

## Creating Equity Indices: A Case Exercise

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### Abstract

Brooks Hamilton is a recent college graduate who joins a regional money management firm. His first assignment is to create a stock index based on local firms for his manager to include in her presentation to clients. Eager to make a good first impression, Brooks reviews his college notes on price-weighted and market-weighted indices and then begins his work. Along the way, he encounters stock splits and constituent changes and makes appropriate adjustments to his indices. He provides a report to his manager and makes his recommendation on which index to use.

### Introduction

Brooks Hamilton arrived early for his first day of work at Rising Tide Limited, a Charlotte, North Carolina-based regional money management firm for high net worth individuals. He was eager to get started and make a good impression with the portfolio manager that he would be supporting. He found that his portfolio manager was already in her office and she motioned for him to come in and have a seat while she wrapped up a call. Brooks noticed that her office was very orderly, unlike most of the professors' offices from his college. His manager had photos on the wall which showed her with local celebrities, business executives, and politicians. He could tell that she was well-connected and accustomed to spending her day building her business. As she completed her call she welcomed Brooks to the firm. She told him that many of her clients are executives' at large firms in the area. Much of their net worth is concentrated in shares of their own firm. Over the past several months she had been working with her clients to diversify their holdings, but several were reluctant to take on shares in other firms since they were so familiar with their own company. She wanted to create a regional index that would allow her clients to compare their less diversified holding with an index of large companies in the area, but she didn't have enough time to gather the data and create the index. Now that Brooks was on-board, this would be his first task. She also mentioned that although some analysts came into the office a little later in the day, she expected him to be ready to start at 7:00 AM. Brooks thought he was off to a poor start and wanted to get back on track to let his manager know he was a hard worker and capable of doing the work. Brooks asked her to provide a bit more information about the index as he was eager to get started. She told Brooks to get a list of firms in the Charlotte region that were included in the Fortune 500 and to create an index of the shares of these firms so that her clients could see the benefit of holding a more diversified portfolio. She explained that ideally she would like to have an index with more firms to gain a greater level of diversification, but that by focusing on local firms the benefits would be more impactful for her clients. Brooks recalled from his college investments class that there were a few ways to create an index so he asked if she wanted a price-weighted index or a market-capitalization weighted index. He recalled that there was another method called, equally-weighted index, but wanted to stick to just the first two to get her response. She turned the question around and asked him to do what he thought would be the most appropriate. He decided to do both and let her see the strengths and weaknesses of both approaches. She asked Brooks to have the material ready to review the following morning so that she could use the information in an important client meeting later in the week. Brooks had brought his college investments text and notes to work thinking that they might come in handy. He was happy that he had as he flipped to the section on stock indices. It looked like it would a late night for Brooks.

### Why index?

Why do we use indices? One of the key methods for gauging performance in the investments field is relative value. A portfolio manager's skill is often measured relative to a benchmark. The question being addressed is, did the manager produce risk-adjusted returns in excess of the benchmark portfolio? For instance, if the Standard & Poor's 500 index had a 12% return for the year, did the manager's results beat this on a risk-adjusted basis. The term 'risk-adjusted' refers to a method to express the portfolio return in excess of the risk-free investment adjusted by the risk of the portfolio. A standard term for this is the Sharpe ratio, named after William Sharpe. The Sharpe ratio is written:

$$[E(r_p) - r_f] / \sigma_p \quad (1)$$

where:  $E(r_p)$  = the expected return on the investment portfolio

$r_f$  = the risk-free rate of return

$\sigma_p$  = the standard deviation, or variation, in the excess returns on the investment portfolio

Using equation (1), a portfolio manager's relative performance, adjusted for the risk of the portfolio, can be determined. The expected return on the investment portfolio is typically the simple arithmetic average of returns over a period of time. The risk-free rate of return is often the 10-year Treasury yield. The standard deviation of the portfolio returns is the variability in excess returns over the observation period, or risk. This risk provides a gauge of the likelihood of actually earning the expected excess return on the portfolio. For instance, a high standard deviation suggests that the returns of the portfolio fluctuate a great deal and implies that the actual return could be significantly greater or less than the expected excess return. A low standard deviation suggests that returns are fairly constant and increases the likelihood of actually receiving the expected excess return. This risk-adjustment is crucial in creating a relative performance benchmark.

