Quality Dollar Cost Averaging Investing Versus Quality Index Investing

Harvey W. Rubin
Louisiana State University in Shreveport

Carlos G. Spaht, II
Louisiana State University in Shreveport

Financial independence is defined as the ability to do anything at any time without financial restrictions. In an age of job insecurity and economic volatility, financial independence is difficult to acquire unless a person is financially independent of his/her employment organization. The purpose of this paper is to develop a strategy for generating an increasing income stream and capital appreciation during both the employee's working years and retirement years by comparing dollar-cost averaging to an initial lump sum investment while reinvesting the dividends in both cases.

INTRODUCTION

The phrase "a life well lived" is subject to individual and societal interpretation. For example, in the past, some Native American tribes viewed success by the number of horses owned. Some cultures viewed it, at least from the male's perspective, by the size of a man's harem. Now most societies view it by philanthropic contributions, quality of life, or wealth accumulation. Regardless of one's position in this "life well lived" philosophy, financial independence must first be gained to support it. The purpose of this paper is to show how this can be done.

PERSPECTIVE

This paper will compare the results of dollar-cost averaging (DCA) in quality stocks with the results of initial lump sum investing in a quality index. Most investors are unable to invest large sums of money at regular time intervals. Even if they were able, their investments would probably be made at the height of the market. Buying low and selling high rarely works as an investment strategy. Why? Because, investing is typically an emotional decision made by buying or selling at the impulse of the moment. Such investments are frequently made according to the latest tip or fad and are often made on junk or low-grade stocks rather than investment grade (quality) stocks.

For most people, DCA is the best investment strategy. It is almost a mathematical certainty that when investing equal amounts of money in the same stock periodically (for example, each quarter), the average cost per share of stock will be substantially below the high points in the market. This is because, at regular time intervals, the market fluctuates from being high to moderate to low, which results in the

average cost per share being significantly below the high cost of the shares. The investor buys more shares when the price is low and fewer shares when the price is high (Smith, 2016).

Many studies have been done concerning advantages of long term and continuous investing in the market. Some of the results are rather startling. For example, according to Putman investors, by taking away the 10 best market days in the S&P 500 over the last 15 years, the annualized return would have been only 2.1%! On the other hand, being fully invested for the entire period generated a return of 6.5%. A comparable study by Morningstar Direct demonstrated that between 1926 and March 2014, the S&P 500 Index generated positive returns 94% of the time over 940 rolling monthly 10-year periods, and 99.7% of the time over 880 rolling monthly 15-year periods (Summers, 2014). Furthermore, if this same study had been extended to 2017 when the stock market reached all-time highs, the resulting returns would have been even more dramatic (Arends, 2014; Housel, 2014; Hulbert, 2014; Hutchinson, 2012; Zweig, 2014).

Investing in stocks that pay dividends is critical for achieving a substantial return. From 1972 to 2015, stocks with increasing dividends in the S&P 500 had an annualized rate of return of 9.8%, those with stationary dividends had a rate of 7.2%, and those with no dividends had a rate of only 2.5% (Smith, 2016). Thus, dividend paying stocks had an approximately four times greater return than the non-dividend paying stocks. Moreover, reinvesting the dividends would have generated an even greater return as we will discuss in this paper. Historically, dividends have comprised well over 40% of the total return earned from stocks.

This paper will compare individual stock investing with that of index investing over a 15-year period of time to determine which is better – investing a fixed amount of money as an initial lump sum in the S&P 500 Index or investing the same amount of money spread over the same 15-year period in quality stocks using the DCA method. We will also compare the results of these two strategies when the dividends are reinvested versus when they are not.

The authors incorporated findings from their previous papers for analytical purposes (Spaht & Rubin, 2007; Rubin & Spaht, 2010; Rubin & Spaht, 2011; Spaht & Rubin, 2012; Rubin & Spaht, 2013; Spaht & Rubin, 2014; Rubin & Spaht, 2015; Rubin & Spaht, 2016).

ANALYSIS

To determine the return value of the portfolio using the DCA method and reinvesting the dividends, this paper assumes that, in the beginning of the first quarter of 1993, investments were made in a sample of 10 randomly selected stocks contained in the S&P 500 Dividend Aristocrats Index. This index was used because it only includes stocks that have paid dividends consistently for at least the last 25 years. The sample of selected stocks was also limited to those stocks that increased their dividends over this 25-year period and had either a buy or a strong buy recommendation from the S&P equity analysts. The 10 stocks randomly selected were Abbott Labs; AFLAC, Inc.; Becton, D'son; Coca-Cola; Exxon Mobile; Johnson & Johnson; McDonald's; Pepsi Co., Inc.; Proctor & Gamble; and Wal-Mart Stores.

