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A Tax-Free Exploitation of the Turn-of-the-Month Effect: C.R.E.F.

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By applying knowledge of the "turn-of-the-month" effect investors will improve the risk-adjusted performance of their retirement accounts by using a simple and easily implemented "switching" strategy. Our exploitation of the turn-of-the-month anomaly achieves a 17.7 percent average annual rate of return by switching between a money market account and a broad market indexed stock account. This is compared to a 15.6 percent average annual rate achieved by simply buying and holding the stock account, or a 5.8 percent rate on the money market account. Additionally, volatility is cut in half and there are no tax consequences or transactions fees when the switching strategy is used within a retirement account. Our results suggests that this strategy might be successfully implemented, under current tax laws, in qualified retirement plans and in variable annuities.

I. INTRODUCTION

The turn-of-the-month effect in stock returns has received much attention recently, especially by those who have attempted to document opportunities to exploit this apparent market anomaly. In one recent study, Henzel and Ziemba (1996) demonstrate a trading strategy which achieves superior performance by switching between an interest bearing cash account and the S&P 500 Index around the turn-of-the-month. While ignoring transfer costs and the tax consequences, they claim the results would appeal to institutional investors concerned with the timing of purchases and sales. This paper examines whether individual investors can exploit the turn-of-the-month effect in retirement accounts and variable annuities. By applying a similar switching strategy in a tax-deferred, no transfer cost retirement fund we find that individual investors can exploit the turn-of-the-month effect and earn superior risk-adjusted returns while avoiding the transfer costs and tax consequences of account switching.

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II. LITERATURE REVIEW

Evidence of seasonal anomalies in stock returns has generated considerable public interest in recent years and a significant amount of research has been devoted toward documenting their existence and potential for generating abnormal returns. Much of the empirical evidence suggests that these abnormal returns are economically insignificant once transactions costs and tax consequences are considered.

The January effect, in which average stock returns are higher in January than in any other month, is perhaps the best known and most extensively documented seasonal anomaly. The persistence of this phenomenon over the years, despite the attention it has generated in the popular press, has been reaffirmed in innumerable academic articles since it was first observed more than 50 years ago (Wachtel, 1942) and rediscovered more recently (Rozeff & Kinney, 1976). Among the possible explanations proposed by Wachtel are year-end selling of stocks for tax loss purposes and a "general feeling of good fellowship and cheer" during Christmas holidays (Wachtel, p. 186). The tax-loss selling hypothesis is generally considered the most likely explanation for the January rebound and has received the strongest support in the academic literature.

Early work by Keim (1983), Roll (1983), and Reinganum (1983) link the observed January seasonal to small firm return patterns in January and this connection has been reinforced by others. Lakonishok and Smidt (1984), Ritter (1988), and Johnston and Cox (1996) find that tax motivated trading of small capitalization stocks by individual investors drives the January rebound. Haugen and Lakonishok (1987), and Ritter and Chopra (1989) suggest that portfolio rebalancing (or window dressing) by professional portfolio managers to clear smaller, lesser known companies off the books is another likely source of the apparent anomaly. Several studies attribute the January effect to variation in risk premia or expected returns and suggest either that the assumed positive risk-return tradeoff is restricted to small stocks in January (Tinic & West, 1984) or that smaller stocks are simply riskier in January than at other times of the year (Chan, Chen, & Hsieh, 1985; Rogalski & Tinic, 1986). The information hypothesis proposed by Ritter (1988) suggests that informed investors are perceived to have a larger relative advantage when trading after the turn-of-the-year as management becomes aware of non-public information. Since individual investors tend to buy a disproportionate number of smaller stocks this informational advantage results in an increase in the volatility and systematic risk of smaller stocks in January.

