

## DOLLAR COST AVERAGING

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DCA is generally interpreted to mean paying the same amount to an account each month (normally)- say \$100. It has been considered a viable and conservative way to enter the market place since it averages out the shares prices over a period of time. I use the term "generally" since DCA is most commonly interpreted incorrectly. The point being that DCA starts with a lump sum- say, \$12,000. Instead of investing all at once, you spread the investment over time in \$1,000 monthly increments in order to average out the price. If you do NOT have a lump sum, you are simply doing monthly investing which I will call MI. They may end up doing the same thing if the monthly investments are the same, but the DCA is a decisionmaking process of splitting up money into increments while MI while is primarily only investing what you can or wish to do that month.

But it can be a very risky venture leading to a lot of bad investments and lost money.

First, the basics. As stated, DCA/MI generally means putting in the same amount of money each month into an investment regardless of market volatility, regardless of price movement. In doing so, an investor is unconcerned about the swings of the stock (or fund) and doesn't have to try to find a low price on which to buy. The price of the shares average out over time and can still produce an acceptable profit- assuming that the ending value of the shares is higher than the dollar cost average or monthly investing - not an absolute guarantee.

For the example, assume you put in \$100 per month into Fund X:

Month	Amount Invested	Share Price	Number Purchased
1	\$100	\$50	2
2	100	75	1.33
3	100	100	1
4	100	66.66	1.5
5	100	40	2.5
6	100	25	4
7	100	33.33	3
8	100	66.66	1.5
9	100	80	1.25
10	100	80	1.25

Total \$1,000 19.41 Shares

Dollar cost Average/Monthly Investing = How much the shares cost divided by how many shares purchased =  $\$1,000/19.41 = \$51.52$ .

Admittedly, I made the stock very volatile to make a point. But as you can see, while you would have preferred to buy all the shares at \$25, you just as easily might have purchased them at \$80 or \$100. DCA/MI avoids the "problem" in selecting the best time to buy. That said, you do not invest when the economics are terrible. For example, putting money directly into the market during the mid 70's would have meant enormous losses of 40%+. That is a valid commentary to dollar cost averaging, but it nonetheless would have meant the money ended up in the marketplace within one year anyway, so any savings would have been incidental over lump sum investing. My point is, everything else being equal, astute investors- who see the market as currently being reasonable viable- would put in all the funds at once (though with asset allocation). But by the same token, they would NOT have invested during a great portion of the 70's. Investors who were not astute would have invested under dollar cost averaging and suffered greatly. Recognize that I am only addressing funds. An astute investor could never use dollar cost- or any other rational investing philosophy- unless he/she knew the correct answers to the [THE INVESTOR'S QUIZ.](#))

If you are investing in 401(k) plans, IRA's and the like, you really aren't doing dollar cost averaging because you want to, you just end up doing it because you don't have any other choice. This, as sated above, is simply monthly investing. You don't have- except for perhaps rollovers and bonuses- a lump sum to invest anyway, just monthly or quarterly sums that become available through your salary. Yes, you might say that the \$2,000 IRA could be worked under DCA, but the amount is so small, why bother.

But there are problems. First, the standard method of investing money under DCA/MI doesn't necessarily produce the best returns. Another method called Value Dollar Cost Averaging/Monthly Investing requires an investor to buy or sell mutual fund shares so that the portfolio grows by a set amount each month or quarter. Suppose you invested \$1,000 in Fund A and you wanted the fund to grow by \$100 each month. If in the first month the account grew to \$1,025, you would deposit \$75 (now it's \$1,100). If in the second month the account grew to \$1,290, you would sell \$90 (now it's \$1,200). Supposedly, in the past, this has shown returns 24% over normal dollar cost averaging though I did not see the actual analysis. Regardless, there are other methods that state increased returns versus the regular DCA/MI. This is not the main issue.

If you have money to invest as a lump sum, DCA produces a LOWER return than investing the money all at once. Two researchers (Williams and Bacon) have discounted dollar cost averaging by statistically showing that putting all the funds in at one time outperforms dollar cost averaging by two to one. They invested a theoretical sum in 90 day T-bills and moved into the S&P 500 over a year's period. They compared these results with investing all the funds at once- starting with different periods from 1926 to 1991.

"Nearly two thirds of the time, a lump sum strategy significantly outperformed dollar cost averaging". The lump sum approach returned an annualized return of about 12.75% while the dollar cost averaging was just 8.50%. Reducing the dollar cost averaging from once a month to three or four times per year also increased the return. This study should not be all that surprising. First, stocks have outperformed money market and bond funds over almost all time frames (and certainly beyond 10 years). Also, with interest rates being so low in many time frames (as they are today), it's tough to get a decent annual return with the bulk of funds sitting in 3% bank accounts. Admittedly, many people don't like to dump everything they own into the market all at once and like to test the market so the actual use may be debatable. But most money managers get paid to produce results and a two to one play is awfully good odds.