For example, suppose the Standard & Poor's 500 index had a 12% annual return and a standard deviation of excess returns of 25%. A portfolio manager produced a return of 15% on her portfolio over the same period, but with 45% standard deviation. If the 10-year Treasury yield is 4%, did the portfolio manager beat the market on a risk-adjusted basis?

$$\text{S\&P 500:} \quad [12\% - 4\%] / 25\% = 0.32$$

$$\text{Portfolio Manager:} \quad [15\% - 4\%] / 45\% = 0.24$$

Although the portfolio manager had a superior return than the market, the increased variability of her portfolio produced a lower Sharpe ratio, which is roughly translated as the excess return of the portfolio per unit of risk. Having a benchmark for comparison is important and Brooks knows that his manager has her performance measured relative to others<sup>1</sup>. Therefore, indices are important as a gauge of relative performance and as a standard, or benchmark, for understanding the performance of the market. Before getting started on the data gathering, Brooks decided to refresh his memory of index creation and opened his text to review global stock indices.

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<sup>1</sup> Performance attribution analysis is a preferred method of gauging the performance of a portfolio manager. This technique analyzes the portfolio to determine investment style, asset allocation, and security selection. The example used in this mini-case focuses on a single measure, Sharpe ratio, since performance attribution is beyond the scope of this study—which is intended to illustrate index creation.

### Global Indices

There are many indices around the world. This case highlights a few of the larger, more relevant, indices. One question that is often asked at financial firms throughout the day is “how’s the market doing today?” We can use the performance of an index to provide a view of market performance. There are a few global standards for ‘the market’. The most common equity index in the U.S. is the Dow Jones Industrial Average, or the DJIA for short. The first appearance of a Dow Jones average was on July 3, 1884. It consisted of the closing prices of 11 companies trading on the New York Stock Exchange, nine railroads and two industrials. This index was created by a relatively small news-distributing business that opened in a small, unpainted room at 15 Wall Street. The business was founded by Charles Dow, Eddie Jones, and Charles Milford Bergstrasser and was known as Dow, Jones & Co<sup>2</sup>. Currently there are three main Dow indices, with the DJIA being the most widely known. The other two are the Dow Jones Utility Index and the Dow Jones Transportation Index. The DJIA is comprised of 30 companies. The stocks comprising the DJIA have changed through time due to acquisitions and alignment of the constituents with the current economy.<sup>3</sup> The DJIA is a price-weighted index which means that the prices of the 30 constituent firms are summed and then this figure adjusted by a divisor to arrive at the index value. The divisor would normally start at 30 for a 30 stock index and then adjust to ensure that the index is consistent through time.

**Figure 1. Creating a Three-Stock Price-Weighted Index**

	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	111
Stock B	34	35	33	33	36
Stock C	10	11	12	13	15
Sum	156	159	159	159	162
Divisor	3	3	3	3	3
Index Value	52	53	53	53	54
Calculation	$(112+34+10)/3$	$(113+35+11)/3$	$(114+33+12)/3$	$(113+33+13)/3$	$(111+36+15)/3$

Source: Authors

An illustration of a price-weighted index is shown in Figure 1. In this example, there are three firms in the initial index (A, B, and C). At the inception of the index the prices of the three stocks are summed and the result is divided by three to get the initial index value of 52. Each day, the prices are summed and divided by three to produce a series of index values. The figure shows that the index increased in value from 52 to 54, or 3.85%  $[(54/52) - 1]$ , over the five-day

