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PIONEERS OF FINANCE THEORY

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Abstract

Beginning from the end of XIX. century, there were a lot of scientists who contributed to develop finance as a discipline. At this point, it is tried to define short biographical information of 8 scientists who contributed to the finance theory with their pioneer work, research and publishings, basic concepts and theories that they put forth and their publishings that are thought as basic in years.

These scientists are as follows respectively: Bachelier, who has an influential role in the development of using stochastic process with mathematical finance. Fisher who is the pioneer of using and developing the index numbers, and has prior studies on interest, value and money; Keynes who gave to separation of economy as before Keynes and since Keynes, Graham whu is known as the father of security analysis, Marschak who put forth the concept of new middle class, Williams who is named as the father of dividend investing by many investors; Hicks who is the architect of "Capital" triology, and Kaldor who blend numerous economic theories and policies successfully.

Key Words: Finance Theory, Pioneers, Louis Bachelier, John Burr Williams, Jacob Marschak.

Introduction

The trends and movements in the financial markets have raised interest in many economists and mathematicians to study finance and related areas further. With economic scenarios taking downturns over the years, many researchers have studied the factors to understand the reason behind it. Some of the work which had been conducted years ahead had been lying untouched for years (Louis Bachelier) while some gained instant recognition and generated a new school of thought (John Maynard Keynes). While many people developed their initial theory, constant research helped them fight criticism. Many concepts were opposed and rejected by others in the years that followed, however most of these contributed greatly to make the field of finance what it is today. A common difference in personal traits can be seen in many of these pioneers. While there are many more people who made similar contributions in the field of financial theories, these are some of the pioneering work discussed in the paper below.

In the paper, after giving short biographic information about the pioneers who take place, their main studies and contribution to finance theory is tried to be mentioned, and lastly their important works are tried to be listed. At this point, while the workings are mentioned, their first publishment years are wrote down, and for the articles the name, volume and pages of the journals and for the books the names and the publishers tried to be given.

1. Louis Bachelier

Louis Jean-Baptiste Alphonse Bachelier was born in 1870 in Le Havre, France and died in 1946 in Saint-Servan-sur-Mer, France. His father was a wine merchant and amateur scientist, and the vice-consul of Venezuela at Le Havre. He studied science at Sorbonne and received a certificate in mathematical physics in 1897. He came up with various publications Calcul des Probabilités (1912), Le Jeu, la Chance et le Hasard (1914). Also the most noted Théorie de la Spéculation in which he applied the probability theory and stochastic analysis to understand the stock and option market and introduced the Brownian motion (Courtault

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et.al., 2000: 341-353). Later in his memorial the Bachelier Finance Society was founded in 1996 to gratify his immense contribution to the field. Researchers over the years have stated how Bachelier's work was commendable as it introduced many concepts related to stochastic analysis and he also provided a theory to value options which is strikingly similar to the Black-Scholes model.

On 29th March 1900 Bachelier defended his Ph.D. thesis "Théorie de la Spéculation (1900a) / Theory of Speculation (Cootner, 1964: 17-78)" and Louis with his further work is considered to be an influential source to develop stochastic calculus and mathematical finance (Davis, Etheridge, 2006: 15). Louis Bachelier introduced a combination of mathematics and finance in his thesis. Bachelier used the concept of probability and theory of heat along with the knowledge of stock markets and exchanges, which helped lay the foundation for modern Brownian motion (although there were claims made on it earlier). In his model he argued that the small fluctuations in stock prices which are observed over a shorter interval of time are not dependant on the current value. The initial part of the thesis describes the products that were available at the French stock market. These included forwards and option contracts. After explaining the structure of the financial markets he explains his mathematical model and concurs that "expectation of speculator is zero". It states that at a given time, the mathematical expectation on the basis of current trading and those based on future trends of the prices, will be zero. He also states a hypothesis that the stock movement is a Markov process which is homogeneous over time. He stated that movement of the stock exchange are influenced by the past, current or future expected trends but he states that there are innumerable such factors but no obvious dependence can be noted between them. Based on the Central Limit Theorem he also inferred that the increase is independent and distributed normally. He felt that all transactions in the market can be symbolized in a geometric equation, by placing the prices on the x-axis and y-axis stating the related profits on them. Bachelier introduced the Brownian Theory to help apply the mathematical models to understand and monitor price movements and contingencies of the financial markets through his work. However a deficiency in his Brownian model as stated by research over the years was that the price at any time can be negative as it is normally distributed. Bachelier continued to work on stochastic analysis and published a book on probability theory and his work was cited as among the most influential work on probability. But his thesis lay ignored until almost 50 years later when it reached economists. Many economists argue that a review of his work could have helped many aspects such as option valuations. Options had been trading in the markets since 1973, the valuation could have helped understand and develop asset valuation much ahead. While some disagree stating that technology is another key that helps understand the modern financial markets (Blaug, 1986).

The work by Bachelier can be applied to various fields such as Markov process, diffusion process, Brownian motion and is considered among the significant works in the area of mathematical finance. Thereby it is essential to understand the contribution of this pioneer who helped structure the financial domain and brought forth concepts well ahead of its time. In today's date when the calculations are done with the help of technology, things are easier to be computed but it is because of people like Bachelier that the mathematical finance is developing every day.

Bachelier's workings were published in French and in the following years some of them like his Ph.D. thesis were published in English, in also. Additionally, some of his works were combined and published in the 1990's again. Examples of his works are as follows:

- 1900a, "Théorie de la Spéculation", *Annales Scientifiques de l'École Normale Supérieure,* 3 (17), p.21–86, Translated into English, Paul H. Cootner 1964, p.17–78.
  Also published as a book, 1900b, *Théorie de la spéculation*, Gauthier-Villars. Republished in a book of combined works, Bachelier 1995.
- 1901, "Théorie Mathématique du Jeu", *Annales Scientifiques de l'École Normale Supérieure,* 3 (18), p.143–210. Republished in a book of combined works, Bachelier 1995.
- 1906, "Théorie des Probabilités Continues", *Journal de Mathématiques Pures et Appliquées,* 6 (2), p.259–327.
- 1908a, "Étude Sur les Probabilités des Causes", *Journal de Mathématiques Pures et Appliquées,* 6 (4), p.395–425.

