0.9950	-0.0033	0.3450
10%	1.111%	0.0320	0.9951	0.0680	0.3470
15%	1.116%	0.0320	0.9951	0.1383	0.3490
20%	1.121%	0.0320	0.9950	0.2071	0.3509
25%	1.126%	0.0319	0.9948	0.2739	0.3528
40%	1.142%	0.0319	0.9936	0.4590	0.3584
50%	1.152%	0.0318	0.9924	0.5667	0.3619
75%	1.177%	0.0318	0.9877	0.7743	0.3702
100%	1.202%	0.0318	0.9807	0.9003	0.3777
150%	1.252%	0.0321	0.9600	0.9851	0.3897
200%	1.303%	0.0327	0.9314	0.9543	0.3980

Table V : The Performance of the Past Three Quarters Momentum Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past three quarters and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.064%	0.0420	0.9823	0.4022	0.2534
10%	1.065%	0.0419	0.9833	0.4484	0.2540
15%	1.066%	0.0419	0.9842	0.4930	0.2546
20%	1.067%	0.0418	0.9850	0.5355	0.2551
25%	1.068%	0.0418	0.9856	0.5751	0.2556
40%	1.071%	0.0417	0.9865	0.6708	0.2568
50%	1.073%	0.0417	0.9864	0.7101	0.2574
75%	1.077%	0.0417	0.9834	0.7155	0.2583
100%	1.082%	0.0419	0.9768	0.6218	0.2582
150%	1.091%	0.0428	0.9533	0.3388	0.2551
200%	1.101%	0.0442	0.9185	0.0655	0.2489

Table VI : The Performance of the Past Year Momentum Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past year and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
5%	1.063%	0.0420	0.9816	0.3745	0.2531
10%	1.063%	0.0420	0.9819	0.3918	0.2533
15%	1.063%	0.0419	0.9821	0.4068	0.2535
20%	1.063%	0.0419	0.9823	0.4193	0.2537
25%	1.063%	0.0419	0.9823	0.4293	0.2539
40%	1.063%	0.0418	0.9817	0.4429	0.2542
50%	1.063%	0.0418	0.9808	0.4386	0.2542
75%	1.062%	0.0418	0.9767	0.3882	0.2539
100%	1.062%	0.0420	0.9698	0.2992	0.2529
150%	1.062%	0.0427	0.9488	0.0809	0.2489
200%	1.061%	0.0437	0.9192	-0.1346	0.2426

Table VI (a) : The Performance of the Past Year Momentum Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by their returns for the past year and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
5%	1.644%	0.0479	0.9638	0.5128	0.3431
10%	1.650%	0.0477	0.9644	0.5799	0.3459
15%	1.656%	0.0475	0.9649	0.6473	0.3486
20%	1.662%	0.0473	0.9654	0.7146	0.3514
25%	1.668%	0.0471	0.9657	0.7818	0.3541
40%	1.685%	0.0465	0.9664	0.9798	0.3623
50%	1.697%	0.0461	0.9664	1.1068	0.3677
75%	1.726%	0.0453	0.9648	1.3950	0.3810
100%	1.755%	0.0446	0.9608	1.6249	0.3938
150%	1.813%	0.0435	0.9445	1.8822	0.4172
200%	1.871%	0.0428	0.9164	1.9192	0.4367

Table VI (b) : The Performance of the Past Year Momentum Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by their returns for the past year and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
5%	0.447%	0.0441	0.9963	-0.4341	0.1014
10%	0.443%	0.0441	0.9961	-0.4722	0.1003
15%	0.439%	0.0442	0.9958	-0.5090	0.0993
20%	0.435%	0.0443	0.9954	-0.5444	0.0982
25%	0.431%	0.0444	0.9950	-0.5782	0.0971
40%	0.420%	0.0447	0.9931	-0.6695	0.0939
50%	0.412%	0.0449	0.9914	-0.7216	0.0918
75%	0.393%	0.0456	0.9859	-0.8239	0.0863
100%	0.374%	0.0463	0.9787	-0.8943	0.0809
150%	0.336%	0.0479	0.9596	-0.9783	0.0701
200%	0.298%	0.0499	0.9361	-1.0248	0.0596