Here are some numbers to put the study into perspective. Assuming \$25,000 was invested in 1980 and assuming the study showed returns over 15 years to 1995 matched those of 1926 to 1991, the lump sum investing would have grown to \$151,247 versus the DCA value of \$84,993 (annual compounding). That's over \$66,000 more using lump sum investing. O.K., you say, the assumptions may not be valid and should have been adjusted downward. O.K. so let's say the difference is not \$66,000, but \$50,000. Or even half to \$33,000. That's still a sizable difference in my book. But whatever you do, you need to recognize the study and its implications before you can dismiss the study. The point with this exercise is that I bet you never heard of the study anyway. Now you have and now you have to think.

Here is the same element regarding DCA and my work as an adviser. Assume I had a client with \$1,000,000 in 1984. If I was dumber than a stone, I could have invested \$100,000 a year for them for 10 years during one of the greatest bull markets for both stocks and bonds. And I would have/should have been fired years and years ago since the returns would have been terrible. Of course, someone could say that I should have invested \$100,000 per month? But DCA doesn't address that aspect. It is my contention that if you READ and are financially astute by yourself or through an adviser, you could have reasonably determined in that period of time that the market was growing solidly and invested almost all at once. You would have been much further ahead than even the example above.

Thirdly, and perhaps most importantly, many investors using DCA (or monthly investing) don't bother to watch the investments after they start. They may not rebalance the investments- normally a once per year revision. While true that over time stocks outperform other investments, you have to pay attention since the managers may have changed, the fund may have changed identity and, most importantly, the economics might have changed. For example, you don't want to end up in another 1970's marketplace where stocks did absolutely terrible for some time- about a 45% loss in 1973-1974. Sure, stocks finally caught back up and outperformed other investments after that, but there is literally **no** person that can tell me they could stomach a 40%+ loss without having sleepless nights (even 20%+). That's the absurdity with many magazines saying, "don't worry, just ride it out. It will come back". Well, what happens if the market has been driven down during a period when you weren't paying attention and just when you needed money for your kids education or some medical emergency or you had just retired? DCA/MI doesn't help you there.

Here's a real life story that addresses two problems at once- no continued involvement in the investment process and the use of a single stock under dollar cost average. My sister's husband worked at Digital for many years. He bought Digital stock frequently at special Digital prices, dollar cost averaging all the time. The stock went from around \$20 a share up to a peak of \$200. Unfortunately, no one paid any attention when it went up (except to note how much money they "made")- and they didn't pay any attention when it went down and down and down- well, you get the point. George died of a massive heart attack several years ago. I had to value the stock at the date of death- it was \$54.00 per share. (Value Line rating service rated it a D at that point.) That's almost a 75% drop. It went further down from there- \$16.00 a share though it went up somewhat later on. Mary was "out" over \$80,000 because no one paid any attention to the economy or the potential (or lack thereof) of the company. Past research shows that a company that goes that far down, goes down for a reason and will seldom reach its previous stature. Digital will probably never get back to the old glory days- at least not in Mary's lifetime. True, IBM has come back with a vengeance, but I submit that is an anomaly.

Many individuals are doing this today- using single issue stock that comprises almost all of the families fortunes purchased through "no brainer" dollar cost averaging at work. There is no monitoring of the investment. But the real life aspect for my sister is that the losses sustained by the use of DCA/MI cannot be offset in my sister's lifetime.

It is true that if an investor had used a truly diversified portfolio, it is doubtful that the losses ever would have been that severe. But we may once again see the terrible investment environment of the 70's, so it pays to be vigilant nonetheless.

Dollar Cost Averaging is no excuse for not doing research, monitoring and rebalancing.

In summary, many individuals in retirement plans are not using Dollar Cost Averaging as a way of investing. They just end up doing it because there is no other choice. If you have a lump sum and are totally naive to the marketplace, DCA may lower the psychological risk of investing but it almost unquestionably will result in lower returns. That's a risk in itself.

On the other hand, if you are well read- or would hire someone that does read- the use of DCA is not particularly valid.

**DOLLAR COST AVERAGING (1997):** This is putting money into an investment over a period of time. It does NOT beat investing the money all at once since that outperforms DCA about 2/3rds of the time. However, if you are investing in IRA's or 401 (K)'s, you are putting in money over time anyway. In such cases, you should invest your money on the third or second to last day of the month because most of the return in a month is in the first half of the month and most of that is during the last trading day of the month and the first four days of the new month.

