Possibility of an Experimental Approach to Investment Studies
Author(s): O. K. Burrell
Source: *The Journal of Finance*, Vol. 6, No. 2 (Jun., 1951), pp. 211-219
Published by: Wiley for the American Finance Association
Stable URL: https://www.jstor.org/stable/2978985
Accessed: 31-03-2020 02:14 UTC

INDUCTIVE TESTS OF INVESTMENT THEORIES

POSSIBILITY OF AN EXPERIMENTAL APPROACH TO INVESTMENT STUDIES*

O. K. BURRELL
University of Oregon

IT IS IMPOSSIBLE to define an investment study with any precision. In investment we are interested in what the world will be like tomorrow, and consequently almost any kind of general economic inquiry or analysis may be significant from the point of view of investment. In spite of the difficulties of definition, there is such a thing as an investment study. It is perhaps useful for our purposes to divide such studies into the following categories:

1. Value studies. These are studies based on cross-cut analysis of value elements in industry groups and particular securities. They are necessarily based on explicit or implicit assumption regarding the future.

2. Tests of the results of alternative investment or speculative policies. The studies of Edgar Lawrence Smith, Van Strum, Rose, Rodkey, and others were based upon this method. More recent studies of formula planning have also followed this method. Essentially this method measures the results of a given policy over what is believed to be a representative segment of time.

3. Studies of market structure. These studies involve essentially the behavior of markets and the relationships and patterns of prices. They include a wide variety of topics having to do with market response to both internal and external factors.

This paper is concerned primarily with studies classified here as studies in market structure. Our thesis is that the behavior of markets is but a reflection of relatively constant human behavior patterns and that experimental studies designed to reveal how men behave in the market may be of value in understanding how security markets work.

* This article by O. K. Burrell and the following two articles, one by C. Sidney Cottle and W. Tate Whitman, and the other by Henry S. Schneider, were presented at a meeting of the American Finance Association in Chicago on December 29, 1950. The general subject discussed was "Inductive Tests of Investment Theories." The program was under the chairmanship of Benjamin Graham, Graham-Newman Corporation.

It is difficult to adapt the experimental method to investigations in finance because it is difficult to approximate the circumstances under which economic decisions are made. But the extensive use of the experimental method in psychology suggests that it may be possible to devise valid experiments that will add to our understanding of how markets work. This does not mean that we should abandon the more conventional types of investment or economic studies. It is only suggested that experimental studies may add to our knowledge of markets and perhaps even be useful to investors in avoiding errors. If, for example, we discover a definite behavior pattern we may be able to infer a resultant security price pattern. We may then logically go to price-volume data to see if such a pattern exists. If it does not appear to exist, then either the analysis of investor behavior was unsound or other forces have outweighed and overshadowed the effect of the particular behavior pattern.

If we are to undertake experimental studies we must clearly understand that the experimental method is not likely to yield quick and spectacular results. We must not be too quick to accept conclusions based on a single experiment. Experiments must not be conceived as a means of pointing the way to quick profits in the stock market. The experimental method has limited application at best and should be thought of as a means of increasing our understanding of how markets work and without too much immediate concern over how the results should influence investment behavior.

It is perhaps in order here for purpose of illustration to review and report on two experiments, one published and one unpublished.

The first of these was published under the title, *An Experiment in Speculative Behavior*.[1] It attempted to measure investor-speculator response to price level and to price change and to dividends. The experimental group was a class of about forty students in investments. From this group thirty-three usable sets of data were obtained. Six class sessions were required to complete the experiment. The assigned objective was to obtain the greatest possible growth in funds including both capital gains and dividends. A method of record keeping was devised which was audited after each class session. Each student started out with a theoretical cash fund of $20,000 which was required to be invested in a group of six stocks. These stocks were designated simply as A, B, C, D, E, and F. The dividend rate and the regular dividend dates of each stock were indicated and the stocks were assigned quality ratings.

1. Bureau of Business Research, University of Oregon, 1950.

The opening prices of the six stocks were placed on the blackboard and students given an opportunity to arrange the initial investment. Students then carried stock and cash balances to the second transaction sheet and immediately turned in transaction sheets covering the initial transactions. As soon as these were collected, prices for the second month were placed on the blackboard and the process repeated over a theoretical period of thirty-six months.