The assumption is made that the investor invested in each of these stocks from 1993 through 2007 with an initial investment of $250 and then, on a quarterly basis for the next 15 years, reinvested the dividends while also investing an additional fixed amount of $75 in each of the 10 stocks. Notice that with an initial investment of $250 in each stock, the total amount invested over the 15-year period is $4,750 ($250 + 4 x $75 x 15) per stock or $47,500 for all 10 stocks.

The period 1993-2007 was selected because it contains almost equally good and bad years in the stock market. The bursting of the Tech bubble at the end of 2000 as well as the stock market highs in 2007 are both represented.

This paper derives a formula referred to as the DCA-QDRIP (Dollar-Cost Averaging Quarterly Dividend Reinvestment Plan) formula which is used to determine the returns for the various stocks purchased over this 15-year period. The formula is then slightly modified to determine the returns for the same stocks over the same 15-year period using the DCA method without reinvesting the dividends. The results of these two calculations are shown in Tables 2 and 3. Both returns are then compared with the

returns obtained by investing the total sum of $47,500 as an initial one-time investment in the S&P 500 Index.

DCA-QDRIP FORMULA

To derive the DCA-QDRIP (Dollar Cost Averaging Quarterly Dividend Reinvestment Plan) formula, the formula used to compute accumulations in stock value, consider an arbitrary stock and let:

- P(n) = the price per share of stock during the n^{th} year (P(n) is computed by finding the average of the high and low price per share during the n^{th} year),
- D(n) = the declared dividend per share of the n^{th} year,
- A(n) = the dollar amount invested to purchase additional shares of stock during the n^{th} year (this value is assumed to be $75 per quarter or $300 per year in this paper),
- S = the number of shares initially purchased,
- S_i = the number of shares owned at the end of the i^{th} quarter,
- and S_{Pi} = the number of shares purchased during the i^{th} quarter.

Two assumptions are made in the derivation of the formula. First of all, since P(n) is the average price per share of stock during the entire n^{th} year, it will remain constant and not fluctuate throughout the year. Secondly, since the dividend is normally declared annually and distributed quarterly, it also will remain constant throughout the year and not change until the first quarter of the following year. Note that since S_i is the number of shares owned at the end of the i^{th} quarter, then S_{i-1} represents the number of shares owned at the beginning of the i^{th} quarter.

Under the above assumptions, the amount of dividend (DIV(i)) generated by one share of stock and used by the investor to purchase additional shares of stock during the i^{th} quarter is:

$$\mathrm{DIV(i)} = .25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right] + 1\right), \tag{1}$$

where [ ] denotes the greatest integer function. Also, the price (PRICE(i)) per share of stock over this same time period is:

$$\mathrm{PRICE(i)} = \mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right] + 1\right). \tag{2}$$

Thus the quotient,

$$\frac{\mathrm{DIV(i)}}{\mathrm{PRICE(i)}} = \frac{.25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}, \tag{3}$$

represents the number of shares of stock purchased by the investor from the dividends of a single share of stock during the i^{th} quarter. This continuing process is illustrated in Table 1.

TABLE 1
SHARES PURCHASED FROM THE DIVIDENDS OF ONE SHARE OF STOCK

	Quarters			
Year	1	2	3	4
1	$\frac{.25\mathrm{D}\left(\left[\frac{1-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{1-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{2-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{2-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{3-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{3-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{4-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{4-1}{4}\right]+1\right)}$
2	$\frac{.25\mathrm{D}\left(\left[\frac{5-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{5-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{6-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{6-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{7-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{7-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{8-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{8-1}{4}\right]+1\right)}$
3	$\frac{.25\mathrm{D}\left(\left[\frac{9-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{9-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{10-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{10-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{11-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{11-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{12-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{12-1}{4}\right]+1\right)}$
4	$\frac{.25\mathrm{D}\left(\left[\frac{13-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{13-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{14-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{14-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{15-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{15-1}{4}\right]+1\right)}$	$\frac{.25\mathrm{D}\left(\left[\frac{16-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{16-1}{4}\right]+1\right)}$
5	… … … …	… … … …	… … … …	… … … …

Also note that the number of shares S_i owned at the end of the i^{th} quarter is given by:

$$\begin{aligned} S_i &= S_{i-1} + S_{Pi} \\ &= S_{i-1} + S_{i-1} \bullet \frac{\mathrm{DIV(i)}}{\mathrm{PRICE(i)}} + \frac{.25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}{\mathrm{PRICE(i)}} \\ &= S_{i-1} + S_{i-1} \bullet \frac{.25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)} + \frac{.25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}. \end{aligned} \tag{4}$$

For the purpose of this paper, since \$75 per quarter is used to purchase additional shares of stock, we have our DCA-QDRIP Formula of:

$$S_i = S_{i-1} + S_{i-1} \bullet \frac{.25\mathrm{D}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)} + \frac{75}{\mathrm{P}\left(\left[\frac{\mathrm{i}-1}{4}\right]+1\right)}. \tag{5}$$

