Market Timing versus Dollar-Cost Averaging: Evidence based on Two Decades of Standard & Poor's 500 Index Values

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"Dollar cost averaging is a technique which enables investors to reduce the short-term impacts of market highs and lows." *www.vanguard.com*

"As a convenience, investors can authorize systematic investments to take advantage of dollar-cost averaging strategies." www.tdwaterhouse.com

"The Use of Dollar Cost Averaging is the Second Step in Successful Savings" www.merrillynch.com

" By using the dollar cost averaging investment technique even if you are investing for the long run (ten years or more) and the market goes down, in the end you will be a winner." www.suzeorman.com

Introduction

As evidenced by the above quotes, dollar-cost averaging (DCA) is a popular investment method wherein an investor with a sum of money to invest does not invest the entire sum immediately. Instead, a fixed proportion of the available dollars is invested at equal, scheduled intervals through time. The intervals might be a week, month, quarter, or year. By following DCA, an investor ends up purchasing more shares when prices fall and fewer shares when prices rise. In this way, it is assumed that investors will not invest their entire sum at a market high and thus, subsequently, regret their investment decision.

Suggestions regarding investment transaction timing are also frequently distributed by financial planners. Examples at the national level include Simon's (1994, p. 38) Money article on DCA. At the local level is an article published in the La Crosse Magazine titled "Riding the Roller Coaster". Contained within the article is a chart depicting the hazards of market timing that demonstrates the disadvantage of being out of the market on the best 10 days, 20 days, 30 days, 40 days, and 50 days (North Central Trust Company, Fall 2002). The article, however, does not consider the impact of being out of the market on the worst 10 days, 20 days, 30 days, 40 days, and 50 days. It also implicitly conflicts with the concept of DCA, by assuming full investment at the beginning of the period less the identified days.

This study first presents a literature review covering articles about DCA and alternative investment strategies. It then presents results from our investigation of the impact of not being invested in the S&P 500 during the worst trading days of the period including1982 through 2001. It will also consider the value of using DCA over the same period, using monthly and quarterly investment periods. Finally, our study will determine whether the use of DCA in other stock market indexes and bond indexes would have produced higher returns during the period under question.

Review of the Literature

Reference to DCA goes back many decades. In 1925, Mongtgomery (1925, p. 1416) urges financial managers to use a "diversification of maturity" strategy, because "the constant reinvestment of funds places one in a position always to take advantage of such price opportunities as arise." In 1967, Cohen, Zinbarg, and Zeikel (1967, p. 51) observe "Dollar-cost averaging allows one to buy a greater number of shares of any stock when the price is down. Dollar-cost averaging is most helpful in buying growth stocks." Constantinides (1979) acknowledges DCA's ability to reduce the risk of investing but still finds DCA to be a theoretically sub-optimal investment strategy when compared to "jumping in" to the market and investing the entire amount in one lump sum.

Several researchers have empirically compared DCA to alternative investment strategies. Edleson (1988) compares DCA to value averaging (adding enough to the portfolio to be sure that it increases in value by a given amount, such as $1000 per quarter), and finds that individuals are better off with a value averaging investment strategy. Marshall and Baldwin (1993) observe no statistical difference in risk between DCA and value averaging methods, while Marshal (2000) presents extensive data supporting the existence of superior return performance to the value averaging technique. Thorley (1994) finds that DCA leads to a reduction in expected returns and an increase in risk when compared to a buy-and-hold investment strategy.

For investments with low volatility, a Monte Carlo simulation conducted by Abeysekera and Rosenbloom (2000) finds a lump-sum strategy to be the best. For investments that are more volatile, Abeysekera and Rosenbloom observe lump-sum investing to provide both higher returns and greater risk. Israelson (1999) studies mutual fund annual holding period returns over a ten-year period, finding that DCA beats a lump-sum investment in 19 out of 35 instances. The study concludes that DCA is a superior strategy for funds with low volatility while investing the lump sum is better for volatile funds. Milevsky and Posner (2001) find DCA to be superior to lump sum investing, especially when the investment ends up with a zero return or with a loss.

There have also been a variety of risk-adjusted return measures used in the research. Leggio and Lien (2001) find that DCA does not lead to a higher Sharpe ratio (i.e., the excess return per unit of standard deviation). However, variance is a two-sided measure, implying the individual dislikes any deviation from the mean regardless of the direction of deviation. Not surprisingly, Kahneman and Tversky [1979] find that individuals weight losses much more than gains. Using the alternative Sontino Ratio (i.e., the excess return per unit of downside risk) and Upside Potential ratio (i.e., upside potential per unit of downside risk), Leggio and Lien (2003) find DCA an inferior investment technique.