- 1908b, "Le Problème Général des Probabilités Dans les Épreuves Répétées", *Comptes-rendus des Séances de l'Académie des Sciences,* (146), p.1085–1088.
- 1910a, "Les Probabilités à Plusieurs Variables", *Annales Scientifiques de l'École Normale Supérieure,* 3 (27), p.339–360.
- 1910b, "Mouvement D'un Point ou D'un Système Matériel Soumis à L'action de Forces Dépendant du Hasard", *Comptes-rendus des Séances de l'Académie des Sciences*, présentée par M. H. Poincaré, (151), p.852–855.
- 1912, Calcul des Probabilités, Vol. 1, Gauthier-Villars. Republished, Bachelier 1992.
- 1913a, "Les Probabilités Cinématiques et Dynamiques", *Annales Scientifiques de l'École Normale Supérieure,* (30), p.77–119.
- 1913b, "Les Probabilités Semi-Uniformes", *Comptes-rendus des Séances de l'Académie des Sciences*, présentée par M. Appell, (156), p.203–205.
- 1914, *Le Jeu, la Chance et le Hasard*, Bibliothèque de Philosophie scientifique, E. Flammarion. Republished, Bachelier 1993.
- 1915, "La Périodicité du Hasard", *L'Enseignement Mathématique,* 17, p.5–11.
- 1920a, "Sur la Théorie des Corrélations", *Bulletin de la Société Mathématique de France,* (48), p.42–44.
- 1920b, "Sur les Décimales du Nombre π", *Bulletin de la Société Mathématique de France*, (48), p.44–46.
- 1923, "Le Problème Général de la Statistique Discontinue", *Comptes-rendus des Séances de l'Académie des Sciences*, présentée par M. d'Ocagne, (176), p.1693–1695.
- 1925, "Quelques Curiosités Paradoxales du Calcul des Probabilités", *Revue de Métaphysique et de Morale,* (32), p.311–320.
- 1937, Les Lois des Grands Nombres du Calcul des Probabilités, Gauthier-Villars.
- 1938, La Spéculation et le Calcul des Probabilités, Gauthier-Villars.
- 1939, Les Nouvelles Méthodes du Calcul des Probabilités, Gauthier-Villars.
- 1941, "Probabilités des Oscillations Maxima (Erratum)", *Comptes-rendus des Séances de l'Académie des Sciences,* (213), p.220.
- 1992, Reprint of Calcul des Probabilités (1912), Vol. 1, Ed. Jacques Gabay, ISBN: 287647090X.
- 1993, Reprint of Le Jeu, La Chance et le Hasard (1914), Ed. Jacques Gabay, ISBN: 2876471477.
- 1995, Combined volume prints of Théorie de la Spéculation (1900b) and Théorie mathématique du jeu (1901), Ed. Jacques Gabay, ISBN: 2876471299.

2. Irving Fisher

Irving Fisher was born in 1867 in New York, US and died in 1947 in New York, US . His father was a teacher and Congregational minister. He graduated from Yale with a bachelor degree in mathematics, and later completed his Ph.D. in economics. While he wrote about diverse topics his most influential work was his development of index numbers. He was considered as a pioneer in developing and using index numbers. He applied mathematics to understand share value and measure inflation. He also spoke extensively about world peace and healthy lifestyle after his years of struggle with tuberculosis. His versatile interest extended to multiple fields such as poetry, geometry, mechanics and astronomy. But it is believed by many economists that his work stimulated many classical and monetarist theory which were based on inflation. With wide array of work and publications in areas of economics and mathematical finance, Fisher has gained the position of a significant contributor in the world of finance. The theories are all still worked upon and many theories have been developed on the basis of his prior work.

The quantity theory of money was first introduced when gold and silver was being brought into Europe and coins were being turned into coins (HET, 2010a: 1-3). The inflation figures began to rise. Fisher stated theory of money or monetarism then which states that direct relation exists between quantity of money and prices of products/services in the economy. It states that if the amount of money doubles then price also doubles leading to inflation. So with an increase in supply of money, the buying capacity of each unit of money falls. That is, MV= PT, where stock of money is represented by M, velocity of money circulation by

V, price by P and volume of transaction by T. The equation is still used by economists with minor modification. He had also laid the functions of credit market by stating how to allocate resources over a specific time period. Also he had identified the significance of risk in the entire economic activity and process; both very relevant concepts in any financial area. He was also among the first to differentiate between nominal and real interest rates (Mendoza, 2009: 1-6).

Another theory which gained prominence in the field of finance was the Fisher Separation Theorem. It stated that the value of a firm did not depend on its source of financing or the preferences of the owner. This meant that the financial decisions did not need to consider the risk averseness of an owner or the financing decisions. The theory gives rise to net present value and the theory had gained tremendous importance in corporate finance. The flaw in the theory was that it was difficult to apply; the NPV would not have the sunk or opportunity cost, leading to confusion as to how to implement the risk factor. Secondly, the decision as to whether to invest in the project can never be made using the simple theory as there may be disagreements on time aspects.

Fisher had soiled his reputation during the Great Depression by persistently stating the economy would imminently recover. But Fisher's theory of debt, deflation and instability is still considered to understand the present day crisis. His theory stated that the economic changes are forced by both expected and sudden disturbances, which lead to a cyclical oscillation. This leads to newer inventions and opens up further options for investors and also leads to great "over-indebt ness". Due to this liquidation is stimulated which leads to swelling of dollars, which further aggravates debts and makes the depression worse. His solution was bankruptcy or reflation, which he believed should be opted for in the very onset of the crisis. So he believed that fiscal spending should be made to help provide support to the economy (LE&L, 2010a: 1-8)

In Fisher's son Irving N. Fisher's book (1961) 2425 workings of his father are pointed out. In this paper, it is tried to be ranked only some of Fisher's books and better known articles among his works.