In an extensive study of equally weighted deciles of stocks on the NYSE from 1926 through 1993, Haugen and Jorion (1996) find that the January premium persists for all but the largest decile of stocks with no significant reduction in magnitude. However, more recent evidence indicates that the January effect may be running its course, except for the smallest capitalization stocks. Riepe (1998) documents a diminishing of the effect by examining market-value weighted deciles of stocks between 1926 and 1997. The author concludes that the introduction of futures on the S&P 500 and Value Line in 1982, and especially the creation of futures contracts on the Russell 2000 by the Chicago Merchantile Exchange in 1993, has contributed to the market's ability to exploit the effect. This, and other evidence (Star, 1996), suggests that opportunities for exploiting the effect with small-cap stocks are limited by liquidity, transactions costs, and the availability of futures.

The Monday seasonal in equity returns, also referred to as the weekend effect, is another apparent anomaly which continues to generate interest and research. Early evidence that Monday returns are negative and significantly different from other daily returns

is presented in Cross (1973), French (1980), and Gibbons and Hess (1981). Keim and Stambaugh (1984) document 55 years of the effect on the S&P 500 and Flannery and Protopapadakis (1988) find the pattern is shared by 11 asset groups, including Treasury security of varying maturities and three stock market indices. Possible explanations include the timing of corporate news announcements, trading patterns of institutional and individual investors, and settlement procedures.

In studies of corporate news announcements Patell and Wolfson (1982) and Penman (1987) find that bad news announcements are more likely to occur during closed market periods or on Mondays. The relationship between negative markets and the Monday effect has been substantiated by Dyl and Maberly (1988), Fishe, Gosnell, and Lasser (1993), Athanassakos and Robinson (1994), and others. Abraham and Ikenberry (1994) find that positive (negative) Monday returns follow positive (negative) Fridays and suggest that the Monday effect is a consequence of both corporate news announcements and a Monday bias toward sell transactions by individual investors following weekend decision making.

A number of studies identify an imbalance in buy and sell orders on Mondays caused by the trading activity of individual and institutional investors as a possible source of the weekend seasonal (Lakonishok & Maberly, 1990; Lakonishok, Shleifer, & Vishny, 1992; Miller,1988). These studies suggest that the Monday effect results from a combination of factors, including a selling bias by individual traders and reduced institutional trading activity on Mondays when brokers are planning strategy for the week.

Recent evidence that the Monday effect is weakening, at least for large capitalization stocks, indicates trading to exploit the anomaly. In an article examining daily returns from 1962–1993, Kamara (1997) finds that the Monday seasonal disappears after 1982 for stocks in the Standard and Poor's (S&P) 500 but continues to be present in the smallest decile of stocks on the NYSE, reflecting the ability of institutional investors to trade against the effect. Another recent study by Chow, Hsiao, and Solt (1997) also reports a diminishing of the effect between 1970 and 1993 for those stocks with lower transactions costs.

A lesser known and more recently discovered seasonal pattern is the monthly calendar anomaly known as the turn-of-the-month effect. It has been identified in a number of studies in both individual stocks and in various stock market indices. Ariel (1987) first reported a monthly seasonal pattern in the returns of equally-weighted and value-weighted stock portfolios between 1963 and 1981, using data obtained from the Center for Research in Security Prices (CRSP). In that study, stock returns in the first half of the month, identified as the first nine trading days of the month plus the last trading day of the previous month, are considerably higher than stock returns in the second half of the month, identified as the last eight trading days of the month, exclusive of the last trading day. This pattern exists in both large and small capitalization stocks and is independent of other known calendar anomalies, such as the January effect. Ariel notes that the phenomenon is especially strong in the five day period between the last trading day of one month the fourth trading day of the next month (trading days −1 through +4).