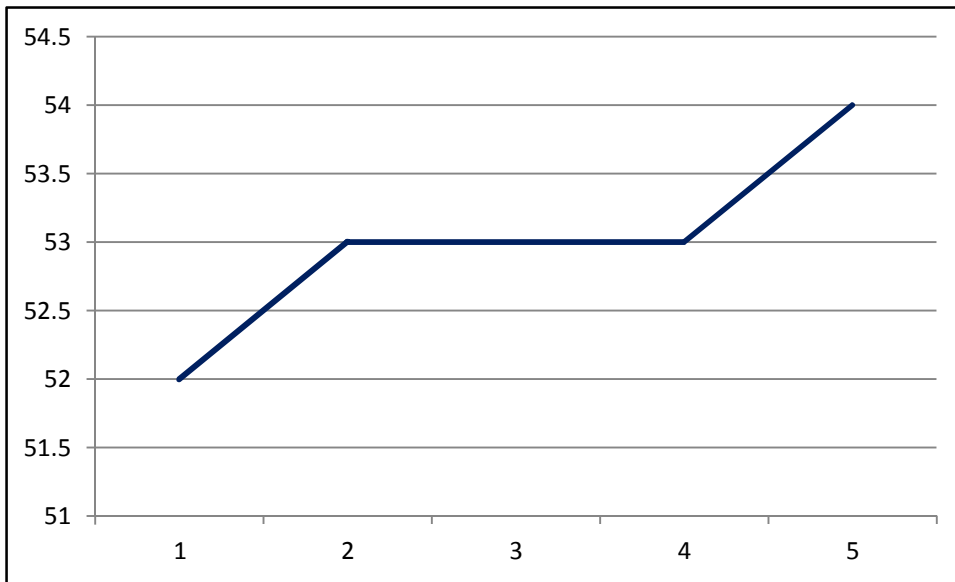
<sup>2</sup> For a wonderful history of Wall Street the reader should refer to *Capital Ideas*, by Peter Bernstein.

<sup>3</sup> The most recent constituent changes were: September 14, 2012, Kraft Foods, Inc. was replaced by UnitedHealth Group. On June 8, 2009, Citigroup, Inc. and General Motors Corp. were replaced by Cisco Systems Inc. and The Travelers Companies, Inc. , September 22, 2008, American International Group, Inc. was replaced by Kraft Foods, Inc. February 19, 2008, Altria Group, Inc. and Honeywell International were replaced by Bank of America Corporation and Chevron Corporation.

period. It is interesting to note that Stock C increased in value by 50% over this time, from 10 to 15. The price-weighted index is biased towards higher priced stocks. Therefore, Stock A has the most impact of the three stocks in this index, followed by Stock B and then Stock C. As the name implies, a price-weighted index is based on stock prices and higher prices have the most influence over the value of the index.

Figure 2 shows the series value over the time period. This figure plots the index values of 52, 53, 53, 53, and 54 over the five-day period. With more data the time series plot will more closely resemble the line charts that we see each day in financial periodicals.

**Figure 2. Time Series Plot of Three-Stock, Price-Weighted Index**



Source: Authors

Suppose that on day 5, after the market closes, firm C is acquired by firm D. The index now needs to be adjusted to accommodate the higher stock price of D, which is trading at \$50 per share versus stock C's \$15 per share. If we simply sum A, B, and D and divide by three, the index increases from 54 to 65.67, or more than 21%, however this is due to a constituent change rather than performance. We see this illustrated in Panel B of Figure 3. In order to create a consistent index we need to adjust the divisor to maintain the index value. Panel C of Figure 3 shows the mechanics behind this adjustment and presents the new divisor. We sum the three stocks (A, B, and D), then divide by the prior index value of 54 to attain the new divisor of 3.65. We will then use 3.65 for each subsequent day unless there is a change in the index.

Figure 3 depicts that constituent changes require an adjustment in the divisor in order to keep the index consistent through time for comparison purposes. Another instance when a divisor adjustment is required is when a company issues a stock split. A stock split adjusts the current price either down (stock split) or up (reverse stock split) and adjusts the shares either up (stock split) or down (reverse stock split). For instance, suppose an investor owns 200 shares of a stock trading at \$80 per share. The investor's holding is worth \$16,000 = (200 x \$80). If the company initiates a 2 for 1 (2:1) stock split, then the investor will now have 400 shares each worth \$40 per

share. That is, the number of shares doubled and the price was halved. The net result though is that the investor's holding is still worth \$16,000 = (400 x \$40).