**DCA 2000:** DCA does not work, has not worked and almost universally will not work in the future. Advisers like to tout its viability but it is really for such advisers and "investors" who don't read economic material or are simply emotional wimps to begin with. And statistics validate the argument that you simply make more money by investing all at once.

[A professional article by Moshe Milevsky notes that the previous studies date back to only the 1950s or 60's. As such, the strong current market masks the effects that DCA would have in a poor market. So Milevsky and Steven Pollard did a study that focuses on variability rather than returns. They proved that DCA would have a greater risk overall and would clearly be less efficient. "Because of the higher standard deviation with dollar cost averaging, you would have higher odds of ending up with less money overall."](#)

Part of the lengthy report offered this conclusion, "amongst the general public, DCA appears to be an axiom of prudent investing..... In contrast to this widespread practice, financial economists have shunned this strategy and repeatedly demonstrated its irrationality. .... and mean variance inefficiency. It goes on to address Ito-Markovian structure of asset prices and stochastic payoffs, etc. Suffice to say, the vast amount of B/D firms, financial planners, mutual funds, Santa Claus and your mama all get misty eye with DCA. But they either don't have the foggiest to what is really going on (probably 90%+) or are just playing the emotional element of investing.

Is DCA valid for anyone? Sure! As stated, if you don't have a clue to what you are doing and are emotional about investing money, it is a less strainful method. Of course, finding out you don't have enough money because you didn't pay attention to economics and investment fundamentals- or didn't pay someone who does- is not very valuable when you are 70+ years of age and are running out of money.

[Portfolio Risk In Dollar Cost Averaging Jeopardizes Retirement](#) (Frank Armstrong 2001) Good info on risk and some excellent charts describing Monte Carlo projections.

[Not too many advisers talk about how bad DCA](#) (dollar cost averaging 2001) actually is in total return on money invested. (Actually, most advisers are dumber than rock salt). Anyway, here is one of the few statistical analyses that verifies other studies done for years.

"DCA's delaying tactics are nothing more than thinly disguised attempts to time the market. And delaying investing like that actually decreases your chances of success. Dollar cost averaging with a lump sum is an attempt to "split the baby," and that has historically been a losing strategy. "

[DCA:](#) (2002) Bob Brinker says DCA is great. But then this study by Moshe Arye Milevsky and Steven E. Posner, " The theoretical work tends to focus on the issue of rationality of investors. Still doesn't work though.

DCA: Never has worked over time (2004)

**TABLE 1**  
**Monthly Rates of Return**  
January - December 1988

Month	90-Day T-Bill	S&P 500
January	0.29%	4.27%
February	0.46%	4.70%
March	0.44%	-3.02%
April	0.46%	1.08%
May	0.51%	0.78%
June	0.49%	4.64%
July	0.51%	-0.40%
August	0.59%	-3.31%
September	0.62%	4.24%
October	0.61%	2.73%
November	0.57%	-1.42%
December	0.63%	1.81%

**TABLE 2**  
**Annualized Returns from Lump-Sum and Dollar-Cost Averaging Strategies for Various Periods**

	Mean Return	Standard Deviation
<b>1926-1991</b>		
Lump Sum	12.75%	22.81%
12-Month Averaging	8.50%	13.21%
6-Month Averaging	9.97%	16.81%
3-Month Averaging	11.14%	19.40%
<b>1950-1991</b>		
Lump Sum	13.37%	16.39%
12-Month Averaging	9.63%	9.83%
6-Month Averaging	10.97%	12.91%
3-Month Averaging	12.00%	14.61%
<b>1970-1991</b>		
Lump Sum	13.28%	16.84%
12-Month Averaging	10.80%	10.56%
6-Month Averaging	11.84%	13.80%
3-Month Averaging	12.51%	15.40%

**TABLE 3**  
**Lump Sum Versus Dollar-Cost Averaging**

	Percent of Time LS Exceeded DCA
<b>1926-1991</b>	
Lump Sum vs. 12-Month DCA	64.5%
Lump Sum vs. 6-Month DCA	62.4%
Lump Sum vs. 3-Month DCA	60.5%
<b>1950-1991</b>	
Lump Sum vs. 12-Month DCA	66.3%
Lump Sum vs. 6-Month DCA	63.2%
Lump Sum vs. 3-Month DCA	62.2%
<b>1970-1991</b>	
Lump Sum vs. 12-Month DCA	59.5%
Lump Sum vs. 6-Month DCA	56.7%
Lump Sum vs. 3-Month DCA	57.5%