Therefore, at the end of n years (or 4n quarters), the investor will have accumulated a value in stock of A dollars where:

$$\begin{aligned} A &= \mathrm{P(n)} \bullet S_{4n} \\ &= \mathrm{P(n)} \bullet \left[S_{4n-1} + S_{4n-1} \bullet \frac{.25\mathrm{D}\left(\left[\frac{4\mathrm{n}-1}{4}\right]+1\right)}{\mathrm{P}\left(\left[\frac{4\mathrm{n}-1}{4}\right]+1\right)} + \frac{75}{\mathrm{P}\left(\left[\frac{4\mathrm{n}-1}{4}\right]+1\right)} \right]. \end{aligned} \tag{6}$$

TABLE 2
STOCK VALUE GROWTH WITH DCA-QDRIP PLAN
1993-2007

Stocks Name	IIV	ICS	INS	FCS	FNS	FIV	% GAIN	ARR
Abbot Labs	250	13.40	18.66	54.15	207.78	11,251.10	136.87	5.917
Aflac, Inc.	250	4.65	53.76	54.55	432.09	23,570.50	396.22	11.27
Becton, D'son	250	8.25	30.30	77.60	249.77	19,382.4	308.05	9.828
Coca-Cola	250	20.65	12.11	54.95	141.082	7,752.44	63.21	3.320
Exxon Mobil	250	15.90	15.72	82.15	208.20	17,103.50	260.07	8.916
Johnson & Johnson	250	10.40	24.04	64.25	213.01	13,685.90	188.12	7.310
McDonald's Corp.	250	13.00	19.23	53.00	230.94	12,239.70	157.68	6.514
PepsiCo, Inc.	250	19.40	12.89	70.45	165.63	11,668.80	145.66	6.175
Procter & Gamble	250	12.85	19.46	67.80	196.06	13,292.60	179.84	7.101
Wal-Mart Stores	250	14.25	17.54	46.75	211.48	9,886.76	108.14	5.008
TOTAL	2,500					139,833.70	194.39	7.464

IIV = Initial investment value
ICS = Initial year's average cost per share ((high price – low price)/2)
INS = Initial number of shares purchased
FCS = Final year's average cost per share ((high price – low price)/2)
FNS = Final number of shares
FIV = Final investment value
% GAIN = Percentage total return (includes both reinvestment of dividends and investment of $75 per quarter per stock + initial $250 investment in each stock)
ARR = Annual rate of return in accumulations of stock value (includes both reinvestment of dividends and investment of $75 per quarter per stock + initial $250 investment in each stock)

TABLE 3
STOCK VALUE GROWTH USING DCA WITHOUT REINVESTING DIVIDENDS
1993-2007

Stocks Name	IIV	ICS	INS	FCS	FNS	FIV	% GAIN	ARR
Abbot Labs	250	13.40	18.66	54.15	167.48	9,068.97	90.93	4.406
Aflac, Inc.	250	4.65	53.76	54.55	386.47	21,081.70	343.83	10.445
Becton, D'son	250	8.25	30.30	77.6	218.86	16,983.30	257.54	8.865
Coca-Cola	250	20.65	12.11	54.95	119.54	6,568.48	38.28	2.184
Exxon Mobil	250	15.90	15.72	82.15	162.21	13,325.80	180.54	7.119
Johnson & Johnson	250	10.40	24.04	64.25	175.82	11,296.40	137.82	5.946
McDonald's Corp.	250	13.00	19.23	53.00	201.07	10,656.70	124.35	5.535
PepsiCo, Inc.	250	19.40	12.89	70.45	141.66	9,980.17	110.11	5.074
Procter & Gamble	250	12.85	19.46	67.80	164.06	11,123.50	134.18	5.837
Wal-Mart Stores	250	14.25	17.54	46.75	193.53	9,047.51	90.47	4.389
TOTAL	2,500					119,132.53	150.81	6.322

IIV = Initial investment value
ICS = Initial year's average cost per share ((high price – low price)/2)
INS = Initial number of shares purchased
FCS = Final year's average cost per share ((high price – low price)/2)
FNS = Final number of shares
FIV = Final investment value
% GAIN = Percentage total return (includes $75 invested per quarter per stock + initial $250 investment in each stock)
ARR = Annual rate of return in accumulations of stock value (includes $75 invested per quarter per stock + initial $250 investment in each stock)

RESULTS OF STOCK VALUE GROWTH WITH REINVESTING DIVIDENDS

In referencing Table 2, had the investor invested an initial amount of $250 in each of the 10 stocks and reinvested the dividends while also investing an additional $75 in each stock quarterly (all investments made at the beginning of each quarter), then at the end of 15 years, that portfolio would have grown in value from $2,500 to $139,833.70. This results in a percentage increase of 194.39% in total return which annualizes to a rate of 7.46%. The total amount invested, excluding dividends reinvested, equals $4,750 ($250 + 4 x $75 x 15) per stock or $47,500 for all 10 stocks.