Table VI (c) : The Performance of the Past Year Momentum Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their returns for the past year and a percentage of the total weight is reallocated such that stocks with lower returns have their weights reduced and stocks with larger returns have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
5%	1.099%	0.0321	0.9953	-0.1072	0.3421
10%	1.097%	0.0321	0.9955	-0.1413	0.3412
15%	1.095%	0.0322	0.9956	-0.1771	0.3402
20%	1.093%	0.0322	0.9955	-0.2142	0.3392
25%	1.090%	0.0322	0.9953	-0.2521	0.3381
40%	1.084%	0.0324	0.9936	-0.3665	0.3346
50%	1.080%	0.0325	0.9917	-0.4400	0.3319
75%	1.069%	0.0329	0.9845	-0.6036	0.3246
100%	1.058%	0.0334	0.9738	-0.7366	0.3163
150%	1.036%	0.0348	0.9441	-0.9384	0.2975
200%	1.014%	0.0366	0.9065	-1.0913	0.2770

Table VII : The Performance of the Book-To-Market Tilting Strategy for the Period From February 1989 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their book-to-market ratios and a percentage of the total weight is reallocated such that stocks with lower book-to-market ratios have their weights reduced and stocks with larger book-to-market ratios have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 95 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.827%	0.0329			0.2510
0%	0.756%	0.0325	0.9945	-0.9756	0.2328
5%	0.760%	0.0325	0.9944	-0.9134	0.2339
10%	0.764%	0.0325	0.9941	-0.8492	0.2350
15%	0.768%	0.0326	0.9936	-0.7843	0.2360
20%	0.772%	0.0326	0.9929	-0.7199	0.2369
25%	0.776%	0.0326	0.9921	-0.6572	0.2378
40%	0.788%	0.0328	0.9884	-0.4877	0.2403
50%	0.796%	0.0329	0.9851	-0.3946	0.2417
75%	0.817%	0.0334	0.9739	-0.2319	0.2445
100%	0.837%	0.0340	0.9591	-0.1467	0.2461
150%	0.877%	0.0356	0.9205	-0.1035	0.2464
200%	0.918%	0.0377	0.8743	-0.1353	0.2437

Table VII (a) : The Performance of the Book-To-Market Tilting Strategy for the Period From February 1989 to January 1993

The 300 stocks of the TSE 300 Index are sorted by their book-to-market ratios and a percentage of the total weight is reallocated such that stocks with lower book-to-market ratios have their weights reduced and stocks with larger book-to-market ratios have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 48 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.159%	0.0308			0.0516
0%	-0.004%	0.0301	0.9938	-1.5578	-0.0013
5%	-0.006%	0.0303	0.9939	-1.5784	-0.0019
10%	-0.007%	0.0304	0.9939	-1.5934	-0.0024
15%	-0.009%	0.0306	0.9937	-1.6029	-0.0030
20%	-0.011%	0.0307	0.9933	-1.6071	-0.0035
25%	-0.012%	0.0309	0.9927	-1.6062	-0.0040
40%	-0.018%	0.0314	0.9900	-1.5785	-0.0056
50%	-0.021%	0.0318	0.9874	-1.5446	-0.0066
75%	-0.030%	0.0328	0.9785	-1.4349	-0.0090
100%	-0.038%	0.0339	0.9669	-1.3213	-0.0112
150%	-0.055%	0.0365	0.9380	-1.1367	-0.0151
200%	-0.072%	0.0394	0.9051	-1.0104	-0.0184

Table VII (b) : The Performance of the Book-To-Market Tilting Strategy for the Period From February 1993 to December 1996

The 300 stocks of the TSE 300 Index are sorted by their book-to-market ratios and a percentage of the total weight is reallocated such that stocks with lower book-to-market ratios have their weights reduced and stocks with larger book-to-market ratios have their weights increased. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 47 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.508%	0.0339			0.4446
0%	1.532%	0.0332	0.9956	0.4691	0.4609
5%	1.542%	0.0331	0.9954	0.5992	0.4655
10%	1.552%	0.0330	0.9950	0.7241	0.4701
15%	1.562%	0.0329	0.9944	0.8425	0.4746
20%	1.572%	0.0328	0.9936	0.9536	0.4791
25%	1.582%	0.0327	0.9927	1.0564	0.4835
40%	1.611%	0.0325	0.9887	1.3131	0.4964
50%	1.631%	0.0323	0.9852	1.4413	0.5046
75%	1.681%	0.0321	0.9728	1.6350	0.5237
100%	1.730%	0.0320	0.9556	1.7001	0.5404
150%	1.829%	0.0323	0.9076	1.6373	0.5658
200%	1.928%	0.0333	0.8449	1.4733	0.5799