The pattern of price changes as well as price levels were arranged in such a way as to permit test of predetermined hypotheses of behavior. In general the stocks were arranged in pairs. Two stocks were alike in quality ratings, dividend yields, price earnings ratios, and direction of movement. The only difference was that one was a high-priced stock and one was a low-priced stock. Incidentally the high-priced stock was split in the twenty-ninth month, permitting measurement of response to reduction in unit price. One stock was made to go erratically downward and one upward. Two of the stocks were similar in all essential particulars except that one had a much higher dividend rate than the other.

In order to permit test of results of speculation in a fluctuating but trendless market the pattern of prices was so arranged that the weighted average was the same at the beginning, at midpoint, and at the close.

The results of the test were not particularly surprising. For the most part the behavior traits revealed were those known to any good customers' broker. There was indicated a strong tendency to buy dividends. Where other factors remained constant, a preference was shown for higher dividend yields; a very distinct tendency to sell on a small increase from cost but to hang on like grim death and even to add to holdings as the price moved below cost. Negatively the experiment indicated no inherent tendency toward speculative losses in a fluctuating but trendless market. Neither was there any evidence of preference for low-priced or high-priced stocks as such.

The results of the experiment generally tend to confirm other studies of market behavior which have been based on analysis of the market itself. The tendency to buy dividends serves to explain why stocks drop the full amount of the dividend on the ex dividend date even though income tax considerations would seem to indicate a typical decline of something less than the dividend. The distinct tendency to identify value with cost, implicit in taking short profits and long losses, affords a behavioristic explanation of the well-known theory of resistance points or resistance areas. Perhaps the best statement

of this idea is to be found in John Burr Williams, *Theory of Investment Value*.[2] In the formulation or statement of this theory Mr. Williams clearly implied that men behave in the way that this experiment seems to demonstrate that they do behave.

The experimental group displayed no preference for high-priced stocks or low-priced stocks as such. This would seem to be related to the question as to whether or not stock splits result in a higher aggregate valuation. Here the evidence is conflicting. I have found that based on the major stock splits of 1947[3] there is no basis for the belief that reduction of unit value serves relatively to increase stock prices. On the other hand, Myers and Bakay[4] report evidence, based on the stock splits of 1945–46, that split-ups exert an upward pull on the price of the stock affected.

This small bit of experimental evidence indicating no preference for high-priced or low-priced stocks as such also bears on the question of relative volatility of high-priced and low-priced stocks. It has been shown[5] that in general low-priced stocks are more volatile than high-priced stocks. I have shown,[6] however, that when a group of high-priced and low-priced stocks are paired for quality there is no marked difference in volatility. The experimental evidence here tends to support the validity of this latter conclusion.

The experimental group was a relatively unsophisticated one and this raises the question as to whether the same results would have been obtained with a more experienced group. In this connection it can be reported that Mr. James W. Wooster, Jr., of the Commonwealth Fund, conducted the same experiment this summer with a group of students in investment at the Rutgers Graduate School of Banking. While the analysis is not yet complete and has not been published, Mr. Wooster advises me that the results generally parallel those described here. Moreover, Mr. Wooster reports that those members of his group whose work is largely in securities management appear to have done no better than those not so engaged.

2. John Burr Williams, *The Theory of Investment Value* (Cambridge, Mass., 1938), pp. 29 ff.

3. O. K. Burrell, "Price Effects of Stock Dividends and Split-ups," *Commercial and Financial Chronicle* (December 2, 1948).

4. John M. Myers and Archie Bakay, "Influence of Stock Split-ups on Market Price," *Harvard Business Review* (March, 1948).

5. See especially Zenon Szatrowski, "The Relationship between Price Change and Price Level for Common Stocks," *Journal of American Statistical Association* (December, 1946).

6. O. K. Burrell, "Price Fluctuations of High Priced and Low Priced Stocks," *Commercial and Financial Chronicle* (April 21, 1949).

An Experimental Study in Price Mechanics

As a further illustration of the experimental approach in investment studies it is possible to report briefly the results of another experiment in what might be called for lack of a better term, the "Mechanics of Price Change."

When the price of a security moves from one price level to another, we may presume it is in response to some change in the basic factors of valuation. These factors may be concerned either with the general economic situation or with the fortunes of the particular industry or company.

But when a security price or security prices in general move from one level to another, it is never, or almost never, a simple straight-line transition. It is rather a seesaw movement with a series of minor interruptions to the central trend.