- 1892, Mathematical Investigations in the Theory of Value and Prices, New Haven: Yale University.1896,
- Appreciation and Interest, New York: Macmillan Company.
- 1906, The Nature of Capital and Income, New York: Macmillan Company.
- 1907, The Rate of Interest, New York: Macmillan Company.
- 1910, Introduction to Economic Science, New York: Macmillan Company, 2nd ed., 1914.
- 1911a, The Purchasing Power of Money: Its Determination and Relation to Credit, Interest, and Crises, New York: Macmillan, 2nd ed., 1922.
- 1911b, Elementary Principles of Economics, New York: Macmillan Company, 2nd ed., 1913.
- 1915, How to Live: Rules for Healthful Living Based on Modern Science (with Eugene Lyon Fisk), Funk & Wagnalls Company.
- 1918, "Is 'Utility' the Most Suitable Term for the Concept It is Used to Denote?", *American Economic Review*, p.335-37.
- 1921a, "Dollar Stabilization," *Encyclopædia Britannica*, 12th ed., XXX, p.852–853.
- 1921b, "The Best Form of Index Number*", American Statistical Association Quarterly*, 17(133), p.533-537.
- 1922, The Making of Index Numbers: A Study of Their Varieties, Tests, and Reliability, Boston: Houghton Mifflin Company.
- 1923, "The Business Cycle Largely a 'Dance of the Dollar'", *Journal of the American Association*, 18, p.1024–28.
- 1926, "A Statistical Relation Between Unemployment and Price Changes," *International Labour Review*, 13(6), p.785-92. Reprinted as 1973, "I Discovered the Phillips Curve: A Statistical Relation Between Unemployment and Price Changes'," *Journal of Political Economy*, 81(2, Part 1), p.496-502.
- 1927, "A Statistical Method for Measuring 'Marginal Utility' and Testing the Justice of a Progressive Income Tax" in *Economic Essays Contributed in Honor of John Bates Clark* .
- 1928, The Money Illusion, New York: Adelphi Company.

- 1930a, The Stock Market Crash and After, New York: Macmillan Company.
- 1930b, The Theory of Interest,
- 1932, Booms and Depressions: Some First Principles, New York: Adelphi Company.
- 1933a, "The Debt-Deflation Theory of Great Depressions," *Econometrica*, 1(4), p.337-357
- 1933b, Stamp Scrip, New York: Adelphi Company.
- 1935, 100% Money, New York: Adelphi Company.
- 1996, The Works of Irving Fisher, edited by William J. Barber et al., 14 Volumes, London : Pickering & Chatto.

3. John Maynard Keynes

John Maynard Keynes, 1st Baron Keynes, was born in 1883 in Cambridge, England and died in 1946 in East Sussex, England. He attended Kings College from where he secured a degree in mathematics. His father was an economist and a lecturer in moral sciences. He was among the members who structured the post war system during the Bretton Woods Conference in 1944. The influence of his work was so significant that a school of modern thoughts known as the "Keynesian" were formed. Keynesian economics in fact is known to all economists who followed post Keynes (LE&L, 2010b: 1-9).

Keynes was also an active trader who lost greatly during the Great Depression. He had not been able to predict a crash as he felt that such an event was not possible with the Federal Reserve monitoring the markets. He later became the second richest economist by active investment and study of the markets. Among his work two were based on monetarism and monetary reforms to understand the economic woes better. His work published in 1923 "Tract on Monetary Reform" and in 1930 "Treatise on Money" which stated that stabilizing price level will help stabilize the economy. But to stabilize the prices the central bank must fluctuate the interest rate as and when required to help manage the price pattern. In the following years as he witnessed the unemployment figures rise considerably, he went on to study the causes and effects of the economic problems further (Minsky, 1975: 69-70). Later in the year 1936 he published his book "the General Theory of Employment, Interest and Money" claiming that classical work was applicable only in a full employment scenario. The theory brought forth various new concepts such as aggregate demand being the sum of investment, consumption and government spending. This was because he believed that government support was required to reach the full employment scenario. His ideas were found to be controversial and revolutionary but his work is still used by almost economist to seek guidance. Keynes had mentioned on the speculative aspect of the future market in his theory "normal backwardation" where he states that the price of a future will usually be lower than the anticipated spot price of the commodity. He said it was because the hedgers shifted their risks to speculators in form of risk premium (Keynes, 2008). Keynes (1930, 1936) had also envisioned the portfolio selection theory.

Keynes also believed and advocated free market. He believed that after reaching full employment by taking right fiscal initiatives the market could perform freely (Daniel, Stanislaw, 1998: 39-42). At today's date much of Keynes work has been further developed and the short comings have been overcome by his numerous followers. Yet there is so much work done by him that still inspires economists across the globe. Keynes' contribution to the world of economics is not only remarkable but also legendary in ways. In spite of serious criticism in the past his glory has never diminished. So Keynes remains as an unchallenged pioneer in the world of finance.

Keynes was a productive writer. He had almost innumerable newspaper and journal articles. Below list aims to include some of his books and very well known articles.

- 1909, "The Recent Economic Events in India", *Royal Economic Society*, Vol. 19, No. 73, p.51-67.
- 1911, "Principal Averages and Laws of Error which Lead to Them", *Journal of Royal Statistical Society,* Vol. 74, No. 3, p.322-331.
- 1913, Indian Currency and Finance, published by Bennett, Coleman.
- 1914, "The Prospects of Money", *Economic Journal,* Vol. 24, No. 96, p.610-634.
- 1914, "War and the Financial System", *Economic Journal,* Vol. 24, No. 95, p.460-486.
- 1915, "The Economics of War in Germany", *Economic Journal*, Vol. 25, No. 99, p.443-452.