Figure 3. Changing Constituents in a Three-Stock, Price-Weighted Index

Panel A	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	111
Stock B	34	35	33	33	36
Stock C	10	11	12	13	15
Sum	156	159	159	159	162
Divisor	3	3	3	3	3
Index Value	52	53	53	53	54

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (111+36+15)/3

Panel B	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	111
Stock B	34	35	33	33	36
Stock C	10	11	12	13	
Stock D					50
Sum	156	159	159	159	197
Divisor	3	3	3	3	3
Index Value	52	53	53	53	65.67

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (111+36+50)/3

Panel C	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	111
Stock B	34	35	33	33	36
Stock C	10	11	12	13	
Stock D					50
Sum	156	159	159	159	197
Divisor	3	3	3	3	3.65
Index Value	52	53	53	53	54

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (111+36+50)/3.65

Source: Authors

Suppose the investor owns 2,000 shares of a stock trading at \$8 per share. The investor's holding is worth \$16,000 = (2,000 x \$8). If the firm initiates a 1 for 2 (1:2) reverse stock split, then the investor will now have 1,000 shares each worth \$16 per share. That is, the number of shares was halved while the price doubled. The net result is that the investor's holding is still worth \$16,000 = (1,000 x \$16). Stock splits have no initial impact on the investor's holding, but will have a material impact to a price-weighted index unless the divisor is adjusted. As you recall, when we created the three-stock index we did not include the number of shares anywhere in our calculations. Therefore, a stock split will impact the price per share without any corresponding adjusting to shares. To accommodate stock splits in an index, the divisor is adjusted.

Going back to our original three-stock index example, we see that on day 5, stock A had a price of \$111. If the management of stock A decided to initiate a 6 for 1 (6:1) stock split, then the price would fall to \$18.50 (\$111/6). Investors will have their number of shares increase by a factor of six and see not change in their holding value. However, if we reduce the price of A from \$111 to \$18.50, the index will have a material decline in value. Figure 4 highlights the change in index value without the necessary divisor adjustment. Panel A represents the starting value of the index with the inclusion of Stock D and the adjustment process we followed from Figure 3. Panel B of Figure 4 shows the price adjustment to Stock A for the 6:1 stock split. The price of Stock A declined from \$111 per share to one-sixth of that amount, \$18.50 per share. As Panel B shows, when we sum Stocks A, B, and D we see the lower value of 104.50. Dividing this value by the reported divisor of 3.65 results in an index of 28.63, a 46% decline from the prior day.

We know the stock split had no net effect on the investor's holding so why would we accept this disruption in an index value? To make the index more consistent, we adjust the divisor. Panel C of Figure 4 shows that by creating a new divisor of 1.94 the index retains its prior value before the stock split. To attain 1.94, we sum of the prices of A, B, and D and divide by the original index value of 54 on day 5. We continue using this new divisor of 1.94 for our index until there is another change in constituents or stock splits.<sup>4</sup>

The most common method for creating stock indices involves the market capitalization of the firm, share price times shares outstanding, rather than just the price.<sup>5</sup> While the DJIA or Nikkei 225 are well-known examples of price-weighted indices, the S&P 500, Nasdaq, FTSE 100, CAC 40, Euro Stoxx 50, Hang Seng Index, and S&P/ASX 200 all utilize some form of market capitalization in their construction. Just as the price-weighted indices are biased by high price stocks, the market capitalization weighted indices are biased by high market capitalization firms.

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<sup>4</sup> In addition to stock splits, adjustments need to be made for stock dividends as these are simply modified versions of stock splits. A stock dividend is a payment to investors in new shares versus a cash dividend which obviously pays investors a cash amount. For instance, a 20% stock dividend means that an investor with 100 shares will receive an additional 20 shares. This is in essence a 1.2:1 stock split.

<sup>5</sup> Some capitalization-weighted indices use free-float rather than shares outstanding in the weighting process while others include the total shares outstanding. There are differences among indices in the capitalization-weighted category to consider. In this study, we focus on total capitalization.

Figure 4. Stock Split Adjustment for Price-Weighted Index

Panel A	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	111
Stock B	34	35	33	33	36
Stock C	10	11	12	13	
Stock D					50
Sum	156	159	159	159	197
Divisor	3	3	3	3	3.65
Index Value	<b>52</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>54</b>

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (111+36+50)/3.65

Panel B	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	18.50
Stock B	34	35	33	33	36
Stock C	10	11	12	13	
Stock D					50
Sum	156	159	159	159	104.50
Divisor	3	3	3	3	3.65
Index Value	<b>52</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>28.63</b>

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (18.50+36+50)/3.65

Panel C	Stock Price at Close of Day				
	1	2	3	4	5
Stock A	112	113	114	113	18.50
Stock B	34	35	33	33	36
Stock C	10	11	12	13	
Stock D					50
Sum	156	159	159	159	104.50
Divisor	3	3	3	3	1.94
Index Value	<b>52</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>54</b>