In a subsequent study of various seasonal patterns on the Dow Jones Industrial Average over a ninety year period between 1897 and 1987, Lakonishok and Smidt (1988) discover a persistent monthly seasonal limited to trading days −1 through +3. The authors suggest that the monthly jump in returns may be liquidity driven and a result of the buying and selling activity of pension fund managers around the turn-of-the-month. Ogden (1990) provides evidence that the anomaly is driven by liquidity and suggests that a "standardiza-

tion of payments system" in the United States is responsible for the monthly seasonal. Cash receipts such as wages, dividends, interest, and principal payments at the end and beginning of the calendar month are quickly reinvested, resulting in a surge in stock returns. Examining value (equally)-weighted stock indices for the eighteen year period from January 1969 through December 1986 the author reports an average cumulative return during the turn-of-the-month of 0.5132 (0.8468) percent. However, with round trip transactions costs conservatively estimated at 0.46 percent, a speculator is unlikely to generate sufficient profits from trading on this information.

Henzel and Ziemba (1996) demonstrate how the monthly seasonal can be exploited, using data from the S&P 500 Index between 1928 and 1993 and the trading days identified by Ariel (trading day −1 to +4), by switching between the Index and an interest bearing cash account at the turn-of-the-month. The strategy produces an average annual return of 10.13 percent over the sixty-five-year period of the study, compared to an average annual return of 9.50 percent for a simple buy-and-hold strategy on the Index. They also demonstrate that the effect is not the result of a few "significant days" and that large gains and losses are proportionally distributed between the turn-of-the-month period and the rest of the month. An even stronger turn-of-the-month effect is identified for the five days between trading days −2 and +3. This shifting of the critical turn-of-the-month period has been observed in other studies and may be related to futures trading in anticipation of the effect (Henzel, Sick, & Ziemba, 1994).

This study builds on Henzel and Ziemba by testing whether individual investors can exploit the turn-of-the-month effect, and avoid the transactions costs, by implementing the switching strategy in a tax-deferred, no cost retirement plan. If this pattern in returns is driven by liquidity, pension fund buying, and futures activity, then it should be observable in most broad stock market accounts available in retirement plans and variable annuities. By timing trades to the turn-of-the-month period, individual investors could enhance the performance of retirement plans and annuities which allow frequent transfer at no cost. The rest of the paper proceeds as follows. The next sections describe the data used in the study and our efforts to determine if the turn-of-the-month effect exists in the data. This is followed by empirical tests of the switching strategy, the results, and our conclusions based on these results.

III. DATA AND METHODOLOGY

The retirement fund data used in this study were obtained by the authors from the corporate office of the Teachers Insurance and Annuity Association-College Retirement Equities Fund (TIAA-CREF). TIAA-CREF is a nationwide retirement system for employees at colleges, universities, and other nonprofit educational and research institutions in the United States. It is the largest private retirement system in the world, reporting assets in excess of $200 billion as of December 31, 1997. TIAA was established in 1918 as a nonprofit organization for the advancement of teaching as a profession and to provide life insurance, pension products, and long-term disability and care insurance. CREF was established in 1952 as a companion, nonprofit open-end investment company offering new financial products, including the world's first variable annuity. As of June, 1998 CREF offers one traditional

annuity, four equity accounts, two fixed-income accounts, a money market account, a social choice account, and a real estate account.

The study begins on April 1, 1988, the day that CREF introduced its *Money Market Account,* and ends on the last day of December, 1997. We examine four sample periods, one nine-year period and three sub-periods, in which to evaluate the trading strategy. Returns for the switching strategy and the buy-and-hold strategy are computed using the daily closing unit values for the *Stock Account* and *Money Market Account.* The raw data were transformed into daily holding period returns from April, 1988 through December, 1997.

We also examine two market indices, the Dow Jones Industrial Average and Standard & Poor's 500 Index, for evidence that the monthly seasonal identified in earlier studies continues to exist. We obtain daily closing values for the Dow Jones Industrial Average (DJIA) from *The Dow Jones Averages 1885–1995,* (1996), *The Wall Street Journal Index* (1996), and *The Dow Jones Averages: The Market's Measure—Dow Data,* [Online](1997). Closing values for the Standard & Poor's 500 Index (S&P 500) are obtained from Standard & Poor's *Security Price Index Record* (1996) and Standard & Poor's *Current Statistics* (January, 1998). Finally, the Treasury bill rates used to calculate excess returns in the risk-adjusted performance measures are obtained from the Federal Reserve Bank of St. Louis, Research Division, (1997), *Federal Reserve Economic Data (FRED)* [Online] data files of daily historical three-month treasury bill rates.