Table VIII : The Performance of the Capitalization, Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
25%	1.078%	0.0412	0.9807	0.8939	0.2620
50%	1.093%	0.0404	0.9765	1.2911	0.2705
75%	1.108%	0.0398	0.9681	1.5056	0.2782
100%	1.124%	0.0394	0.9553	1.5753	0.2849
150%	1.154%	0.0392	0.9162	1.4820	0.2945

Table VIII (a) : The Performance of the Capitalization, Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
25%	1.721%	0.0465	0.9643	1.1470	0.3704
50%	1.804%	0.0450	0.9618	1.7995	0.4010
75%	1.887%	0.0437	0.9549	2.3220 *	0.4319
100%	1.969%	0.0426	0.9427	2.6786 **	0.4622
150%	2.135%	0.0412	0.9006	2.9660 **	0.5187

Table VIII (b) : The Performance of the Capitalization, Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
25%	0.427%	0.0436	0.9941	-0.5393	0.0979
50%	0.403%	0.0433	0.9891	-0.6484	0.0931
75%	0.380%	0.0432	0.9814	-0.7237	0.0879
100%	0.356%	0.0432	0.9709	-0.7748	0.0825
150%	0.309%	0.0435	0.9421	-0.8376	0.0710

Table VIII (c) : The Performance of the Capitalization, Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
25%	1.087%	0.0313	0.9938	0.0571	0.3468
50%	1.073%	0.0307	0.9881	0.1240	0.3491
75%	1.058%	0.0302	0.9773	0.1246	0.3498
100%	1.044%	0.0299	0.9611	0.0802	0.3487
150%	1.015%	0.0298	0.9125	-0.0722	0.3407

Table IX : The Performance of the Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
25%	1.070%	0.0411	0.9848	0.8686	0.2603
50%	1.078%	0.0404	0.9843	1.2795	0.2669
75%	1.085%	0.0398	0.9791	1.4635	0.2724
100%	1.092%	0.0395	0.9689	1.4524	0.2768
150%	1.107%	0.0394	0.9330	1.1878	0.2812

Table IX (a) : The Performance of the Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
25%	1.682%	0.0464	0.9743	1.0821	0.3629
50%	1.726%	0.0448	0.9805	1.7698	0.3850
75%	1.770%	0.0436	0.9804	2.3181 *	0.4058
100%	1.814%	0.0427	0.9729	2.5648 *	0.4247
150%	1.902%	0.0420	0.9333	2.3810 *	0.4533

Table IX (b) : The Performance of the Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
25%	0.442%	0.0434	0.9943	-0.4051	0.1017
50%	0.433%	0.0430	0.9897	-0.4039	0.1006
75%	0.424%	0.0427	0.9823	-0.3980	0.0993
100%	0.415%	0.0425	0.9722	-0.3923	0.0977
150%	0.398%	0.0425	0.9437	-0.3897	0.0936

Table IX (c) : The Performance of the Earning/Price Ratio, and Past Year Return Multifactor Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
25%	1.088%	0.0317	0.9926	-0.0788	0.3428
50%	1.074%	0.0315	0.9863	-0.1187	0.3412
75%	1.061%	0.0314	0.9758	-0.1819	0.3382
100%	1.047%	0.0314	0.9612	-0.2567	0.3337
150%	1.020%	0.0318	0.9205	-0.4170	0.3208

Table X : The Performance of the Capitalization and Earning/Price Ratio Multifactor Tilting Strategy for the Period From February 1982 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 179 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.038%	0.0421			0.2468
0%	1.063%	0.0421	0.9811	0.3551	0.2528
25%	1.075%	0.0412	0.9779	0.8017	0.2611
50%	1.086%	0.0404	0.9701	1.0776	0.2686
75%	1.098%	0.0399	0.9574	1.1946	0.2750
100%	1.109%	0.0396	0.9394	1.2049	0.2801
150%	1.132%	0.0396	0.8883	1.0661	0.2860

Table X (a) : The Performance of the Capitalization and Earning/Price Ratio Multifactor Tilting Strategy for the Period From February 1982 to January 1987

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.477%	0.0460			0.3211
0%	1.639%	0.0481	0.9631	0.4459	0.3404
25%	1.715%	0.0470	0.9606	0.9781	0.3645
50%	1.791%	0.0461	0.9537	1.4160	0.3881
75%	1.867%	0.0455	0.9419	1.7285	0.4106
100%	1.943%	0.0450	0.9251	1.9212	0.4317
150%	2.095%	0.0448	0.8764	2.0488 *	0.4675