Calculation (112+34+10)/3 (113+35+11)/3 (114+33+12)/3 (113+33+13)/3 (18.50+36+50)/1.94



Let's refer back to our original example which included Stocks A, B, and C and calculate a market capitalization index. As the name implies, market capitalization indices include both share price and shares outstanding. The primary variable is still share price since shares outstanding are relatively static over short time intervals. Table 5 shows the index values from stocks A, B, and C. In this example, Stock A has 1 share outstanding, Stock B has 8 shares, and Stock C has 150 shares.<sup>6</sup> To attain the index value, Figure 5 shows that you simply sum the products of share price and shares outstanding. For instance, at day 1 the value is determined as follows:  $(112 \times 1 + 34 \times 8 + 10 \times 150) = 1884$ . Just as with the price-weighted index, we use a divisor to bring the sum of the market capitalizations into a less unwieldy value. In this case we could apply a divisor of 18.84 to get an index value of 100. The divisor was initially selected to provide a standardized starting value. After establishing this initial index value at day 1, we can determine the index value each subsequent day using the divisor of 18.84 as shown in the second calculation line of Figure 5. For instance, to get the index value of 108.44 in day 2, we sum the market capitalization of the three stocks  $(113 \times 1 + 35 \times 8 + 11 \times 150)$  and then divide by 18.84 to get 108.44. Following this approach we see the index value increasing each day over the time period and ultimately reach a value of 140.61 at the close of day 5. This is an index increase of 40.61% over the five-day period. In contrast to the price-weighted index, which increased by 3.85%, the market-capitalization index reflects the bias towards the high market capitalization of Stock C and its rapid increase in value. Although this example is extreme it highlights the biases between these two indices and shows that the index returns can vary widely depending on the index method chosen.

**Figure 5. Creating a Three-Stock Market Capitalization-Weighted Index**

		Stock Price at Close of Day				
	Shares	1	2	3	4	5
Stock A	1	112	113	114	113	111
Stock B	8	34	35	33	33	36
Stock C	150	10	11	12	13	15
Value		1884	2043	2178	2327	2649
Calculation		$(112 \times 1) + (34 \times 8) + (10 \times 150)$	$(113 \times 1) + (35 \times 8) + (11 \times 150)$	$(114 \times 1) + (33 \times 8) + (12 \times 150)$	$(113 \times 1) + (33 \times 8) + (13 \times 150)$	$(111 \times 1) + (36 \times 8) + (15 \times 150)$
Index Value		100.00	108.44	115.61	123.51	140.61
divisor		18.84	18.84	18.84	18.84	18.84
Calculation		$1884 = 100$	$(2043 / 18.84)$	$(2178 / 18.84)$	$(2327 / 18.84)$	$(2649 / 18.84)$
		initial value = 100				

Source: Authors

As in our prior example, we want to see how to adjust for changes in the constituents in the market capitalization-weighted index. It follows the same approach as the price-weighted index—we adjust the divisor in order to keep the index value constant. In Figure 6 we show Stock C being acquired by Stock D. We've added the number of shares of D to our example and see that the divisor, which we initially set at 18.84 needs to be adjusted at the close of day 5, the acquisition day, so that the index value remains at 140.61. The new market capitalization for close of day 5 is:  $(111 \times 1 + 36 \times 8 + 50 \times 65) = 3649$ . If we divide this figure by 140.61, we get

<sup>6</sup> The reader can make these values in millions of shares, if desired. The values were abbreviated to 1, 8, and 150 for tractability, but can be 1 million, 8 million, and 150 million with no change in index value.

a new divisor value of 25.95121 which we round to 25.95 in Figure 6. This is our new divisor for day 6 and all subsequent days until another material change occurs to the index.<sup>7</sup>

**Figure 6. Changing Constituents in a Three-Stock Market Capitalization-Weighted Index**

		Stock Price at Close of Day				
	Shares	1	2	3	4	5
Stock A	1	112	113	114	113	111
Stock B	8	34	35	33	33	36
Stock C	150	10	11	12	13	
Stock D	65					50
Value		1884	2043	2178	2327	3649
Calculation		$(112 \times 1) + (34 \times 8) + (10 \times 150)$	$(113 \times 1) + (35 \times 8) + (11 \times 150)$	$(114 \times 1) + (33 \times 8) + (12 \times 150)$	$(113 \times 1) + (33 \times 8) + (13 \times 150)$	$(111 \times 1) + (36 \times 8) + (50 \times 65)$
Index Value		100.00	108.44	115.61	123.51	140.61
divisor		18.84	18.84	18.84	18.84	25.95
Calculation		$1884 / 18.84 = 100$	$(2043 / 18.84)$	$(2178 / 18.84)$	$(2327 / 18.84)$	$(3649 / 25.95)$
		initial value = 100				