The switching strategy we investigate involves the transfer of funds between a cash account and a market portfolio. The *Money Market Account* is selected as the cash account because it is the only money market fund available to eligible participants of CREF. The *Stock Account,* CREF's flagship fund, is selected as the market portfolio because it is the most broadly diversified equity account offered by CREF, with almost 80 percent of the account indexed to the U.S. stock market. It is the best proxy for the market portfolio that is available through CREF, as evidenced by the fact that the correlation of returns between the *Stock Account* and the S&P 500 Index is 0.972 during the study.

The switching strategy is similar to the one explored by Henzel and Ziemba (1996). Funds are moved from the *Money Market Account* to the *Stock Account* at the beginning of the turn-of-the-month period (hereafter, simply TOM), and then switched back to the *Money Market Account* on the last day of the TOM period. All transfers between accounts are executed by CREF at the accumulated unit values at the close of that business day. Participants in CREF can place an order to transfer funds from any account, 24 hours a day, seven days a week, using CREF's Automated Telephone Service or the Internet Advanced Communication and Transaction system. There are no restrictions on transfers between accounts and no transaction fees for the transfer. Finally, since these accounts are part of a qualified retirement plan, no tax liabilities are triggered.

Although the study is implemented using CREF data, it has implications for investments in variable annuities and in other tax-deferred retirement plans, such as IRAs, 401(k)s, 403(b)s, which allow frequent trading. A recent article in a leading financial news magazine states that "... with no tax consequences and little or no transaction costs, the 401(k) offers the best possible environment for rapid-trading, market-timing tactics" (Wilcox, p. 53). Since most retirement plans, such as 401(k)s and 403(b)s, offer a stock account and money market account, individual investors would have a practical, operational way to exploit the TOM effect in a tax-deferred, no cost, unlimited switching setting.

In the next section we examine the daily returns of the DJIA, S&P 500, and the *Stock Account* over the period from April, 1988 through December, 1997. We demonstrate that the TOM calendar anomaly exists in the *Stock Account* and continues to be present in the two broad market indices. We then proceed to test the switching strategy in section V.

IV. INITIAL EVIDENCE

Initial examination of the data indicates the TOM pattern exists in the *Stock Account*, which is our proxy for the market portfolio, and continues to exist in the DJIA and the S&P 500 Index. Table 1 shows average daily returns and t-statistics for the eighteen days around the turn-of-the-month for the *Stock Account* and for the two indices. In the Table, *Trading Day 1* is the first trading day of the month, *Trading Day -1* is the trading day just prior to the first trading day of the month, etc. The results in Table 1 show a strong TOM effect in the *Stock Account*, significant at the 10 percent level at least, extending over a six trading day period between *Trading Days –4* and *+2*. No other trading day in the month shows a return that is significantly greater than zero at even a 10 percent level. The average daily return achieved during the six critical days in the *Stock Account* represent an annualized

TABLE 1

Average Daily Returns (%) and T-Values During the Turn-of-the-Month Period for the DJIA, S&P 500, and CREF *Stock Account* (April 1988 to December 1997)