**TABLE 4**  
**Differences in Annualized Returns Lump Sum Minus Dollar-Cost Averaging**

	Mean Difference	σ	T-Value
<b>1926-1991</b>			
Lump Sum Minus 12-Month DCA	4.25%	10.49%	11.31
Lump Sum Minus 6-Month DCA	2.78%	11.34%	6.84
Lump Sum Minus 3-Month DCA	1.61%	9.34%	4.81
<b>1950-1991</b>			
Lump Sum Minus 12-Month DCA	3.74%	9.56%	8.68
Lump Sum Minus 6-Month DCA	2.40%	8.90%	5.97
Lump Sum Minus 3-Month DCA	1.37%	6.21%	4.88
<b>1970-1991</b>			
Lump Sum Minus 12-Month DCA	2.47%	10.79%	3.64
Lump Sum Minus 6-Month DCA	1.44%	8.80%	2.59
Lump Sum Minus 3-Month DCA	0.76%	6.97%	1.74

**Dollar-cost averaging is unlikely to produce superior results to lump-sum investing.**

[Richard E. Williams, Ph.D., and Peter W. Bacon, DBA.](#)

**Dollar-cost averaging vs. lump-sum investing (2005)**

How you would have fared in some of the most popular funds in 1994 by dollar-cost averaging and investing a lump sum.

10-year total return\*

	Fund \$100 a month	\$12,000 lump sum
Fidelity Magellan	\$15,749	\$31,584
American Funds ICA A	\$19,448	\$40,885
American Funds Wash. Mutual A	\$19,375	\$42,736
Vanguard Windsor	\$20,175	\$40,060
Amer Cent Ultra	\$15,893	\$32,273
Janus Fund	\$14,695	\$29,257
Vanguard 500 Index	\$17,087	\$37,259

\* — Dividends, gains reinvested through Dec. 31. Source: Lipper

**Dollar Cost Averaging:** (Robert Dutil is an associate professor of finance at the University of Utah in Salt Lake City, Utah, and a former derivatives risk manager at Merrill Lynch, UBS and Chase in New York City. 2006)

To date, research on dollar-cost averaging (DCA) has focused on the strategy's cost advantages: a constant amount buys more when the price drops and less when the price increases. If the price fluctuates, the DCA scheme is said to lead to a lower cost per share and a greater total return. Several studies have debunked this wisdom by comparing an upfront lump-sum (LS) strategy (for example, \$1,200 invested once) with a present-value-corrected DCA (\$100 invested immediately, the rest parked in T-bills and in equal installments shifted into stocks over one year). Using historical data from the S&P 500, Williams and Bacon (1993) succinctly show that because the average return on stocks is higher than on T-bills, two-thirds of the time a 12-month LS strategy beats a 12-month DCA strategy in total terminal wealth, as it simply amounts to investing at the beginning of the year rather than spreading purchases throughout the year and forgoing the positive excess return. Focusing on the seasonality of stock returns, Atria and Mann (2001) point out that LS beats DCA when started in November, as LS takes advantage of abnormally high returns in December and January, and DCA misses those; the opposite is true for strategies started February–October. They also show that on a percentage return basis, DCA executed with borrowed money outperforms an equivalent LS, and the result holds across international indices. Leggio and Lien (2003) show that using Sharpe, reward-to-semi-variance, and upside potential ratios, on a risk-adjusted basis, LS beats DCA for most asset classes. Their risk measures rely on variance and semi-variance of returns, not of terminal wealth, and hence their results are driven by the reduced return and not by the risk reduction in DCA.

Abeysekara and Rosenbloom (1998) use a Monte Carlo simulation similar to ours to extend the Williams/Bacon results. Instead of a single piece of historical evidence of outperformance of LS over DCA, they provide a sensitivity analysis of the circumstances under which a strategy is likely to dominate. As is intuitive, they show that the higher the excess return of stocks over risk-free money, and the lower the volatility of the stocks, the more likely LS is to outperform DCA. For example, a 14 percent expected return combined with a 10 percent standard deviation leads to a 79.5 percent chance, while a 6 percent expected return combined with a 30 percent standard deviation leads to a 48.8 percent chance that LS will outperform DCA.

The cited articles confirm that the return on lump sum versus dollar-cost averaging depends crucially on the sequence of stock returns. If stocks trend up, then LS dominates, as it results in buying low up front; if stocks trend down, DCA dominates, as it allows buying later at a lower price. If stocks are volatile, then DCA avoids buying all at a high and nothing at a low, and may contribute to a higher overall return. Yet the studies say surprisingly little about the relative risk of the two strategies—that is, the dispersion of the total return at the final horizon—and very little about averaging over long periods (most are limited to 12 months).<sup>1</sup> This is precisely the line of investigation we pursue here by reinforcing the argument advanced in Dutil (2005).