- 1919, The Economic Consequences of the Peace, New York: Harcourt, Brace, and Howe, Inc.
- 1921, A Treatise on Probability, London: Macmillan & Co., Ltd.
- 1922, Revision of the Treaty, London: Macmillan & Co., Ltd.
- 1923, A Tract on Monetary Reform, London: Macmillan & Co., Ltd.
- 1925, The Economic Consequences of Mr. Churchill, by L. and V. Woolf
- 1926, The End of Laissez-Faire, London: Hogarth Press.
- 1926, Laissez Faire and Communism, New York: New Republic, Inc.
- 1927, "The British Balance of Trade", *Economic Journal*, Vol. 37, No. 148, p.551-565.
- 1928, "Amalgamation of the British Note Issue", *Economic Journal*, Vol. 38, No. 150, p.321-328.
- 1928, Reflexions Sur le Franc, published by S. Kra
- 1930, A Treatise on Money, London: Macmillan & Co., Ltd.
- 1931, Essays in Persuasion, New York: Harcourt, Brace and Company.
- 1932, "Member Bank Reserves in the United States", *Economic Journal,* Vol. 42, No. 165, p.27-31.
- 1932, "A Note on the Long-Term Rate of Interest in Relation to the Conversion Scheme", *Economic Journal,* Vol. 42, No. 167, p.415-423.
- 1933, "An Open Letter to President Roosevelt", December 16, *New York Times.*
- 1936, "Fluctuations in Net Investment in the United States", *Economic Journal,* Vol. 46, No. 183, p.540-547.
- 1936, General Theory of Employment, Interest and Money, London: Macmillan & Co., Ltd.
- 1937, "Alternative Theories of the Rate of Interest", *Economic Journal,* Vol. 47, No. 186, p.241-252.
- 1937, “Prof. Pigou on Money Wages in Relation to Unemployment” with Nicholas Kaldor, *Economic Journal,* Vol. 47, No. 188, p.743-753.
- 1937, "The Ex Ante Theory of the Rate of Interest", *Economic Journal,* Vol. 47, No. 188, p.663-669.
- 1938, "The Policy of Government Storage of Foodstuffs and Raw Materials", *Economic Journal* Vol. 48, No. 191, p.449-460.
- 1939, "Relative Movements of Real Wages and Output", *Economic Journal,* Vol. 49, No. 193, p.34-51.
- 1940, "The Concept of National Income: Supplementary Note", *Economic Journal,* Vol. 50, No. 197, p.60-65.
- 1940, How to Pay for the War: A Radical Plan for the Chancellor of the Exchequer, New York: Harcourt, Brace and Company
- 1943, "The Objective of International Price Stability", *Economic Journal*, Vol. 53, No. 210/211, p.185-187.

4. Benjamin Graham

Benjamin Graham known as the “father of security analysis” was born Benjamin Grossbaum in 1894 in London, England and died in 1976 in Aix-en-Provence, France. His family moved to America when he was young. His father was an importer. Graham went to Columbia University and later took a job with Wall Street at Newburger. The crash of 1929 had a great negative effect on his partnership venture. Post it Benjamin Graham together with his friend David Dodd, published a book Security Analysis (1934). In spite of the crisis the book made investors believe that there was a sound way to invest in common stocks. He together with Dodd stated the importance of intrinsic value and how stocks should be purchased at a discounted price. Although Graham was back on his feet, he continued to write and lecture at Columbia. Warren Buffet was his student at Columbia who latter worked under Graham. Till date Buffet acknowledges that he benefited greatly by being under Graham’s guidance. In 1949 he wrote his book the Intelligent Investor which is still considered by investors and students to under value investing. Graham was considered to be the pioneer in understanding value investing and his book Security Analysis (1934), co-authored by David Dodd, is a book still used by students across the globe. Graham in his book the Intellgient Investor helps readers and investors understand security analysis better. Graham’s approach was loss minimization rather than profit

maximization. His theories were not tailored for a speculator. He rather provided theory that bears long term benefit. He believed that an investor should research and analyze options to make sound investments. He states rational plans for trading stocks and bonds, and he believes that these plans must be followed in spite of emotional pulls dring a bull or bear phase. The investor must refrain from taking a random buy or sell decision, nor should he blindly support market trends.

A list of ten criteria to select a stock was provided by Benjamin Graham. These ten pointers are:

- The earning to price must be more than twice that of a AAA bond,
- The price earning ratio should be lower than 40% of the stock's highest price earning ratio in the last 5 years,
- The dividend yield should be equal to or greater than two-third of an AAA bond,
- The stock price should be below two-third of the tangible book value per share,
- The price of the stock should be lower than two-third of net current asset value,
- The total debt should be lesser than book value,
- The current ratio should be greater than 2,
- Total debt should be less than twice the net current asset value,
- Earnings growth of past 10 years should be equal to higher than 7% annual compounded rate,
- The growth of earnings should not have declined more than 5% and no more than twice in the past 10 years.

Post developing the ten criteria theory, Graham stated that the results could be accomplished by the combination of 3 satisfactory criteria that is 1, 3 and 6, while the others were redundant (Graham, 2003).

Some of Graham's books were revised in his lifetime, and by different writers after his death. Here, it is tried to be mentioned his books' first and later editions in addition to his articles which are believed to be important.

- 1917, "Some Calculus Suggestions by A Student", *The American Mathematical Monthly*, Vol. 24, No. 6, p.265–271.
- 1934, Security Analysis, with David Dodd, New York: McGraw-Hill, Editions 1940, 1951,1962, 1988 (updated ed.) and 2008 (updated ed.).
- 1937, Storage and Stability: A Modern Ever-normal Granary, New York: McGraw-Hill.
- 1937, The Interpretation of Financial Statements, New York: Harper.
- 1943, "The Critique of Commodity-Reserve Currency: A Point-by-Point Reply", *The Journal of Political Economy,* 51 (1), p.66–69.
- 1944, World Commodities and World Currency, New Yok & London: McGraw-Hill.
- 1946, "The Undistributed Profits Tax and The Investor", *The Yale Law Journal*, Vol. 46, No. 1, p.1–18.
- 1947, "Money As Pure Commodity", *American Economic Review,* 37 (2), p.304–307.
- 1947, "National Productivity: Its Relationship to Unemployment-in-Prosperity", *American Economic Review,* 37 (2), p.384–396.
- 1949, The Intelligent Investor, New York: Harper, 1973 (revised ed.),2003 (revised ed.) and 2005 (re-issue ed.).
- 1962, "Some Investment Aspects of Accumulation Through Equities", *The Journal of Finance,* Vol. 17, No. 2, p.203–214.
- 1962, "The Commodity-Reserve Currency Proposal Reconsidered", in Yeager, Leland B. (ed.), *In Search of Monetary Constitution*, Massachusetts: Harvard University Press., p.184–214.

5. Jacob Marschak

While our former pioneer was a great political influence, Marschak lost his youthful charm about politics and even refrained from stating proposals related to policies. Jacob Marschak, until 1933 Jakob, was born in 1898 in Kiev, Imperial Russia and died in 1977 in Los Angeles, US. His father was a jeweller. In spite

of his initial interest in the field and turning into a Marxist, latter Marschak did not indulge in any political activities.