It is interesting to speculate as to why this is so. We may postulate two possible reasons for this zigzag movement. In the first place when a security price moves from one level to another in response to some basic valuation change, men are not in instant agreement in their appraisal of the changed circumstances. Moreover, appraisals may change from day to day based on the same facts or based on minor additions to the fund of information. In short, the zigzag pattern may merely reflect the shifting appraisals of men who are in the process of making up their mind as to the significance of the new facts. In the second place, the typical zigzag formation may be inherent in the market process itself. It may result from inequality of bargaining power and purely speculative judgments entirely unrelated to valuation. If this is true we would get a zigzag formation even in an artificial or simulated market situation where there could be no possibility of valuation.

One of the cherished ideas of students of market structure is that the volume-price change relationship offers a clue to the direction of market movement. According to this credo when, over a period of time, a stock declines on large volume but rises on small volume the direction of movement is likely to be downward. When over a period of time price increases are accompanied by large volume and price declines by small volume, an upward movement is indicated. It must be emphasized that we are not here underwriting this idea. We are only reporting it.

Probably any market observer would testify that quite frequently this theory seems to work but that sometimes it does not work. No opinion is here expressed as to whether or not it works oftener than

it fails. It is interesting to attempt to construct a rational hypothesis for this tendency if such tendency exists. It might be urged that it is all based on the greater wisdom of large operators as compared with small operators. But anyone who has even casually observed the SEC reports of insider transactions in relation to subsequent market movements can hardly accept this hypothesis.

For the purpose of this study the following hypothesis is proposed. The volume-price change indicator mentioned above is a factor which is inherent in the nature of markets. From the very nature of markets men seek to sell at the highest possible price and to buy at the lowest possible price. At any given moment and for a given price the supply-demand situation may be either weak or strong. If a security sells at 20 and if there are 100,000 shares for sale between 20 and 22 but there is a demand for only 10,000 shares in the range from 20 down to 18 it is evident that the price is more likely to move under 20 than above 20. If buyers' and sellers' price targets were immutable, trading would simply cease. But price targets are not immutable and as the price fails to advance, an erosion of sellers' expectations occurs. As the price fails to decline to buyers' targets, an upward adjustment of these bids occurs. Not all buyers and sellers participate in this adjustment process but, except in inactive securities, enough do to produce what may be called an equilibrium price which reflects the demand-supply relationship. In the case mentioned this equilibrium price would be closer to 18 than to 20. We are here postulating that at any given moment there is an equilibrium price which reflects the current demand-supply relationship. But this equilibrium price is not necessarily the market price. Differences in bargaining skill as well as luck may result in a market price temporarily above or below this equilibrium. A market order to buy, for example, may serve to push the price at least temporarily above the equilibrium. When the price is above the equilibrium level the volume will be heaviest on declines and lightest on increases. When the price is below the equilibrium level the heavy volume will generally accompany increases and light volume decreases.

We can measure the validity of this hypothesis under experimental conditions where the conditions leading to a given equilibrium price can be controlled. It is more difficult to validate by observation of real markets because of the changing world. Equilibrium prices do not remain constant simply because the world changes. The volume indicator, for example, may show that a security price is above equilibrium but a rise rather than a decline may occur if a brilliant earnings report intervenes to generally raise the level of expectations.

Another question for which we seek an answer has to do with the momentum of price change. When a price moves from one equilibrium level to another, does the movement, of itself, have a self-generating quality and therefore tend to move too far? For example, if a security sells around its equilibrium level of 40 and new circumstances produce a new equilibrium level of 30, is there anything inherent in the bargaining process that would result in a movement from 40 to 25 with a subsequent recovery to 30?

In order to provide at least partial answers to some of these questions an experiment was devised which involved setting up a trading situation with known demand-supply schedules but providing for a shift in supply schedules halfway through the experiment. The experiment proceeded as follows:

1. An investments class of about forty persons made up the experimental group. Each person was given an instruction card which covered buying and/or selling directions. The group was instructed to buy or sell at the most advantageous price not inconsistent with individual instruction cards. They were also instructed, of course, not to show instruction cards to others.

2. Participants were instructed to space their trading over the entire hour.

3. The experiment began at 8:00 A.M. and required one hour for completion. Approximately one-third of the instruction cards included a direction not to enter the market until 8:30 A.M. Selling instructions on such cards called for definitely lower prices.