Working people who save and invest over time in small increments implicitly engage in a form of DCA over their lifetime of investment. We show that, when viewed in such a broad sense, DCA fails to deliver the purported cost savings, but does deliver significant risk reduction. In addition to the standard deviation of the return, we use two new ways of measuring risk from the perspective of a long-term investor. The first is the probability that the investor will lose money relative to a 100 percent risk-free (T-bill) strategy. The second is the expected (dollar) shortfall conditional on missing that minimum. We show that while DCA investors give up return by delaying their investment, they shrink the distribution of their terminal wealth around the mean and significantly reduce the amount of money by which they might miss their retirement goals.

What Is Investment Risk?

In his excellent article on risk allocation, Chhabra (2005) explains why modern portfolio theory (MPT) fails to explain the observable lack of diversification among individual investors, despite 50 years of investor education. MPT defines risk narrowly as

the standard deviation of returns. Individual investors build diversified portfolios along Markowitz's efficient frontier and choose an asset allocation compatible with their (also narrowly defined) risk preferences. Those who deviate from the mean-variance optimal asset allocation are labeled "irrational" and most behavioral finance (see Thaler 1993) focuses on explaining that irrationality. While we do not focus, as Chhabra does, on investors' diversification failures, we do take his broader risk perspective. In addition to standard market risk, this includes two additional important risk components that lead to constraints on investment strategies.

The first can be described as personal risk of not jeopardizing one's basic standard of living. Investors concerned with personal risk views risk asymmetrically. They worry about their wealth not falling below some minimal level, which itself grows over time. (Bodie (2001) drives that point home by recommending replacing all stock investment with Treasury inflation-protected securities combined with stock call options, whose payoffs are reinvested in more TIPS, in order to avoid the risk of falling short of the minimum level.)

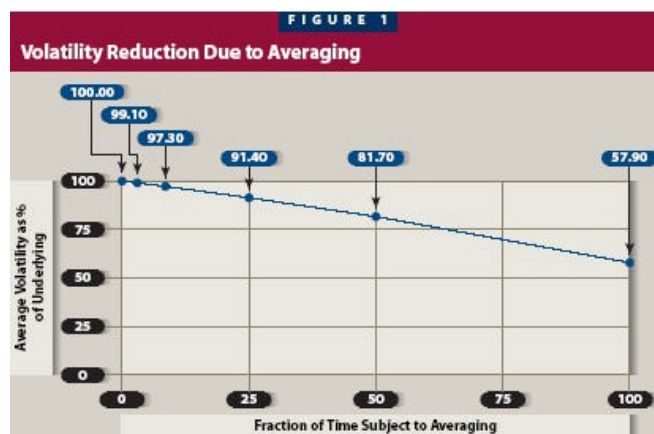
The second aspirational risk component, related to regret, has to do with enhancing lifestyle. Investors measure their wealth not just in absolute terms, but also relative to other investors. To avoid aspirational risk's subjectivity, we limit ourselves to three measures of combined personal and standard market risk for a single investment.

The standard deviation of the terminal dollar amount gauges the dispersion of the strategy's potential final wealth levels around the mean. The terminal dollar amount, realized upon the liquidation of the investment (retirement), depends on the strategy (how many shares we bought, at what prices, and what the liquidation price is) and the performance of the underlying stock. A low standard deviation value means that we are more sure about how much we will end up with at the end of the savings program. A high standard deviation value means that we are likely to fall short of or exceed the mean by a larger amount.

Investors concerned with personal risk do not care about standard deviations per se. Instead, they worry about outright losses or insufficient returns that may jeopardize their retirement well-being. The probability of shortfall gauges the probability that the terminal value of the investment falls below a pre-specified level. In our paper, this is set to the future value of the investment compounded by the risk-free rate. The conditional expected shortfall is the expected value of the shortfall conditional on the shortfall occurring. It measures the average dollar amount by which an investor misses his or her retirement target, if he or she falls short. The conditional expected shortfall depends on the volatility of asset returns and the investor's portfolio choices, and thus is a combined measure of personal and market risk.

#### The Risk-Dampening Effect of Averaging

Option-pricing literature demonstrates<sup>3</sup> that Asian options, written on the averages of interest rates and currencies, are less valuable than standard calls and puts, written on a single observation of the price/rate at exercise/expiry. Moving averages fluctuate less than raw prices, and so the volatility of the average of rates over time is lower than the volatility of the non-averaged underlying. Using Dubil and Dachille's (1989) elegant formula for the volatility of the average relative to the volatility of the underlying stock, in Figure 1 we construct the graph of that ratio for different fractions of averaging over the total investment horizon.<sup>4</sup> The volatility reduction due to averaging ranges from none if there is no averaging to about 42 percent if the averaging covers the entire investment horizon.