Marschak's ability to synthesize and analyze a situation in hand from all possible perspectives led to make him among the most influential people in the field of economics and finance. He subjected every theoretical hypothesis to its feasibility in terms of utility, weighed it against various economic issues which helped him find area for criticism and improvement. He became a leader in a German research organization at a delicate age and latter became the director of Oxford Institute of Statistics. His stay later in University of Chicago as the director of economics helped him analyze various work and make substantial contribution to the economic field (Cowles Commission/Foundation Publications, 2010: 1).

He studied economics at the Kiev Institute of Economics and latter at University of Berlin. Here he realized the great importance of incorporating mathematical analysis into understanding the economic scenario. His interest in journalism led to his study of various industries during the 20s. His paper on rationality behind socialist society (1923) was of great interest. His other work on "new middle class" that is on white collar employees and workers (1926) and study of demand (1931) were vastly studied and analyzed by researchers. He witnessed the economic times through the Great Depression and the World War II. The economy was undergoing various changes and the economist's perceptions and view points were changing as well (Marschak, 1943: 163-166). So Marchak was exposed to random changes occurring around him. It was seen that he as an economists also had a shift of direction in the course of his career. He had also suggested compensatory public works strategy as an initiative that should be adapted during the Great depression, which was much ahead of Keynes's General theory of Employment, Interest and Money (1936). Marschak's study and analysis on money and assets are still influential papers. He in this theory mentioned how the portfolio approach can be taken that is he spoke of the finding out the demand for various asset categories based on the uncertainty which is related to their respective holdings. This was the first time such modeling had been done, although the concept had for long been known (HET, 2010b: 1-3). He also suggested another function by mapping the probability distribution of the returns. While he came back to study and develop his work in this area, there were other major works he worked extensively on. The work with William H. Andrews where he applied simultaneous equations to production processes and functions is among his other work which helped resolve problems in the work developed by Douglas's Measurement of Production Functions and Marginal Productivities (1944). His efforts to prove the relevance of new information on economic behavior was a subject that held his interest time and again. He developed the "theory of team", which stated that a team has members with similar beliefs and preferences but who have different information and thereby act differently. His study was to devise a decision rule that would show his action as a function of the information he has. Although his work was unable to develop any substantial result but he strongly believed that information was the key to many economic happenings and held great relevance (Arrow, 1991: 129-146). His study with Radner was later published in the book "economic theory of teams" (1972). The other major field of research was stochastic decision, which stated that individuals do not always act consistently but they do perform rationally. They are stated to make "choices at a random basis about a rational pattern" (Marschak, Block:1960). His work on stochastic decision had great effect on the study of psychology (Cherrier, 2010: 443-467). The accolades awarded to him only reinforce the fact that he was among the pioneers in the field of finance contributing greatly in many areas of this field.

The early writings of Marschak were published in German, but in the following years some of them published in English as well. Besides having just a few books, Marschak concentrated an article studies mostly. Some of his works are listed below:

- 1923, "Wirtschaftsrechnung und Gemeinwirtschaft", *Archiv für Sozialwissenschaft,* 51, p.501-520.
- 1926, "Der Neue Mittelstand" with E. Lederer, *Grundriss der Nationalökonomik*, 9 (1), p.120-141 (trans. "The New Middle Class", 1937, *WPA*).
- 1931, Elastizität der Nachfrage, Tubingen: J.C.B. Mohr.
- 1938, "Money and the Theory of Assets", *Econometrica*, 6, p.311-25.
- 1938, "Assets, Prices and Monetary Theory", with H. Makower, *Economica*, 5, p.261-288.
- 1938, "Studies in the Mobility of Labour" with H. Makower and H. W. Robinson, *Oxford Economic Papers,* 1, p.83-123; 2, p.70-97; 4, p.39-62.

- 1939, “Family Budgets and the So-called Multiplier”, *Canadian Journal of Economics*, 5, p.358-362.
- 1939, “On Combining Market and Budget Data in Demand Studies”, *Econometrica,* 7, p.332-335.
- 1939, “Personal and Collective Budget Functions”, *Review of Economics and Statistics*, 21, p.161-70.
- 1941, “Lack of Confidence”, *Social Research,* 8, p.41-62.
- 1941, “The Task of Economic Stabilization”, *Social Research,* 8, p.361-72.
- 1941, “Wicksell's Two Interest Rates”, *Social Research*, 8, p.469-78.
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- 1949, "The Role of Liquidity Under Complete and Incomplete Information", *American Economic Review*, 39, p.182-95.
- 1950, “Statistical Inference in Economics: An Introduction”, In: *Statistical Inference in Dynamic Economic Models,* ed. T. C. Koopmans, p. 1-50. New York: Wiley.
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- 1950, “Rational Behavior, Uncertain Prospects and Measurable Utility”, Econometrica, Vol.18, p.114-141.
- 1953, “Economic Measurements for Policy and Prediction”, In: *Studies in Econometric Method,* eds. W.C. Hood and T.C. Koopmans, p.1-26. New York: Wiley.
- 1953, “Equipes et Organisations en Regime d'incertitude”, *Econometrie: Colloques Internationaux du Centre National de la Recherche Scientifique,* 40, p.201-11 (From a CNRS colloquium held May 12-17, 1952, in Paris).
- 1954, “Towards An Economic Theory of Organization and Information”, In: *Decision Processes,* eds. R. M. Thrall, R. L. Davis, and C. H. Coombs, New York: Wiley, p. 187-220.
- 1954, “Three Lectures on Probability in the Social Sciences”, *Mathematical Thinking in the Social Sciences*, Free Press, Glencoe, p. 166-215.
- 1959, "An Identity in Arithmetic" with H.D. Block, *Bulletin of the American Mathematical Society*, Volume 65, Number 3, p.123-124.
- 1960, “Random Orderings and Stochastic Theories of Responses” with H.D. Block, eds. Olkin, Ghurye, Hoeffding, Madow and Mann, *Contributions to Probability and Statistics*, Stanford University Press, p. 97-132.
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- 1963, “Stochastic Models of Choice Behavior” with J. G. Becker and M. DeGroot, *Behaviour Scence,* 8, p.41—55.
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- 1971, “Economics of Information Systems”, In: *Frontiers of Quantitative Economics,*ed. M. Intriligator, Amsterdam: North-Holland, p. 32—107.
- 1972 Economic Theory of Teams, with Roy Radner, New Haven: Yale University Press.
- 1974 *Economic Information, Decision and Prediction,* 3 volumes, Dordrecht and Boston: Reidel.