	DJIA		*S&P 500*		*CREF-Stock*	
Trading Day	*Average Return (%)*	*T-Value*	*Average Return (%)*	*T-Value*	*Average Return (%)*	*T-Value*
–9	–0.0366	–0.43	–0.0568	–0.73	–0.0662	–0.95
–8	–0.0637	–0.84	–0.0244	–0.33	–0.0369	–0.57
–7	–0.1027	–1.34	–0.0905	–1.32	–0.0941	–1.61
–6	0.0482	0.59	0.0341	0.46	0.0315	0.51
–5	0.0360	0.38	0.0101	0.11	0.0147	0.19
–4	0.1368	1.64	0.0963	1.28	0.1121*	1.92
–3	0.0750	1.12	0.1383**	2.13	0.1268**	2.34
–2	0.1203	1.62	0.1290*	1.72	0.1479**	2.33
–1	0.0981	1.40	0.1733**	2.51	0.2414***	4.44
1	0.2398**	3.14	0.2209**	2.96	0.1817**	2.93
2	0.2426**	3.18	0.1998**	2.64	0.2315***	3.64
3	0.0198	0.28	0.0280	0.41	0.0686	1.16
4	–0.0313	–0.44	–0.0533	–0.77	–0.0178	–0.29
5	–0.0035	–0.05	0.0095	0.14	0.0011	0.02
6	0.0796	1.27	0.0393	0.58	0.0373	0.65
7	0.0409	0.58	0.0171	0.25	0.0149	0.26
8	–0.0377	–0.50	–0.0197	–0.28	–0.0172	–0.28
9	0.0820	0.92	0.0741	0.86	0.0463	0.65

Notes: T-values test the null hypothesis that the average daily return is not significantly different from zero. Significance levels are for one-tailed tests.

***Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.

Trading Day represents trading days around the turn-of-the-month. *Trading Day 1* is the first trading day of the month; *Trading Day* -1 is the day prior to the first trading day of the month. The turn-of-the-month effect begins on *Trading Day -4* and extends through *Trading Day +2*.

TABLE 2

Average Daily Returns (%) and Daily Return Standard Deviations (%) for the Dow Jones Industrial Average (DJIA), the Standard and Poor's 500 Index (S&P 500), the *Stock Account* (STOCK), and the *Money Market Account* (MMKT). Figures are for the Six Trading Days Around the Turn-of-the-Month (TOM), for the Rest of the Month (ROM), and for the Entire Month (MONTH)

	TOM		*ROM*		*MONTH*		
	Average Return	*Standard Deviation*	*Average Return*	*Standard Deviation*	*Average Return*	*Standard Deviation*	*F-Value*
DJIA	0.1521	0.8086	0.0228	0.8535	0.0596	0.8428	11.87***
S&P 500	0.1596	0.7828	0.0159	0.8104	0.0569	0.8051	16.09***
STOCK	0.1736	0.6432	0.0145	0.6931	0.0598	0.6829	27.55***
MMKT	0.0233	0.0177	0.0222	0.0161	0.0225	0.0166	2.39

Notes: The turn-of-the-month (TOM) days cover the period between the first two days of the month and the last four days of the previous month.
The F-Value is a test of the null hypothesis that the average daily return during the turn-of-the- month is equal to the average daily return during the rest-of-the-month.
The average daily returns are arithmetic mean returns for the period between April 1988 through December 1997. There are 2,465 total returns, with 702 occurring in the TOM period and 1763 occurring in the ROM period.
***Significant at the 1% level.

compound return of approximately 55 percent while the rest of the month (hereafter, simply ROM) represent an annualized return of less than 4 percent.

In the two indices, the first two trading days of the month show positive average returns that are significant at the 5 percent level. Additionally, the S&P 500 shows positive and significant returns on the last three trading days of the month. No other day of the month shows a significant positive average return for either index.

There is additional evidence of a TOM effect in Table 2, which includes average daily returns, return standard deviations, and an analysis of variance between the TOM and the ROM periods for the two CREF *Accounts* and the two indices. The results in the Table are consistent with earlier studies. The average daily return for the S&P 500 Index in our sample during the TOM period is 0.1596 percent. Henzel and Ziemba (1996) report an average daily return for the S&P 500 Index for the TOM period in their study of 0.1236 percent. Odgen (1990) reports an average daily return on the CRSP value-weighted index during the TOM period of 0.1283 percent. The average daily return for the S&P 500 during the ROM period in this study is 0.0159 percent, compared to 0.0137 percent average daily return in the Ogden sample, and minus 0.0235 percent average daily return reported by Henzel and Ziemba.