Source: Authors

Again, as in our price weighted example, what would happen if Stock A had a 6:1 stock split at the close of day 5? The price would fall from \$111 per share to \$111/6 or \$18.50 per share and the number of shares outstanding would increase from 1 to 6. In other words the market capitalization would remain \$111 and no adjustment would be needed for the market capitalization-weighted index.

## Data

Having refreshed his memory of index creation including the impact of constituent change and stock splits, Brooks was ready to get the data to complete his assignment. He knew that there would be a lot work involved to present both the market-weighted and price-weighted indices for his manager. Knowing that there would be a lot of manual adjustments he needed to make to create the indices, and the fact that there were only so many hours in the evening, he decided that he would do a sample of just one month's data and perform the calculations for both indices. By seeing both indices over a short period of time, his manager could see the benefits and biases of both and select the method that she thought was best. Brooks could then work on that one approach and complete his work on time for his manager's presentation. He decided to take a sample of all Fortune 500 companies in the Charlotte, North Carolina region for July 2012. He would gather daily prices and perform the appropriate calculations to create the indices. As Brooks starting gathering data he found that there were nine Fortune 500 companies for his indices. The list of companies and their respective ticker symbols are found in Figure 7.

Brooks gathered the stock information for each of these companies and downloaded the data which is presented in Figure 8. He noticed that Duke Energy had a 1:3 reverse stock split after the market close on July 2. He also noted that July 4 was a U.S. holiday and the stock market was closed. The final unusual item during the month of July 2012 was that Goodrich Corporation was purchased by United Technologies after the market close on July 26. He was ready to get busy.

<sup>7</sup> Material events would include a share issuance, share repurchase, cash dividend, company change, rights offering, spinoffs, and mergers. For the market capitalization-weighted index a stock split or stock dividend is immaterial.

**Figure 7. Fortune 500 Companies in the Charlotte, NC Region**

Company	Ticker Symbol	Company Description
Bank of America Corp.	BAC	Bank of America Corporation, through its subsidiaries, provides various banking and financial products and services to individual consumers, small- and middle-market businesses, institutional investors, corporations, and governments in the United States and internationally.
Domtar Corp.	UFS	Domtar Corporation engages in the design, manufacture, marketing, and distribution of fiber-based products in North America. The company operates in three segments: Pulp and Paper, Distribution, and Personal Care.
Duke Energy Corp.	DUK	Duke Energy Corporation, together with its subsidiaries, operates as an energy company in the United States and Latin America. The company operates in three segments: U.S. Franchised Electric and Gas, Commercial Power, and International Energy.
Family Dollar Stores, Inc.	FDO	Family Dollar Stores, Inc. operates a chain of self-service retail discount stores primarily for low- and middle-income consumers in the United States.
Goodrich Corp.	GR	Goodrich Corporation is a global supplier of systems and services to the aerospace, defense and homeland security markets.
Lowe's Companies Inc.	LOW	Lowe's Companies, Inc., together with its subsidiaries, operates as a home improvement retailer. It offers a range of products for maintenance, repair, remodeling, and home decorating.
Nucor Corporation	NUE	Nucor Corporation, together with its subsidiaries, engages in the manufacture and sale of steel and steel products in North America and internationally. It operates through three segments: Steel Mills, Steel Products, and Raw Materials.
Sonic Automotive, Inc.	SAH	Sonic Automotive, Inc. operates as an automotive retailer in the United States. It engages in the sale of new and used cars, light trucks, and replacement parts; provision of vehicle maintenance, warranty repair, paint, and collision repair services; and arrangement of extended service contracts, financing, insurance, and other aftermarket products.
SPX Corp	SPW	SPX Corporation provides flow technology products, test and measurement products, thermal equipment and services, and industrial products and services worldwide.