6. John Burr Williams

John Burr Williams is called the father of dividend investing by many investors. He is known for his pioneering work in creating the discounted dividend models. Williams was born in 1899 or 1900 and died in 1989 in Massachusetts, US. John Burr Williams studied at Harvard University with mathematics and chemistry. Later he went to graduate from Harvard Business School, which is where he received his first exposure to security analysis. Williams was a successful investor himself when he went back to Harvard to gain his Ph.D. in Economics.His work, the Theory of Investment Value (1938) gives a mathematical model to value stock. In his book he stated how the prevailing system of stock valuation was inappropriate and that it is crucial to include dividends in stock valuation. This is because dividends, he believed, was more volatile than the earnings of a share. Unlike all the pioneers mentioned above he spent greater part of his career on work related to security analysis and investment portfolios (Hagstorm, 2005). He was amongst the first to stress on the need to determine a stock's intrinsic value to analyze the security from an investment perspective. He believed that understanding the volatility of the markets, it is essential to understand and review the capability of a company to pay dividends over a longer duration of time.

Williams formula based on discounting present value for the whole market for a number of years is an alternative still used to value equity risk. The equation takes into account current dividends and investor's required rate of return. The future dividend is projected for based on an expected dividend growth over an infinite period of time. However the formula does not hold true when the rate of return needed by the investor is lesser than the growth rate. Although the formula is very useful as the values increase with a rate of growth and lower when the expected rate is higher.

Unlike other economists he did not preach the investors to beat markets instead he attempted to bring forth a less speculative aspect. He rather stressed on investment value and stated that earnings alone were not parameter enough to understand a stock.

He aspired to learn the reasons for the crash of 1929 during his course and realized that the primary reason was the high volatility which existed in the market. He believed that a lack of proper valuation of stocks and inappropriate regulatory actions that caused the distress in the economy. He stated that the volatility of the market happened because investors wanted short term earnings rather than long term dividends, unable to determine the intrinsic value of the share; they turned to the government to manage the free market. He believes that the Government was unable to allocate capital properly at this point of time leading to the shortage of growth and profits. He also believed that the analysts had not considered vital points leading to inaccurate valuation of stocks, so they were also partly liable for the depression. Even if we apply his thoughts in present day crisis, it can be observed that the dividend paying capacity had not fluctuated as much in the market, the prices and earnings had. The investors started doubting the free market and due to slow growth environment the problem unfolded to such heights. Although there are various other factors responsible for the crisis, but his work still holds some relevance in today's date. He contribution thereby is among the most significant ones in the world of finance.

Some of Williams' major works are listed below, some of them posted again later.

- 1936, "Speculation and the Carryover", *Quarterly Journal of Economics*, Vol.50, No:3, p.436-455.
- 1938, *The Theory of Investment Value*, Massachusetts: Harvard University Press. Reprinted in 1997, Virginia: Fraser Publishing.
- 1949, "The Theory of International Trade", Reconsidered *Economic Journal*, 39, p.195-209.
- 1954, *International Trade Under Flexible Exchange Rates*, Amsterdam: North-Holland Pub. Co.
- 1964, *Interest, Growth & Inflation*. Reprinted in 1998, Virginia: Fraser Publishing.
- 1964, *The Free Enterprise System*, Massachusetts: Wellesley Hills.
- 1967, "Path to Equilibrium", *QuarterlyJournal of Economics,* May, Vol. 81, No.2, p.241-255.
- 1979, *Fifty Years of Investment Analysis: A Retrospective*, Financial Analysts Research Foundation.

7. Sir John R. Hicks

Sir John R. Hicks, was born in 1904 in Warwick, England and died in 1989 at Blockley, England. His father was a journalist of a local newspaper. He studied in Clifton College, Balliol College and later Oxford. But his education at London School of Economics in 1920s was the most influential in his career. His interest was in fields of mathematics, history and literature. With diverse interests he also had worked on different field in economics and finance. Hicks had written on various areas such as money and international trade, applied economics and relation with developing economies, and growth and fluctuations of markets. He is considered to be amongst the most significant economist of the era, Knightian Theory (1931), Theory of Wages (1932), his articles on Monopoly (1935) and Value and Capital (1939) were among the various works published by him. His paper Mr. Keynes and the Classics (1937) introduced the IS-LM and liquidity trap concept that helped start the Neo-Keynesian thought (Hicks, 1988: 1-6). In 1980 "IS-LM: An Explanation" Hicks denounced the Neo-classical Keynesian synthesis which he himself had helped develop. He thereby led the way to future perspectives in the Post Keynesian thought. He received the noble prize in 1972 for his contribution to the field of demand and welfare theory. The four primary contributions made by Hicks were: introduction of concept of elasticity of substitution, General Theory of Employment, Interest and Money (1936), Value and Capital (1939) and compensation test. The General Theory of Employment, Interest and Money stated that economy can exist in equilibrium even without full employment. The work was published post Keynes's book and thus helped substantiate his work. While the Value and Capital stated that the value of goods and why they have value can be calculated without assuming that utility is measurable. In stead it was sufficient to assume that people are capable of ranking bundles of goods and commodities on the basis of preference. His work was amongst the first to discuss how all markets are interrelated and work together to reach a point of equilibrium. The book also contributes towards advancement of the Paretian Value Theory and Walrasian Theory.