Despite the lack of consistent research support, DCA is prominently discussed in leading textbooks (for example, Gitman and Joehnk (2002, p. 565)). This study improves upon prior research in three ways. One, it examines the impact of missing out on the best and worse days in the stock market. Two, it examines a much more comprehensive set of securities. Three, it uses a more recent sample period.

Research Findings

The Best and Worst of the S&P 500: 1982 - 2001

Investment advisors frequently tell clients they should not be tempted to exit a bear market for the possibility of missing out on a rebound (e.g., North Central Trust, p. 62). In fact, missing only a fraction of the best trading days in a 20-year period could have a dramatic impact on the return. North Central Trust advises investors to "shift slowly and carefully to other investments when their long-term risk tolerance declines." Leaving the market during a downtime not only secures losses that could have been implicitly earned, but also conflicts with the use of DCA. Should you sell off investments or buy more shares?

We will first consider the issue of missing the market extremes and the potential effect on overall return. Our data set consists of daily S&P 500 returns for the twenty-year period from January 1, 1982 to December 31, 2001. The data was obtained from Economagic.com. These daily returns are then compounded to calculate annual returns for reporting purposes. The standard deviation of daily returns is used as a measure of risk. With this measure, risk-adjusted returns can also be assessed.

Dividends were excluded due to their potentially confounding impact on return calculation and difficulty in understanding how dividends were incorporated in prior studies. For instance, it is difficult to determine whether dividends were added to the total return or the dividends were reinvested and compounded in North Central Trust's article. In terms of speculating on future returns, Amy Higgins of the Cincinnati Enquirer recently reported that "the S&P dividend yield peaked in July of 1982 above 6%, [then sank] to as low as 1.1% in August 2000**.** At this writing, the S&P's yield is now about 1.4%" (Higgins, 2003). If current economic conditions force companies to dramatically reduce or even eliminate dividend payouts, the 3 to 3.5% averages will not be sustained in the future.

Our data set of 5050 trading days (20 years x 252.5 trading days on average) is not quite evenly split between advancers and decliners. In fact, 2674 days (53%) showed positive returns, while only 2376 (47%) were negative. Our sample statistics produced a Kurtosis measure of 148.7 on the negative trading days as opposed to 13.3 on the positive days. This would indicate a much sharper peak in the data set for losers than for winners, which is not surprising considering some of the worst days in the period occurred in October of 1987.

Table I shows that missing the ten best days out of the 5050 possible reduces the return from11.83% to 9.00%, reducing return by almost twenty-four percent. At the same time, the associated risk drops by less than three percent. Should the investor miss out on the 50 best trading days of the period (only 1% of the data set) returns drop to a meager 2.43%, representing almost an eighty percent loss of return, while risk is reduced by only six percent. It would appear that market timing could be hazardous to one's return. However, if market timing means missing the best trading days of the period, then missing the worst days must be possible as well. The question then becomes, "How will returns be affected if the investor misses the worst trading days of the period?"

Table II outlines the results of missing the worst trading days of the 20-year period. It is apparent from the results that the worst days of the period, although 298 fewer in number were somewhat more severe than the best days. By simply missing the ten worst days the return jumps from 11.83% to 16.41%, almost a thirty-nine percent increase! By missing the worst fifty days of the period the return is up to 24.04%, or over one hundred percent! At the same time, missing the worst fifty days decreases the level of risk by over eleven percent. If market timing can be hazardous to one's return, it seems to be quite beneficial as well.

Our final calculation from this vantage point is to see how missing both the best and worst days of the twenty-year trading period will impact the outcome. Table III combines the above results to show that missing both the ten best and worst days has the potential to only slightly increase and somewhat stabilize the return, pushing it to 13.45%. The return remains relatively unchanged as one scans down the first column of Table III. However, the level of risk continues to decline steadily. While risk is reduced by ten percent (from 0.01037 to 0.00932) when both ten best and worst days are missed, it drops by slightly over eighteen percent when only eighty additional trading days, or two percent of the sample, are eliminated.

The results of this study are not unlike those of the Towneley Market Timing Study, commissioned by Towneley Capital Management and conducted by Professor H. Nejat Seyhun (Seyhun, 2003). On a much larger scale, Professor Seyhun studied stock market returns and risk for the months between 1926 and 1993, and for all trading days between 1963 and 1993. Professor Seyhun's data set was a capitalization-weighted composite of stocks traded on the NYSE, ASE, and NASDAQ, with some 7525 stocks in total. His study concluded that it is much more difficult than previously thought to time the market and emerge on the winning side, since exiting the market during down times would likely cause the investor to miss the positive market surges that follow.

Dollar-Cost Averaging: 1982-2001

Mark Hulbert recently reported that market timing has not been and likely will not be one of the best strategies for investors (Hulbert, 2003). Hulbert's research into mutual funds found that actively managed funds are much more likely to under-perform their asset classes by a consistent 2 to 3%. He reported that the most profitable mutual funds are those with appropriate asset allocation and less management or market timing. One can incorporate DCA with a long-term investment strategy that excludes market timing. This report examines this potential next.