The results also clearly show that the TOM effect exists in the *Stock Account*. The average daily returns in the TOM period, ROM period, and during the entire month are 0.1736 percent, 0.0145 percent, and 0.0598 percent, respectively. With approximately 21 trading days in the average month, the six days of the TOM period account for approximately 83 percent of the average month's total return for the *Stock Account*.

Finally, the F-value in the analysis of variance shows the TOM period is significantly different from the ROM period at the 0.01 level for the *Stock Account* and for both indices. The relevant issue now is what the effect will be on the investor's portfolio when attempts are made to exploit the monthly pattern that we have identified. The next section examines

whether individual investors can exploit the TOM effect by implementing a switching strategy with the *Stock Account* and *Money Market Account*.

V. PERFORMANCE RESULTS USING THE SWITCHING STRATEGY

In this section we examine the performance results of a traditional buy-and-hold strategy versus a switching strategy based on the TOM pattern that we have identified in the *Stock Account*. The buy-and-hold strategy is implemented by placing $1,000 in the *Stock Account* on April 4, 1988. The markets are closed on April first and weekends, making April 4 the first trading day of the month for that year. This money is left in the *Stock Account* for the duration of the study. The switching strategy is also implemented by placing $1,000 in the *Stock Account* on April 4. All accumulated funds are then moved to the *Money Market Account* at the close of business on April 5, the second trading day of the month. Finally, accumulated funds are switched back from the *Money Market Account* into the *Stock Account* at the close of business on the fifth trading day prior to the end of the month. This switching of funds is repeated each month, moving funds into the *Stock Account* during the TOM period and back into the *Money Market Account* during the ROM period, through the end of December, 1997.

TABLE 3
Average Daily Compound Return (%), Return Standard Deviation (%), Beta, Sharpe, Treynor, and Appraisal Ratios for the Period Between April 1988 and December 1997 and for Three Sub-Periods

Period	*Average Daily Return*	*Return Standard Deviation*	*Beta*	*Sharpe Ratio*	*Treynor Ratio*	*Appraisal Ratio*	*Growth of $1,000 Investment*
4/1988 - 12/1997							
MMKT	0.023	0.017	—	—	—	—	$1,740
STOCK	0.057	0.683	0.824	0.0625	0.00052	0.0638	$4,118
SWITCH	0.065	0.350	0.219	0.1429	0.00228	0.1367	$4,921
4/1988 - 12/1991							
MMKT	0.030	0.019	—	—	—	—	$1,331
STOCK	0.057	0.793	0.852	0.0484	0.00045	0.0809	$1,724
SWITCH	0.085	0.389	0.210	0.1689	0.00313	0.1741	$2,233
1/1992 - 12/1994							
MMKT	0.014	0.010	—	—	—	—	$1,112
STOCK	0.025	0.509	0.817	0.0299	0.00019	0.0791	$1,209
SWITCH	0.043	0.278	0.247	0.1205	0.00136	0.1386	$1,388
1/1995 - 12/1997							
MMKT	0.021	0.013	—	—	—	—	$1,176
STOCK	0.090	0.684	0.787	0.1105	0.00096	0.0481	$1,976
SWITCH	0.061	0.362	0.220	0.1293	0.00213	0.0898	$1,588

Notes: Annualized returns for the *Money Market Account* (MMKT) and the *Stock Account* (STOCK), are 5.8 percent and 15.6 percent, respectively. Annualized return for the switching strategy (SWITCH) is 17.7 percent. There are 2,465 daily returns between April 1988 through December 1997.

Betas for the *Stock Account* and the switching strategy are calculated by regressing the daily returns for each onto the daily return for the S&P 500 Index for the entire period and each subperiod.