In 1950s, Hicks worked towards formulating compensation criteria. Although the work received great criticism it is among the best justification to understand cost benefit and cost effectiveness. His work on value and risk contributed to portfolio selection theory. His other major attempt at disequilibrium was done through his paper in Contribution to the Theory of the Trade Cycle (1950) which had two factors alleviate the instability which the accelerator encourage in the equilibrium of growth. Hicks's next work was to understand the dynamics of the capital and its growth (Hicks, 1974: 205-214). The work by Hicks has made way for the post Keynesian theories and helped frame and substantiate many work. He revolutionized the assumption and clauses of many work to help further develop them. He had clearly differentiated between fix price and flex-price markets. However the most important part lay in the second half of the book Capital and Growth where he assumed a steady growth rate and stated that the capital goods that were being produced were also used for producing outputs (Wood, Woods, 1989: 147-162). Later to deal with the criticism drawn by the book he published his work in his next book Capital and Time: A Neo-Austrian Theory (1973), Hicks states that there are three economic models based on the degree of disintegration: Method of sectoral disintegration, Method of J. von Neumann and Neo-Austrian Method. He finds the Neo-Austrian system as the most appropriate as in it every production cycle or process constitutes of specific time frames for inputs and outputs (Hicks, 1970: 257-281).

Hicks has made tremendous contribution to various policy decisions and discussions. His ideas have often not been well received by others, but he has always tried to incorporate the criticism to develop his work further. He along with his wife, Ursula Hicks had made major contribution to applied research on taxation. His work such as the work on policies and compensation to understand wage inflation had been well received by people across the globe and even in the higher political circle. He had also worked on the correlation between taxation and increased wage claims. His work has been so wide and spread across that it is difficult to summarize the immense contribution he made in the field of finance.

Hicks was knighted in 1964 and was co-recipient of the Nobel Prize in Economic Sciences (with Kenneth J. Arrow) in 1972. He donated the Nobel Prize to the School's Library Appeal in 1973 (LSE, 2010: 1).

Hicks signed a lot of books and articles besides "Capital" trilogy. Here just some of them are mentioned.

- 1932, The Theory of Wages, London: Macmillan, 2nd ed., 1963.
- 1934, "A Reconsideration of the Theory of Value" with R. G. D. Allen, *Economica*. New Series, Vol. 1, No. 1, p. 52-76.
- 1937, "Mr Keynes and the Classics: A Suggested Interpretation", *Econometrica*, Vol. 5, No. 2., p. 147-159.
- 1939, "The Foundations of Welfare Economics", *Economic Journal*, Vol. 49, No. 196, p. 696-712.
- 1939, Value and Capital: An Inquiry into Some Fundamental Principles of Economic, Oxford: Clarendon Paperbacks, Oxford University Press, 2nd ed., 1946.
- 1940, "The Valuation of Social Income," *Economica*, 7, p.105–24.
- 1941, "The Rehabilitation of Consumers' Surplus", *Review of Economic Studies*. Vol. 8, No. 2, p.108-116.
- 1942, The Social Framework: An Introduction to Economics, Oxford: Clarendon Press.
- 1950, A Contribution to the Theory of the Trade Cycle, Oxford: Clarendon Press.
- 1956, A Revision of Demand Theory, Oxford: Clarendon Press.
- 1958, "The Measurement of Real Income", *Oxford Economic Papers*. New Series, Vol. 10, No. 2, p.125-162.
- 1959, Essays in World Economics, Oxford: Clarendon Press.
- 1965, Capital and Growth, Oxford: Clarendon Press.
- 1969, A Theory of Economic History, Oxford: Clarendon Paperbacks, Oxford University Press.
- 1973, "The Mainspring of Economic Growth", *Economic Perspectives*, August 1977 , p. 1-20.
- 1973, Capital and Time: ANeo-Austrian Theory, Oxford: Oxford University Press.
- 1974, "Capital Controversies: Ancient and Modern", *American Economic Review*, Vol. 64, No. 2, Papers and Proceedings of the Eighty-Sixth Annual Meeting of the American Economic Association, p.307-316.
- 1976, Economic Perspectives, Oxford: Oxford University Press.
- 1979, “The Formation of an Economist”, *Banca Nazionale del Lavoro Quarterly Review*, No. 130, p.195-204.
- 1980, "IS-LM: An Explanation", *Journal of Post Keynesian Economics*, Vol. 3, p.139-155.
- 1981, Wealth and Welfare: Vol I. of Collected Essays in Economic Theory, Oxford: Basil Blackwell.
- 1982, Money, Interest and Wages: Vol. II of Collected Essays in Economic Theory, Oxford: Basil Blackwell.
- 1983, Classics and Moderns: Vol. III of Collected Essays in Economic Theory, Oxford: Basil Blackwell.

8. Nicholas Kaldor

Nicholas Kaldor, Baron Kaldor, was born in 1908 in Budapest, Hungary and died in 1986 in Cambridgeshire, England. His father was a lawyer. Kaldor began his studies at the University of Berlin in 1925 and then after two years arrived in England to study at the London School of Economics. Kaldor was educated at the London School of Economics, where he went on to become a lecturer later. He became a professor of economics at Cambridge during the war. Here he continued to work to develop the theory of economic growth and distribution. This later led to the “post-Keynesian” school of thoughts. John Hicks a friend and colleague also introduced him to the work of various other economists. John King had stated how Kaldor’s work was “original, provocative and invariably interesting” (King, 2007: 39-61). He was among the leading economist in the post war period. Kaldor also acted as an advisor to the UK government and eight other countries as well. He acted as a consultant on various taxes related issues. He was a special advisor to three labor chancellors in Britain during the years 1964 to 1976. He was appointed to the Royal commission on taxation. Among his various work and various advisory research conducted, his work on An Expenditure Tax (1955) was the most effective. He contributed greatly in theories related to market equilibrium (1934), capital (1939), and welfare economics (1939). Post Keynes’ General Theory he joined the Keynesian revolution and contributed to the Keynesian theory by including the “own rate of interest” and “effects of speculation. His compensation criteria are known as the Kaldor-Hicks efficiency for welfare comparison

which received great acknowledgement from other economists. Kaldor's study on theory of economic growth during the 50s and 60s; and income distribution (1956) which stated the requirement of having an alternative to the marginal productivity theory, are studied and analyzed till date by economists (Kaldor, Mirrlees, 1962: 174-192).

Kaldor opposed the concept of Monetarism and which lay emphasis on monetary authority and controls ensuring a grip to prevent inflation (Kaldor, 1970: 1-18). Kaldor in 1970 challenged the hypothesis of a stagnant demand for money and potential money supply which was under the supervision of the government (King, 1998: 411-432). He had also critically analyzed the Neo-classical theory and underlying assumptions about the economy. As the definition and understanding of monetarism grew in the next decade, his criticism also grew further. In 1982, his lecture at the British Academy brought forth criticism of the General Theory and how it did not identify closed economy, maximum employment and maximum output, lack imperfect competition etc (Kaldor, Nicholas, 1982: 259-273).