With such a large number of losing days in our 20-year period, and considering the severity of the drops as compared to positive days, the question arises as to the potential for earning greater returns with the use of DCA. Based on the concept of equal, periodic investment, where the investor purchases shares during good times as well as bad, a larger number of shares are ultimately purchased at a lower average cost per share. As a result, the use of DCA may theoretically produce a return exceeding that of an early lump-sum investment.

Armed with this concept and our S&P 500 data set, we set out to determine if using DCA during the period 1982 to 2001 would actually produce an equal or higher return per dollar invested. We considered both monthly and quarterly investment periods. Specifically, a one hundred dollar investment was made at the beginning of each month, three hundred dollars were invested at the beginning of each quarter, and a lump-sum twenty-four thousand dollar investment was made at the beginning of the sample period. For the monthly and quarterly annuity, Reported yields are based on the amount of money invested and not the $24,000 lump sum.

In addition to the S&P 500, we examined the consequences for investors in the NASDAQ Composite Index, Dow Jones Composite Index, and Dow Jones Utility Index. We also considered alternative investments in bonds. Our null hypothesis was that there would be greater returns on the monthly and quarterly data sets, because they include more volatility than the daily set for the S&P 500.

Table IV outlines the interesting findings. With the exception of an investment in the NASDAQ Composite Index, an early lump-sum investment produced a higher return than a DCA annuity. Across annuities, the quarterly annuity investment produced a higher return for the S&P 500, NASDAQ, and DJ Composite index than did the monthly annuity. This is contrary to what was expected in terms of volatility. Could it be that quarterly earnings announcements are pushing prices down just prior to the end of the quarter? Or is there some other phenomena occurring here?

With respect to the single sum producing a slightly higher return than the annuity, one must keep in mind that the data sets do not include dividends. Had the dividends been received and reinvested, the differences would be greater, especially since the lump-sum investor would be entitled to dividends on his entire investment for the entire period, whereas an annuity investor would pick up shares and dividends at a much slower rate. Furthermore, with the decline in the average annual yield over the years, the annuity investor missed out on most of the larger dividends by the time all shares were purchased.

As shown in the bottom portion of Table IV, early 1982 would have been an opportune time for investing in long-term bonds. With a 13.45% return on 30-year treasuries and an even higher 16.55% on baa long-term corporate bonds, an early lump-sum investment would have been favorable. Otherwise, picking up bonds at an ever-declining rate would have only produced a return of 8.15% and 10.02% on the treasuries and baa bonds respectively.

If the volatility of our data set will not produce a higher return with DCA, then what would it actually take? Vanguard Plain Talk answered this very question with an article that addresses a variety of DCA scenarios (The Vanguard Group, 2003). Specifically, the article illustrates how certain market conditions must be present for the DCA theory to maximize returns. The four different market conditions that one could encounter, according to Vanguard, include: a steadily rising market, a steadily declining market, a market rise following a drop, and a market drop after a rise. Of the four separate cases, the only one that generates an excess return with DCA over that of a lump-sum investment is that where the market rises to its original price after a drop of fifty percent.

In many instances return is discussed with little said to the dollar value of invested funds. We believe this should be given some consideration since most people don't pay their bills after retirement with "10%", rather with dollars. Table IV indicates that DCA produces close to the same rate of return, not considering dividends, as the lump-sum investment over time. Yet, as seen in Table V, the total dollar values at the end of the twenty-year period are dramatically different. Obviously, the longer the investment has to grow, the larger it will become. And for most investors the lump-sum investment would be the choice when dollars are needed for retirement. One possibility of generating the funds for investment, absent the dollars to begin with, is borrowing early on. The final part of our analysis then, will determine what can be generated with borrowed funds considering the cost of borrowing and that this expense will reduce the overall return.

Securing an equity loan at the current mortgage rate of 5.75% is one such possibility (Economagic.com, 2003). By borrowing at the current 30-year mortgage rate an investor could conceivably create a lump-sum investment and still come out ahead of the annuity investor in terms of total dollars generated. Our lump-sum investment of $24,000 would have become $224,838 over 20 years, assuming no dividends and an 11.83% average annual compound rate of return. With borrowed funds the dollar value is reduced to $147,930, which is still substantially greater than that created by either the monthly or quarterly annuity. This dollar value was generated under the following assumptions:

- The $8,191.50 cost of borrowing reduces the initial investment by the present value of after-tax cash flows (interest payments)
- The investor will deduct all mortgage interest at a marginal tax rate of 27%
- Borrowed funds are paid back over the same 20-year period
- The investment is compound at the same 11.83% annual compound rate

This particular strategy may not be a bad idea if you consider there will be dividends at some rate generated on the investment to help offset the cost of borrowing. Furthermore, if the borrowed funds were to be paid back over a shorter period of time, say ten years instead of twenty, the dollar value of the investment at the end of twenty years would have grown to $181,743. So why didn't investors use this strategy in early 1982? Simply put, the mortgage rate on single-family homes in January 1982 was 15.13% (Economagic.com, 2003), making this particular strategy not even one to consider!