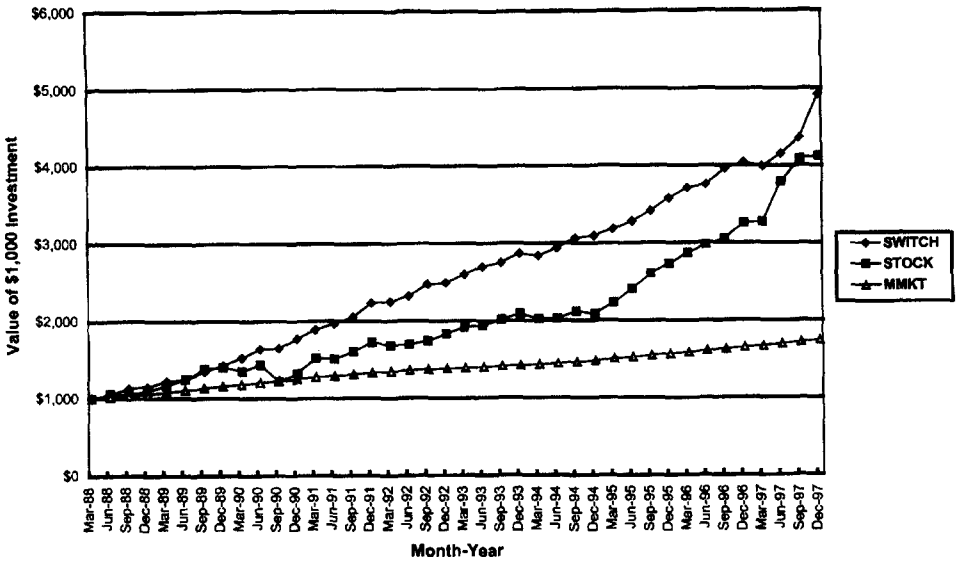

Figure 1. Growth of $1,000 Between April 1988 and December 1997 in the *Money Market Account* (MMKT), the *Stock Account* (STOCK), and the Switching Strategy (SWITCH)

Performance results for the switching and the buy-and-hold strategies indicate that the switching strategy clearly outperforms the buy-and-hold strategy. Table 3 shows various summary statistics and risk-adjusted performance measures for the entire period and for the three sub-periods. Between 1988 and 1997 the switching strategy achieves an average daily compound return of 0.065 percent over the 2,465 trading days, compared to an average daily compound return of 0.057 percent for the buy-and-hold strategy and a 0.023 percent for the *Money Market Account*. This means that, beginning with a $1,000 investment, the accumulated value grows to $4,921 over the 117 months of the study in the switching strategy, compared to $4,118 for a similar $1,000 investment in the buy-and-hold strategy. The growth of a $1,000 investment in both strategies and in the *Money Market Account* is shown graphically in Figure 1. Not included in the table are the results from combining the *Money Market Account* with the DJIA and the S&P 500 in a switching strategy. Over the entire period of the study, a $1,000 invested in the DJIA grows to $4,198 with the strategy, versus $3,978 without the strategy. A $1,000 investment in the S&P 500 Index grows to $4,432 with the strategy, and $3,748 without.

Funds in the switching strategy are held in the low risk *Money Market Account* over seventy percent of each month, significantly reducing the investment's risk as measured by total volatility of return. Return standard deviation for the switching strategy is reduced to almost half that of the buy-and-hold strategy, from 0.683 percent to 0.35 percent. Betas for both strategies are calculated by regressing returns onto the S&P 500 Index. We find a reduction in this measure of market risk from 0.82 for the *Stock Account* to 0.22 for the switching strategy. Also reported in Table 3 are the summary results for each sub-period that we examined.