Table X (b) : The Performance of the Capitalization and Earning/Price Ratio Multifactor Tilting Strategy for the Period From February 1987 to January 1992

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 60 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.522%	0.0463			0.1127
0%	0.450%	0.0440	0.9964	-0.3951	0.1024
25%	0.442%	0.0433	0.9933	-0.3772	0.1022
50%	0.434%	0.0427	0.9862	-0.3510	0.1016
75%	0.425%	0.0423	0.9748	-0.3290	0.1005
100%	0.417%	0.0422	0.9589	-0.3158	0.0989
150%	0.400%	0.0424	0.9146	-0.3135	0.0945

Table X (c) : The Performance of the Capitalization and Earning/Price Ratio Multifactor Tilting Strategy for the Period From February 1992 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 59 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.117%	0.0324			0.3451
0%	1.101%	0.0321	0.9949	-0.0752	0.3430
25%	1.067%	0.0310	0.9912	-0.0223	0.3445
50%	1.033%	0.0300	0.9822	-0.0264	0.3442
75%	1.000%	0.0292	0.9668	-0.0764	0.3419
100%	0.966%	0.0286	0.9444	-0.1549	0.3373
150%	0.898%	0.0280	0.8774	-0.3531	0.3204

Table XI : The Performance of the Capitalization and Book-To-Market Ratio Multifactor Tilting Strategy for the Period From February 1989 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 95 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.827%	0.0329			0.2510
0%	0.756%	0.0325	0.9945	-0.9756	0.2328
25%	0.728%	0.0326	0.9895	-1.2990	0.2232
50%	0.699%	0.0330	0.9765	-1.4347	0.2120
75%	0.671%	0.0336	0.9563	-1.5031	0.1995
100%	0.642%	0.0345	0.9300	-1.5571	0.1861
150%	0.585%	0.0370	0.8657	-1.6588	0.1583

Table XI (a) : The Performance of the Capitalization and Book-To-Market Ratio Multifactor Tilting Strategy for the Period From February 1989 to January 1993

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 48 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	0.159%	0.0308			0.0516
0%	-0.004%	0.0301	0.9938	-1.5578	-0.0013
25%	-0.107%	0.0305	0.9876	-2.2701 *	-0.0349
50%	-0.210%	0.0313	0.9701	-2.5098 *	-0.0669
75%	-0.312%	0.0324	0.9436	-2.5414 *	-0.0964
100%	-0.415%	0.0338	0.9105	-2.5111 *	-0.1228
150%	-0.621%	0.0374	0.8343	-2.4200 *	-0.1661

Table XI (b) : The Performance of the Capitalization and Book-To-Market Ratio Multifactor Tilting Strategy for the Period From February 1993 to December 1996

The 300 stocks of the TSE 300 Index are sorted by each factor and ranked from 1 to 300. The ranks of each stock is summed and the stocks are sorted again by these total ranks. A percentage of the total weight is reallocated such that stocks with lower total ranks have their weights increased and stocks with higher total ranks have their weights reduced. The portfolios are rebalanced each year at the end of January. The percentage redistributed is found in the first column and the average monthly return of the portfolios is reported in the second column. Std Dev. is the standard deviation of the portfolios and Correl. reports the correlation of each tilted index portfolio to the TSE 300 Index. Zsin is the Z statistic of the Jobson and Korkie test for a test of the equality of the Sharpe measures for each tilted index portfolio with the market portfolio. * and ** indicates significant results at the 0.05 and 0.01 levels, respectively. Sh is the Sharpe measure for each tilted index portfolio. There are a total of 47 monthly return observations for each studied portfolio.

% Redis.	Monthly Ave. Ret.	Std Dev.	Correl.	Zsin	Sh
TSE 300	1.508%	0.0339			0.4446
0%	1.532%	0.0332	0.9956	0.4691	0.4609
25%	1.580%	0.0327	0.9933	1.0469	0.4827
50%	1.627%	0.0324	0.9861	1.4180	0.5028
75%	1.675%	0.0322	0.9738	1.5904	0.5207
100%	1.722%	0.0321	0.9563	1.6326	0.5360
150%	1.817%	0.0326	0.9071	1.5325	0.5580

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