4. The demand-supply schedules were established in such a way as to yield a theoretical equilibrium price of 40 from 8:00 A.M. to 8:30 A.M. and an equilibrium price of 33 thereafter.

5. Very simple trading rules were established and prices and volume were recorded on a blackboard as trading progressed.

Conclusion

We are not here especially interested in how closely the actual prices approximate theoretical equilibrium levels. We are interested, however, in the movement of prices in relation to theoretical equilibrium levels. In this connection perhaps the most significant observation is the apparent influence of established price. The initial price was 34, six points below the equilibrium price of 40. The price moved up gradually during the first half-hour and attained equilibrium exactly at the end of the half-hour period.[7] If trading had been permitted

7. The effect or bias of the initial price is also suggested in an experiment reported by Edward H. Chamberlin ("An Experimental Imperfect Market") in the *Journal of Political Economy* for April, 1948.

to continue without a change in the supply curve it is possible that the price would have moved above equilibrium in the second half.

When the supply curve shifted at the end of the half-hour, the equilibrium price changed from 40 to 33. In the second half-hour the price declined gradually, reaching the equilibrium price about halfway through this period and declining further to a price of 28 at the end of the hour. The influence of established price seems evident in the movement toward the new level. Approximately half the trading was in the range 37–40. While the fundamental forces of additional supply ultimately brought prices to and below equilibrium, nevertheless the memory of previous prices seemed to exert something of a gravitational pull on subsequent prices.

There is certainly no evidence of a momentum effect. The downward movement was persistent and entirely lacking anything resembling a secondary recovery. Upticks never continued beyond a single transaction but there was no plunge downward on panic selling.

In real markets we do have secondary recoveries. Within the limits of the sample and the experimental design we may postulate that such movements are not inherent in the nature of markets. In the real world supply and demand schedules are not constant. If secondary recoveries are not inherent in the marketing process they can only be explained on the basis of shifting demand-supply schedules, i.e., part of the valuation process. This is to say that the secondary recovery represents a picture of men in the process of making up their minds about valuation.

Within the limits of the sample and the experimental design our hypothesis concerning the volume-price change indicators would appear to be validated. The data were prepared on a cumulative basis with plus and minus increments consisting of the product of the price change and volume of trading. This index was rather modestly above the zero line during the first half-period while the price curve was slightly below equilibrium. When the supply curve shifted and the price decline started the volume indicator dropped sharply. Moreover, this drop in the volume indicator occurred while the price was materially above the new equilibrium. As the new equilibrium was approached, the volume indicator leveled out.

It is, of course, outrageous to assert that this brief experiment proves anything. So far as the data can be depended upon, however, it does appear that the volume indicator is more or less inherent in the nature of markets. When prices are moving to new equilibrium levels the volume indicator seems to be of some assistance in pointing the trend. It must be emphasized, however, that nothing in this ex-

periment proves that the volume indicator is an instrument for predicting changes in the fundamental valuation factors. It is possible that the transactions of persons best informed on industry and company prospects may result in a volume indicator which would be useful in anticipating changes in the basic valuation factors themselves. This brief experiment, however, throws no light on this possibility.

It would not be difficult, however, to devise an experiment to test the usefulness of the volume indicator in predicting a change in equilibrium levels. In our experiment all participants had an equal knowledge of the market. It would be quite simple to provide a few participants with advance knowledge of a change in equilibrium levels. Under these circumstances it is possible that the volume indicator might point the direction of the impending change in price, even before the change in the supply-demand relationship became effective. Whether such an experimental situation would approximate the conditions of real markets is, of course, quite another matter.

If time permitted it would be interesting to discuss the pattern and design of other possible experimental studies. But this would be a topic in itself. After all, the planning and execution of experimental studies in economic behavior as in the natural sciences is advanced by a variety of points of view and repeated experimentation.

In conclusion, then, our thesis is that the experimental method may be of some value in advancing our understanding of the valuation process. Value is not a result of formula or mathematics. Men make markets and therefore to better understand how men behave in the market is to better understand the nature of the valuation process.

We must not be deluded into thinking that experimental studies in economic or market behavior will lead to profit-making formulas. We must view such studies rather as a means of increasing our knowledge of the tangible and intangible forces that make investment values and thereby improve the probability of making wise judgments on the basis of this broader understanding.