Conclusion

Is market timing detrimental to the investor return? Our study of the S&P 500 over the 1982-2001, twenty-year period showed that market timing may not only be hazardous to the return, but may also be beneficial in terms of reducing risk. And although these results were consistent with those published as the Towneley Market Timing Study, years of research support the fact that most returns are diminished when market timing is employed. Although hindsight is 20/20, hindsight won't tell you what the market will do next.

DCA has long been considered an alternative strategy to playing the timing game. Theoretically, DCA should produce equitable returns. However, the results of this study have shown that, even without dividends, annuity investments into the S&P 500 and other indexes usually fall short of an investment up front. Only the NASDAQ showed contrary results. When the overall dollar value of the investments is considered, DCA falls far short.

Based on this research, an investor should:

1. Not try to time the market. Emotional investing will more likely hurt rather than help long run returns.
2. Make the largest up-front investment possible, even consider borrowing. With the cost of capital at a 45-year low, investing with borrowed funds is likely to provide positive results.
3. Absent the dollars up front, DCA is still a good idea. Being in the market creates positive long run returns, while being out of it creates only opportunity costs.

Table I

Impact of Missing the Best Returns

	Compound Annual Return	**Daily Return**	**Standard Deviation**	**Change in Return**	**Change in Risk**
All 5050 Trading Days	11.83%	0.0443%	0.01037		
Less 10 Best Days	9.00%	0.0342%	0.0101	-23.9%	-2.6%
Less 20 Best Days	7.03%	0.0270%	0.00998	-40.6%	-3.8%
Less 30 Best Days	5.31%	0.0206%	0.00988	-55.1%	-4.7%
Less 40 Best Days	3.83%	0.0150%	0.00981	-67.6%	-5.4%
Less 50 Best Days	2.43%	0.0096%	0.00974	-79.5%	-6.1%

Table II

Impact of Avoiding the Worst Returns

	Compound Annual Return	**Daily Return**	**Standard Deviation**	**Change in Return**	**Change in Risk**
All 5050 Trading Days	11.83%	0.0443%	0.01037		
Less 10 Worst Days	16.41%	0.0603%	0.00961	38.7%	-7.3%
Less 20 Worst Days	18.73%	0.0684%	0.00945	58.3%	-8.9%
Less 30 Worst Days	20.46%	0.0748%	0.00935	73.0%	-9.8%
Less 40 Worst Days	22.39%	0.0807%	0.00927	89.3%	-10.6%
Less 50 Worst Days	24.04%	0.0862%	0.0092	103.2%	-11.3%

Table III

Combined Impact of Missing Best and Worst Returns

	Compound Annual Return	**Daily Return**	**Standard Deviation**	**Change in Return**	**Change in Risk**
All 5050 Trading Days	11.83%	0.0443%	0.01037		
Less 10 Best & Worst	13.45%	0.0502%	0.00932	13.69%	-10.1%
Less 20 Best & Worst	13.65%	0.0511%	0.00901	15.38%	-13.1%
Less 30 Best & Worst	13.59%	0.0511%	0.0088	14.88%	-15.1%
Less 40 Best & Worst	13.62%	0.0514%	0.00863	15.13%	-16.8%
Less 50 Best & Worst	13.59%	0.0515%	0.00848	14.88%	-18.2%

Table IV

Yields Arising From Different Funding Frequencies

Investment	Single Sum	Monthly Annuity	Quarterly Annuity
	Compound Annual Return		
S&P 500	11.83%	11.31%	11.33%
NASDAQ	12.18%	12.17%	12.17%
DJ Composite	11.21%	10.27%	10.30%
DJ Utility	5.08%	3.82%	3.85%
	Average Annual Return		
	Single Sum	Monthly Annuity	Quarterly Annuity
30-Year T-Bonds	13.45%	8.15%	8.18%
baa Long-term Bonds	16.55%	10.02%	10.06%

Table V

Terminal Dollar Amounts Arising from Different Funding Frequencies

	Dollar Value of Investments As of December 31, 2001		
	$24,000 Lump-sum	$100/month Annuity	$300/qtr. Annuity
S&P 500	$ 224,838	$ 84,650	$ 85,639
NASDAQ	$ 239,022	$ 93,863	$ 94,829
DJ Composite	$ 200,995	$ 74,745	$ 75,622
DJ Utility	$ 64,709	$ 35,786	$ 36,035

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