

The Way of the Dow

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It is almost impossible to get through the nightly news without hearing about the Dow. Discussions of the past and future course of the Dow are almost as popular as discussions of sports and the weather. Yet, few people have any understanding of the Dow other than a vague notion that its value goes up and down with the market. Surprisingly, one reason the Dow is such a popular and enduring part of our culture is its simplicity. Armed with little more than basic arithmetic, one can understand the Dow as well as other similar stock market indicators.

“The Dow” is really the Dow Jones Industrial Average which is often abbreviated DJIA. As the name suggests, the DJIA is an average of other numbers called an index. In this case, the average is of stock prices, more formally called equity prices, so it is therefore an equity index. Indexes are useful because they provide a broad measure of a large class of individual constituents. In the case of equity indexes, they may be an indicative price level of the general market (or some subsection of the market) compiled using individual equity prices.

There are thousands of equity indexes that have been compiled, but the number of equity indexes which could be invented is endless. In most cases, there are only two aspects to an equity index which one needs to understand: its selection method and its weighting method. The selection method determines what equities are included in the index while the weighting method determines how the equity prices are averaged together.

Selection methods for an index are often the best understood aspect of indexes because they are part of their marketing. Common examples are “large-cap”, “mid-cap”, and “small-cap” indexes which select equities based on the relative sizes of companies’ market capitalization. Since dividing companies into relative baskets can be complicated, many of the more popular indexes simply focus on a fixed number of equities, such as the 100 or 500 largest companies by market capitalization. The DJIA rather uniquely selects 30 equities but without a quantitative criteria. It is based on an index

committee’s analysis of US listed stocks which are non-transportation and non-utility. The committee looks at issues such as reputation, growth rate, and sector representation.

Weighting methods usually consist of one of the following three methods: price-weighting, capitalization-weighting, and fundamental-weighting. Price-weighting weights each equity by its price making it the simplest weighting method. Capitalization-weighting weights each equity price by its market capitalization. Fundamental-weighting weights using one of the companies’ financial metrics, such as book value. Market capitalization is by far the most common weighting method. Fundamental-weighting is arguably a better weighting scheme, but has found little acceptance. The DJIA is, interestingly, a price-weighted index probably because of its tenure as the industry’s oldest equity index.

In the final analysis, the DJIA is really an average of the prices of 30 publically-traded US companies. If we were particularly energetic, we could get the list of DJIA constituents and average their prices. However, the number we would get would be nowhere near the current DJIA. If we knew the DJIA was first published in 1885 and were particularly astute, we might realize that companies like Microsoft Corp. and Cisco Systems, Inc. couldn’t have always been in the index. Obviously, companies are removed from the index to be replaced by others from time to time. These changes are called rebalancing and they usually occur only at pre-specified intervals, such as yearly or quarterly, but again, the DJIA uniquely reviews the index only as-needed following a critical corporate action of one of its constituents. Since the prices of incoming companies are different from the prices of the old companies, some mechanism is required to keep the DJIA from suddenly jumping. To accommodate changes in the index slight adjustments are made in the divisor when averaging prices.

Originally, the divisor for the DJIA was 30 because it was an average of 30 equities. As newer equities replaced older ones during rebalances, the divisor changed little by little to

accommodate the new prices. For instance, if the sum of equity prices in the index was 3,000 and the divisor 30 (index price of 100 ($=3,000/30$)), but a replacement equity moved the sum to 2,900, the divisor would become 29 ($=(2,900/3,000)*30$). The index would remain the same ($2900/29=100$), but the divisor would be slightly different. With such a long history and so many changes, the divisor for the DJIA is now a little over 0.13 – a long way from 30.

While divisor changes do not change the index, they do have a little appreciated effect on index levels. If we look at changes in the index due to price changes in the underlying constituents, we can see that different divisors cause the same index to grow at different rates. In the above example, a \$1 change in the underlying equities changes the index by 0.033 before the divisor change while it changes the index by 0.034 after the divisor change. While this doesn't seem like a problem, a change of \$1 in the underlying equities for the current DJIA leads to a change of 7.68 in its level. Consequently, as divisors change so does the rate of growth for the index.

Such small divisors have drawbacks. As happened in the 2008 crisis, a single equity caused the DJIA to lose 3,000 points in the course of a month and a half. To this effect, this month S&P Dow Jones Indices announced the replacement of Bank of America, Hewlett-Packard, and Alcoa with Goldman Sachs, Visa, and Nike. Even though Bank of America is larger than Goldman Sachs, it is being replaced by Goldman because Goldman's price ($>\$160/\text{share}$) is much higher than Bank of America's price ($<\$15/\text{share}$). Therefore, Goldman's price movements (as representative of financial companies) will have a greater effect on DJIA movements. At the same time it will also make the divisor larger, so the rate of growth of the index will be slower relative to underlying price movements. The

prices of Visa and Nike are also larger than Hewlett-Packard and Alcoa, so the compilers are likely looking to slow the rate of index growth and add a bit more diversity to its sector representation.

The DJIA, like many equity indexes, is an enduring part of financial markets and an important proxy for market movements. Even though it is talked about rather casually and fairly easy to calculate, its movements can be rather complicated and rebalancing can change index behavior for a long time to come. At least with the preceding discussion in hand, one can navigate the financial news, and maybe even the markets themselves, a bit better.

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