Kaldor has successfully accounted many economic theories and policies. He was among the most efficient economists who not only developed theoretical concepts but also applied them to practical works of life. He had always been working to understand the work of fellow economists and worked to formulate policies which would help steer the financial world to a better tomorrow. But the most commendable thing about this entrepreneur is the ability to have a flexible mind and change his mind and adapt newer things. This ability of his to break from the orthodox and look towards things with greater significance has made him a significant figure over the years.

In 1974, Kaldor was made a life peer as **Baron Kaldor**, of Newnham in the City of Cambridge.

Kaldor published most articles in his early writings, in the latter period he focused on book studies. Some of his publishings are as follows:

- 1932, "The Case Against Technical Progress", *Economica*, No. 36, p. 180-196.
- 1934, "A Classificatory Note on the Determinateness of Equilibrium*"*, *Review of Economic Studies*, Vol. 1, No. 2, p. 122-136.
- 1934, *"The Equilibrium of the Firm"*, *Economic Journal*, Vol. 44, No. 173, p. 60-76.
- 1935, "Market Imperfection and Excess Capacity", *Economica*, New Series, Vol. 2, No. 5, p. 33-50.
- 1937, "Prof. Pigou on Money Wages in Relation to Unemployment" with John M. Keynes, *Economic Journal,* Vol. 47, No. 188, p.743-753.
- 1939, "Welfare Propositions of Economics and Interpersonal Comparisons of Utility" Economic Journal, Vol.49, No: 195, p.549–52.
- 1939, "Speculation and Economic Stability", *Review of Economic Studies*, Vol. 7, No. 1, p. 1-27.
- 1939, "Capital Intensity and the Trade Cycle", *Economica*, New Series, Vol. 6, No. 21, p. 40-66.
- 1940, "A Model of the Trade Cycle", 1940, *Economic Journal*, Vol. 50, No. 197, p. 78-92.
- 1942, "Professor Hayek and the Concertina Effect", *Economica*, New Series, Vol. 9, No. 36, p. 359-382.
- 1954, "The Relation of Economic Growth and Cyclical Fluctuations", *Economic Journal*, Vol. 64, No. 253, p. 53-71.
- 1955, Expenditure Tax, London: George Allen&Unwin Ltd.
- 1956,"Alternative Theories of Distribution", *Review of Economic Studies,*Vol. 23, No. 2, p. 83-100.
- 1957, "Model of Economic Growth", *Economic Journal*, Vol. 67, No. 268, p. 591-624.
- 1958, Monetary Policy, Economic Stability, and Growth.
- 1959, "Economic Growth and the Problem of Inflation", Economica, New Series, Vol. 26, No. 104, p. 287-298.
- 1960, "A Rejoinder to Mr. Atsumi and Professor Tobin", *Review of Economic Studies*, Vol. 27, No. 2, p. 121-123.
- 1960, "Keynes' Theory of the Own Rates of Interest", *Essay on Economic Stability and Growth*, p. 59-74.
- 1960, Essays on Value and Distribution, Free Press.
- 1960, Essays on Economic Stability and Growth, Duckworth.

- 1962, “A New Model of Economic Growth” with James A. Mirrlees, *Review of Economic Studies*, Vol. 29, No. 3, p. 174-192.
- 1964, Essays on Economic Policy, two volumes, Gerald Duckworth&Co. Ltd.
- 1966, Causes of the Slow Rate of Economic Growth in the UK, Cambridge University Press.
- 1970, “The Case for Regional Policies”, *Scottish Journal of Political Economy*, Vol. 17, issue 3, p.337-48.
- 1970, “The New Monetarism”, *Lloyds Bank Review*, July, p.1-2.
- 1970, “Conflicts in National Economic Objectives”, *Economic Journal*, Vol. 81, No. 321, p. 1-16.
- 1972, “The Irrelevance of Equilibrium Economics”, *Economic Journal*, Vol. 82, No. 328, p. 1237-1255.
- 1975, “What is Wrong with Economic Theory”, *Quartely Journal of Economics*, Vol. 89, No. 3, p. 347-357.
- 1976, “Inflation and Recession in the World Economy”, *Economic Journal,* Vol. 86, No. 344, p. 703-714.
- 1977,” Equilibrium Theory and Growth Theory”, in ed. Michael Boskin, New York: Academic Press p.243-291.
- 1978, Further Essays on Economic Theory, New York: Holmes & Meier, Inc.
- 1982, The Scourge of Monetarism, Oxford: Oxford University Press, 2nd Ed. 1986.
- 1985, Economics Without Equilibrium, New York: M.E. Sharpe, Inc.

Conclusion

It is seen that the work of Louis Bachelier was ignored almost for 50 years. The reason could be his background of economics. However further economists such as Fisher, Keynes, Hicks, Kaldor and Marschak have studied the financial markets and their work has been appreciated. However most economists in the initial period felt that the financial markets were more like a casino, where the prices of assets were based on expectation. Also a lot of work was done on speculation rather than a hedge point of view. Benjamin Graham known as the “father of security analysis”. Marschak subjected every theoretical hypothesis to its feasibility in terms of utility, weighed it against various economic issues which helped him find area for criticism and improvement. John Burr Williams was among the first to challenge the view point of the early economists by stating that price of an asset was reflected by its intrinsic value. Work by Hicks and Keynes on the futures market in fact stated that speculators could profit from a hedger’s risk averseness in the form of risk premium. Kaldor had extended Keynes theory of liquidity preference to understand if speculators determined asset prices.

The overall study shows that to be a pioneer the desire to learn more about a financial concept should be present to help a person search for answers unknown to others. There backgrounds help us understand how each person belonged to different fields, with even more varied interests, yet how they developed theories which influence finance and over all economic health greatly.

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"Irving Fisher" LE&L: Library of Economics and Liberty (2010a). Retrieved October 6, 2010 from http://www.econlib.org/library/Enc/bios/Fisher.html
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