Sources: Bloomberg, Yahoo Finance

Figure 8. Daily Stock Prices for Fortune 500 Companies in Charlotte, NC Region – July 2012

Date	GR	BAC	LOW	NUE	DUK	FDO	SAH	SPW	UFS
Monday, July 02, 2012	127.00	8.05	28.62	37.87	23.28 <sup>B</sup>	67.95	14.05	64.95	76.95
Tuesday, July 03, 2012	127.04	8.06	27.62	38.90	68.69	67.28	14.71	65.85	78.74
Wednesday, July 04, 2012	-	-	-	-	-	-	-	-	-
Thursday, July 05, 2012	127.11	7.82	27.58	38.86	68.57	68.23	14.97	66.07	78.25
Friday, July 06, 2012	127.12	7.66	27.85	38.35	66.23	69.58	14.86	64.36	78.25
Monday, July 09, 2012	127.05	7.56	27.28	38.26	65.31	70.38	14.55	62.67	78.36
Tuesday, July 10, 2012	127.10	7.48	27.17	37.70	66.14	69.82	14.53	59.85	74.92
Wednesday, July 11, 2012	127.08	7.63	26.67	37.79	66.48	69.93	14.52	59.02	74.29
Thursday, July 12, 2012	127.02	7.48	26.57	37.70	66.64	68.65	14.77	59.56	74.25
Friday, July 13, 2012	127.18	7.82	26.72	38.42	66.74	67.47	15.81	60.94	75.23
Monday, July 16, 2012	127.11	7.81	25.80	38.03	66.74	68.39	15.86	59.45	74.58
Tuesday, July 17, 2012	127.18	7.92	25.55	38.28	66.34	68.39	16.16	60.48	76.06
Wednesday, July 18, 2012	127.25	7.53	25.66	38.71	66.07	66.43	16.61	61.85	78.23
Thursday, July 19, 2012	127.15	7.26	26.03	38.23	66.12	66.06	16.86	62.52	76.84
Friday, July 20, 2012	127.18	7.07	25.79	37.96	66.22	66.77	16.45	61.05	75.86
Monday, July 23, 2012	127.15	7.09	25.77	37.85	65.50	66.15	16.46	60.31	75.21
Tuesday, July 24, 2012	127.18	7.04	25.77	37.12	65.27	66.52	16.84	59.38	74.03
Wednesday, July 25, 2012	127.20	7.07	25.60	36.82	65.82	64.52	17.38	59.39	72.39
Thursday, July 26, 2012	127.48 <sup>A</sup>	7.17	26.60	37.30	65.34	66.35	17.01	60.60	73.40
Friday, July 27, 2012		7.31	27.07	38.48	67.46	66.63	17.35	63.79	72.38
Monday, July 30, 2012		7.28	26.86	38.50	68.07	66.70	17.22	61.69	74.86
Tuesday, July 31, 2012		7.34	25.37	39.20	67.78	66.08	17.12	60.72	73.86
Shares Outstanding	128.63 million	10.77617 billion	1.228 billion	318.04 million	446.04 million <sup>C</sup>	117.53 million	52.59 million	49.95 million	36.6 million

A : Goodrich purchased after market close on July 26 by United Technologies.

B : Duke Energy conducts a reverse stock split of 1:3 after market close on July 2.

C : Following reverse stock split for Duke Energy there were 446.04 shares outstanding.

Source: Bloomberg

**Exercise 1** Using the information provided in Figure 8. Calculate the price-weighted index for the month of July for these companies. What adjustment is required for the Duke Energy 1:3 reverse stock split? How did you account for the removal of Goodrich from the index?

**Exercise 2** What is the overall change in index value for the month of July using the price-weighted index? Which stock increased in value the most? Which declined the most? Which company(ies) appear to be influencing the price-weighted index the most?

**Exercise 3** Using the information provided in Figure 8. Calculate the market-weighted index for the month of July for these companies. What adjustment is required for the Duke Energy 1:3 reverse stock split? How did you account for the removal of Goodrich from the index?

**Exercise 4** What is the overall change in index value for the month of July using the market-weighted index? Which market capitalization increased in value the most? Which declined the most? Which company(ies) appear to be influencing the price-weighted index the most?

**Exercise 5** Given the information from Exercises 1-4, which method should Brooks suggest that his manager use in her presentation to clients? Why?