#### Simulation

As in the original Dubil (2005) study, we use a Monte Carlo simulation to investigate the risk profile of DCA. The advantage of simulation over a historical analysis is not greater accuracy, or better probability representation, but the ability to obtain the entire distribution of results instead of a single-point estimate and thus to compute all of our risk metrics. We generate 1,000 lognormal paths of an asset price and investigate two \$100 investments in the asset. The LS strategy consists of a one-time upfront investment of \$100. The DCA strategy consists of a gradual acquisition of the stock in equal installments totaling \$100. We sidestep the present valuing or self-financing issues by setting the risk-free rate equal to zero and interpreting the drift (expected return per period) as the



excess return of stocks over the risk-free rate, which we set equal to 6 percent. We then compute the sample standard deviation of the terminal value of the investment; we obtain the probability of shortfall by counting the number of paths for which the terminal value of our investment fell below the initial value; and we obtain the conditional expected shortfall by computing the average shortfall across money-losing paths.

#### Lifetime DCA Reduces Volatility and Shortfall Risks

We ran our simulations for several final horizon and averaging period combinations. We present results for DCAs with five equal annual investments over the first five years of the saving plan with 5- and 15-year final horizons. The results are qualitatively the same for other combinations of averaging time and total investment time (such as 30-year horizons with 10- and 30-year averaging). For simplicity, we present results only for annual DCA rather than monthly DCA, but it should be clear that the more frequent monthly averaging would lead to an even greater risk reduction, although only minimally so (monthly produces less than 10 percent in further risk reductions relative to annual).

In general, what matters most is the length of the averaging period relative to the total length of time money stays invested.

Table 1 shows the ratios of the risk statistics for DCA relative to LS. On average, DCA returns 88 percent to 89 percent of what the upfront LS returns. But the standard deviation of the DCA terminal amount is only 71–79 percent of the standard deviation of the LS strategy for 5-year DCA with 15-year total holding horizon, and only 58–61 percent for 5-year DCA/5-year final horizon. This finding is significant although not unexpected. The longer the averaging relative to the total investment period, the greater the volatility dampening due to averaging. Table 1 also indicates that the riskier the underlying asset base (15 percent standard deviation versus 30 percent standard deviation), the greater the volatility reduction.<sup>5</sup> The reduction of standard deviation is very important. The assurance of a more certain outcome can contribute to fewer mistakes along the investment path, like selling after temporary losses. This may prevent the observed tendency on the part of some investors to underperform benchmarks because of timing errors.

	5-Year Final		15-Year Final	
	Diversified	Undiversified	Diversified	Undiversified
<b>Ratio of DCA/LS</b>				
Mean Return	0.89	0.89	0.88	0.88
Standard Deviation	0.61	0.58	0.79	0.71
Shortfall Probability	1.00	0.95	1.00	0.98
Conditional Expected Shortfall	0.70	0.72	0.95	0.94
<b>For Upfront LS Strategy</b>				
Shortfall Probability	25%	46%	15%	43%
Conditional Expected Shortfall	17.1	35.8	22.8	50.1

The shortfall risk statistics in Table 1 tell an even more compelling story. While the probability of shortfall is not affected much by the averaging, the dollar amount by which one will be short on average is reduced dramatically. In the extreme five-year final case, LS investors will lose money 25 percent of the time. DCA investors will also lose 25 percent of the time, but when they do, on average they will lose only 70 percent of what LS investors do. And the expected conditional loss is not small in either case. On a \$100 investment, when the LS investor loses money, he or she loses, over a five-year horizon, \$17 on a diversified portfolio and a lot larger \$36 on the undiversified stock. High-tech stock investors of the 1990s know this fact very well: losses happen infrequently, but when they do, they can be very steep. During the same five-year period, the DCA investor in the same assets loses 70 percent of the amount lost by the LS investor. The 30 percent "saving" is significant given the large size of the loss. DCA is best at ameliorating the expected size of the losses once they occur. Arguably, the possibility of "losing their shirt" is the biggest fear of most individual investors.

Table 1 also points out that in absolute dollar terms, dollar-cost averaging offers the greatest advantages when applied to very risky assets. In the 30 percent volatility case of a stock, the expected conditional shortfall is very large—\$36 or \$50. A reduction to 72 percent of that amount may be worth a small sacrifice of expected return.