Thus, a very small investor with the discipline to constantly invest small sums and reinvest the dividends can create a portfolio with substantial growth. These growth rates can add a substantial sum to one's salaried income while simultaneously preserving the purchasing power of the portfolio.

How does the DCA portfolio with the dividends reinvested compare to investing in the S&P 500 Index? If the $47,500 had been invested initially in the S&P 500 Index and the dividends reinvested, then at the end of 15 years, the portfolio would have grown in value to $211,935, resulting in a 346.18% increase (annual rate of 10.54%) (S&P 500 Return Calculator, 2017).

RESULTS OF STOCK VALUE GROWTH WITHOUT REINVESTING DIVIDENDS

To determine the stock value growth in the DCA portfolio where the dividends are not reinvested, the same DCA-QDRIP formula is used, only with the $S_{i-1} \bullet \frac{.25D\left(\left\lfloor\frac{i-1}{4}\right\rfloor+1\right)}{P\left(\left\lfloor\frac{i-1}{4}\right\rfloor+1\right)}$ term eliminated. The results are contained in Table 3. Note that if the investor had invested an initial $250 in each of the 10 stocks while also investing an additional $75 in each stock quarterly (all investments made at the beginning of each quarter) and not reinvesting the dividends, then at the end of 15 years, that portfolio would have grown in value from $2,500 to $119,132.53. The resulting percentage increase is 150.81% in total return (annual rate of 6.32%).

How does this portfolio compare with that of investing in the S&P 500 Index? Had the $47,500 been invested initially in the S&P 500 Index without reinvesting the dividends, the fund would have grown to $161,438, resulting in a 239.87% increase (annual rate of 8.54%) (S&P 500 Return Calculator, 2017).

CONCLUSION

The returns from investing a lump sum initially in a market basket of quality stocks clearly exceeds the returns of individual quality stock investing over the same time period. The old adage that "it is the time in the market rather than the amount of money in the market" is what made the difference. Whether you are an individual stock investor or a passive market basket of stocks investor, the results are impressive as long as both types of investments are of quality and as long as the dividends are reinvested. It is the discipline to invest and to reinvest the dividends that significantly raises the total return of capital gains plus dividends.

REFERENCES

Arends, B. (2014, September 6-7). The Case for Sticking with Stocks – No Matter the Price. *The Wall Street Journal*, p. B7.

Housel, M. (2014, September 20-21). Why This Rally Can't Last – and What to Do About It. *The Wall Street Journal*, p. B7.

Hulbert, M. (2014, June 28-29). Look Who Beat the Market. *The Wall Street Journal*, p. B7.

Hulbert, M. (2014, August 9-10). Still Trying to Time the Stock Market? Read This First. *The Wall Street Journal*, p. B7.

Hutchinson, T. (2012, December). The New Golden Age of Dividends. *The High-Income Factor*, A Moneynews.com Special Report.

Rubin, H. & Spaht, C. (2010). Financial Independence! Attainable, Maintainable. *Journal of Applied Business and Economics*, 11(3), 11-18.

Rubin, H. & Spaht, C. (2011). Financial Independence through Dollar Cost Averaging and Dividend Reinvestment. *Journal of Applied Business and Economics*, 12(4), 11-19.

Rubin, H. & Spaht, C. (2013). An Investment Strategy for Financial Independence for the Unluckiest Person in the World. *Journal of Applied Business and Economics*, 15(1), 64-69.

S&P 500 Reinvestment Calculator (2017, May).

S&P 500 Return Calculator (2017, May).

Smith, A., & Fonda, D. (2016). 8 Weeks to Be a Better Investor. *Kiplinger's Personal Finance*, 70(11), 40-44.

Spaht, C., & Rubin, H. (2007). Projections in Accumulations of Stock Value at Difference Dividend Tax Rates. *Journal of Applied Business and Economics*, 7(1), 33-50.

Spaht, C., & Rubin, H. (2012). An Investment Strategy for Financial Independence. *Journal of Accounting and Finance*, 12(3), 38-53.

Spaht, C. & Rubin, H. (2014). Comparison of Three Investment Strategies for Financial Independence. *Journal of Applied Business and Economics*, 16, (6), 44-55.

Summers, N. (2014, September 1-7). Stocks Overvalued? Who Cares? *Bloomberg Business Week*, p. 40.

Zweig, J. (2014, September 13-14). Charles Munger: Secrets of Buffett's Success. *The Wall Street Journal*, p. B9.