The risk-adjusted performance measures included in Table 3 are the Sharpe ratio, the Treynor ratio, and the appraisal ratio. While each is consistent with conventional mean-

variance optimization, they differ in their assumptions about the investor's complementary portfolios. The Sharpe ratio measures average excess return per unit of total risk as measured by standard deviation of return (Sharpe, 1966). It is appropriate when a portfolio represents the investor's entire investment and is being compared to a benchmark or another portfolio. A higher ratio indicates superior risk-adjusted performance. Over the nine years of the study this ratio is 0.14 for the switching strategy, compared to 0.062 when simply buying-and-holding the *Stock Account.*

The Treynor ratio, measuring average excess return per unit of systematic risk as measured by beta, is appropriate when a portfolio is held in combination with other portfolios in a larger investment fund (Treynor, 1965). In this case mean excess return should be weighed against the portfolio's systematic risk and a higher ratio indicates superior risk-adjusted performance. Over the nine years of the study this measure is 0.0023 for the switching strategy and 0.00052 for the buy-and-hold strategy.

The third investment assumption has the investor holding the strategy in combination with a passive market index. When the two portfolios are optimally mixed, the appropriate performance measure is the appraisal ratio. This measures the abnormal return of the active portfolio relative to the passive portfolio, per unit of diversifiable risk (Bodie, Kane, and Marcus, 1996). Abnormal return is computed as the intercept (Jensen's alpha) in a regression of the portfolio's excess returns onto the excess returns of the market. The S&P 500 Index is used as the proxy for the market in this regression. The standard deviation of the residuals in the regression is the measure of diversifiable risk. A higher ratio indicates superior risk-adjusted performance. Over the nine years of the study the appraisal ratio is 0.1367 for the switching strategy and 0.0638 for the buy-and-hold strategy.

Finally, Henzel and Ziemba note that low correlations between the switching strategy's returns and returns on alternative investments provide additional diversification benefits when the strategy is used in combination with other assets. They report a correlation of 0.46 between the switching strategy and the S&P 500 Index. We find that the correlation of the *Stock Account* with the S&P 500 Index drops from 97 percent to 50 percent when the *Stock Account* is combined with the *Money Market Account* in the switching strategy. Based on the three different measures of risk-adjusted performance and the low correlations, the switching strategy is the superior investment strategy for all investors. Subperiod results are reported in Table 3 and are consistent with the overall period.

VI. CONCLUSION

In this study we test whether individual investors can exploit the turn-of-the-month effect with a simple switching strategy in a tax-deferred, no cost retirement plan. Using daily closing prices for a money market account and a broadly diversified stock account, we find that individual investors who use the switching strategy can improve the performance of their retirement accounts. The superior performance of the switching strategy over a simple buy-and- hold strategy is demonstrated using three measures of risk-adjusted performance that are each consistent with a different investment plan or objective. Whether the investment strategy is intended as the sole investment of a portfolio, whether it is intended to be held in combination with many other investments, or whether it is to be combined with a

passive market portfolio, the switching strategy achieves superior risk-adjusted performance under each scenario.

A consequence of the switching strategy is the free-rider problem that may exist in the many types of retirement accounts, including qualified retirement plans and variable annuities, where the strategy could be used. This is potentially a problem when no fees are levied on exchanges between accounts and no restrictions are placed on the number of exchanges allowed. Although plan participants can earn superior risk-adjusted returns through frequent switching, this increases the fund's operating cost and places an unfair burden on the plan participants who do not employ the switching strategy. To address this problem investment companies may eventually limit the number of transfers between accounts and/or charge a fee for each transfer.

There are also public policy issues to consider. Efforts in Washington to eliminate the tax-exempt status of certain events related to variable annuities, such as account switching, are not uncommon and widespread use of switching strategies may add fuel to the forces that are demanding a new tax on exchanges. However, we must recognize that when such opportunities exist, investors will seek to exploit them. A recent article in *The Wall Street Journal* suggests: "If you are going to trade and still have some slim hope of beating the market, you really need to do your buying and selling in a retirement account" (Clements, p. C1). As long as current tax laws and investment company policies allow frequent switching, investors may consider the turn-of- the-month switching strategy as an easy way to enhance the performance of their retirement portfolio while at the same time achieving a considerable reduction in risk.

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