#### Conclusion

Previous studies have shown that dollar-cost averaging's return relative to lump sum depends critically on the sequence of prices. Because an investor cannot predict that sequence, the potential cost savings of DCA are dubious. This study shows, however, that the risk-reduction benefits are real. The risk-reduction level depends not only on the unpredictable volatility of the future price path, but on the investment strategy within the investor's control and, specifically, the length of the averaging relative to the total investment horizon. Our study quantifies the amount of the risk reduction. The expected shortfall amount of DCA at retirement is found to be up to 30 percent lower than that of LS. Normatively, this implies that financial planners should press their clients to take advantage of automatic savings plans over very long periods. This will minimize disappointment at retirement when investment results are poor.

**DCA has long been considered an alternative strategy to playing the timing game. (2007)**

<http://www.uwlax.edu/ba/fin/Research/Dollar%20Cost%20Edited.pdf>

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.

	<b>Compound Annual Return</b>	<b>Daily Return</b>	<b>Standard Deviation</b>	<b>Change in Return</b>	<b>Change in Risk</b>
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%

	<b>Compound Annual Return</b>	<b>Daily Return</b>	<b>Standard Deviation</b>	<b>Change in Return</b>	<b>Change in Risk</b>
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%

	<b>Compound Annual Return</b>	<b>Daily Return</b>	<b>Standard Deviation</b>	<b>Change in Return</b>	<b>Change in Risk</b>
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%



	<b>Dollar Value of Investments</b>		
	<b>As of December 31, 2001</b>		
	\$24,000 <u>Lump-sum</u>	\$100/month <u>Annuity</u>	\$300/qtr. <u>Annuity</u>
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

But think about this- you are in the market in 1999 (this is effectively the case I did against American Express last year) and are retired. You are told you have sufficient monies. 2000- 2002 comes along and you lost 50% of your money (partly due to a bad allocation by a CFP). So you stayed the course and didn't miss the bad days. Fine- the idea is that you can now also get the good days. Unfortunately, you no longer have any money to invest. You are broke.

The fallacy of theory is that it dismisses the real world of people who cannot lose their assets since their finite lifetime does not provide the ability to stay the course to infinity. RETirees were devastated in 1973/74 and not only had to be told that another debacle would statistically occur (2000- 2002) but what was going to be done to alleviate 40%- 50% losses.

No, not all losses would have been eliminated. A correction is 10%- 15% and has to be accepted. But if the economics are bad, bad, bad, losses must be kept to a minimum. Over a trillion dollars was lost in 2000- 2002- much of it was unnecessary by consumers. But "professional advisers" (what? A series 7 licensee?? A CFP??) never had the understanding of risk to provide hardly any real life assistance.

If you do not know diversification by the numbers, you are clueless to risk and always have been.

[DOLLAR COST AVERAGING LINK:](#) Mathematical Illusion: Why Dollar-Cost Averaging Does Not Work

by John G. Greenhut, Ph.D.

Conclusion- This paper examined the behavior of stock volatility, which has given rise through illustrations to the widespread belief that dollar-cost averaging allows more shares to be bought over time than would occur through a lump-sum investment. We have exposed that illustration as a mathematical illusion, based on arithmetic changes in a denominator leading to disproportionate changes in the fraction. We found instead that the price variations that would be expected for fundamentally valued stocks is precisely the pattern that negates the advantage DCA commonly has been illustrated to hold. This result has been confirmed by an examination of the performance of a broad number of stocks, adjusted for the impact of trends on the DCA versus LS outcome. Whether DCA is practiced by investors should be based on their psychological makeup (for example, **aversion to regret**) and their outlook for stocks, not on an overly simplistic and misleading representation of how stock prices vary.

This is a good paper that extends previous studies. Except for extremely volatile stocks in a downtrend, DCA just doesn't work. Even then (2002- 2002), why would you expose yourself to losses upon losses? (Easy, your broker told you to buy and you "trusted" him. How nice.)

[Why Dollar-Cost Averaging Does Not Work \(2008\)](#)

- In spite of the weight of evidence provided in academic literature against the strategy of dollar-cost averaging, DCA continues to be practiced by investors and recommended by financial advisors.
- Beyond its psychological appeal, the popularity of the approach can be said to stem from simple illustrations that show DCA resulting in greater stock holdings across a stock market cycle than is achieved by a one-time, lump-sum investment. Alternatively presented, the average cost per share purchased under DCA is demonstrated, by example, to be less than the average price of stock over its cycle.
- This paper challenges that illustration. It shows that variations in stock prices should not follow the mathematical pattern assumed in the examples. In fact, the price movement should follow a particular mathematical form that yields the same number of shares purchased, whether by DCA or lump-sum investing.
- Absent any benefit from stock price volatility in reducing average cost, the performance of DCA rests on the trend in stock prices, with DCA outperforming in downward markets and lump sum outperforming in upward markets. Since the latter case is the norm over time, customary empirical findings in the finance literature of underperformance by DCA are explained.
- The theory in this paper is confirmed by examining a broad sample of stocks, contrasted over the high-growth trend in the

second half of the 1990s against the general market malaise over the following half-decade. In the absence of this trend, DCA and lump sum provide equivalent results.

- A sizeable number of studies have appeared in academic literature pointing to underperformance of dollar-cost averaging (DCA) compared with a simple lump-sum (LS) approach. In commemorating the 25th anniversary of the *Journal of Financial Planning*, the paper by Williams and Bacon (1993, reprinted in June 2004) was honored for the significance of its findings on this point. Other papers finding sub-optimal performance of DCA include Knight and Mandell (1993); Thorley (1994); Rozeff (1994); Bacon, Williams, and Arinina (1997); Shumway (1997); Bernice (1998); Scherer (1998); Abeysekera and Rosenbloom (2000); Harrington (2001); Leggio and Lien (2001 and 2003); and Bierman and Hass (2004). Yet DCA continues to be practiced by investors and recommended by financial advisors.

#### Sample Web Sites Illustrating Dollar-Cost Averaging

- [www.aigvalic.com/valic2003/aigvalic.nsf/contents/edu\\_str-dollar](http://www.aigvalic.com/valic2003/aigvalic.nsf/contents/edu_str-dollar)
- [www.americancentury.com/workshop/articles/dollar\\_cost\\_averaging.jsp](http://www.americancentury.com/workshop/articles/dollar_cost_averaging.jsp)
- [www.americanskandia.prudential.com/page/0,2225,5279,00.html](http://www.americanskandia.prudential.com/page/0,2225,5279,00.html)
- [www.commonseadvice.com/dollar\\_cost\\_averaging.html](http://www.commonseadvice.com/dollar_cost_averaging.html)
- [www.dripwizard.com/dripinfo\\_dca.asp](http://www.dripwizard.com/dripinfo_dca.asp)
- [www.equitable.com/pdf/dollar\\_cost.pdf](http://www.equitable.com/pdf/dollar_cost.pdf)
- [www.franklintempleton.com/retail/jsp\\_cm/education/fin\\_basic/strategies/dollar\\_avg.jsp](http://www.franklintempleton.com/retail/jsp_cm/education/fin_basic/strategies/dollar_avg.jsp)
- [www.guardianlife.com/solutions/Investing/diversification\\_and\\_dollar\\_cost\\_averaging.html](http://www.guardianlife.com/solutions/Investing/diversification_and_dollar_cost_averaging.html)
- [www.ici.org/i4s/bro\\_i4s\\_dollar.html](http://www.ici.org/i4s/bro_i4s_dollar.html)
- [www.investopedia.com/printable.asp?a=/articles/01/090501.asp](http://www.investopedia.com/printable.asp?a=/articles/01/090501.asp)
- [www.managersinvest.com/index/ret\\_averaging](http://www.managersinvest.com/index/ret_averaging)
- [www.moneyinstructor.com/art/dcostaveraging.asp](http://www.moneyinstructor.com/art/dcostaveraging.asp)
- [www.newyorklife.com/cda/0,3254,10372,00.html](http://www.newyorklife.com/cda/0,3254,10372,00.html)
- [www.pennmutual.com/pmlwebsite/pages/PML\\_Public/Main\\_Content/inveperf/investbasics/dollarcostaverag/index\\_1472.html](http://www.pennmutual.com/pmlwebsite/pages/PML_Public/Main_Content/inveperf/investbasics/dollarcostaverag/index_1472.html)
- [www.rbcfunds.com/learning/dollar\\_cost\\_avg.html](http://www.rbcfunds.com/learning/dollar_cost_avg.html)
- [www.teenvestor.com/investors/stocks/dca.htm](http://www.teenvestor.com/investors/stocks/dca.htm)
- [http://wachovia.com/personal/page/printer/0,,4803\\_4808\\_4934\\_4950,00.html](http://wachovia.com/personal/page/printer/0,,4803_4808_4934_4950,00.html)
- [www.usatoday.com/money/perfi/columnist/block/2001-03-20-block.htm](http://www.usatoday.com/money/perfi/columnist/block/2001-03-20-block.htm)
- [www.youngmoney.com/investing/investment\\_strategies/021007\\_01](http://www.youngmoney.com/investing/investment_strategies/021007_01)