

THE DANCE OF THE DOLLAR: IRVING FISHER'S MONETARY THEORY OF ECONOMIC FLUCTUATIONS

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Irving Fisher was well known during his lifetime for his argument that in the long run, monetary changes would affect only nominal variables such as the price level and nominal interest rate, and that the real interest rate would be determined by time preference and the productivity of capital. His analysis of transition periods attracted less attention at the time, and is not as well remembered. This paper examines Fisher's analysis of the transition period, during which monetary shocks affect output, employment and real interest, and argues that his monetary theory of economic fluctuations motivated his work on index numbers, distributed lags, money illusion and the compensated dollar. This analysis can be more fully appreciated in light of the subsequent development of macroeconomics than it was at the time. Fisher's "A Statistical Relation between Unemployment and Price Changes" (1926) was appropriately retitled "I Discovered the Phillips Curve" when it was reprinted in 1973. His innovative calculation of the correlation between unemployment and a distributed lag of changes in a price index attracted little notice at the time, appearing in the review of the International Labour Office rather than in an economics journal, and the American Economic Association *Index of Economic Journals* listed neither Fisher (1926) nor Fisher's 1936 paper on calculating distributed lag coefficients. This paper examines Fisher's analysis of

economic fluctuation prior to his formulation, after the stock market crash of 1929, of his debt deflation theory of great depressions (Fisher 1932, 1933b).

"Business Cycle Largely a 'Dance of the Dollar'", the title of Fisher (1923), succinctly stated the view of economic fluctuations underlying both Fisher's scientific activity and his efforts as a reformer. His work on index numbers, distributed lags, correlation analysis of economic time series, money illusion, real and nominal interest rates, index linked bonds, and tabular standards was united by a concern with investigating and remedying the consequences of fluctuations in the purchasing power of money. Fisher believed that money illusion was pervasive and that economists had a responsibility to educate the public about the difference between real and nominal magnitudes.

"Why was it," asked Joseph Schumpeter (1948, 234), "that friends and foes of *The Purchasing Power of Money* saw nothing in it but another presentation, statistically glorified, of the oldest of old quantity theories - that is, a monument of an obsolescent theory that was to become quite obsolete before long? The answer is simple: because Fisher said so himself - already in the Preface and then repeatedly at various strategic points." Fisher devoted the first three chapters to exposition of the equation of exchange and the argument that in the long run a change in the money supply leads to "an exactly proportional change in the general level of prices". Later in the work, he included two chapters on the appropriate price index to use in the equation of exchange and two chapters on the statistical verification of the quantity theory. In between these two groups of chapters, noted Schumpeter, Fisher "shoved all his really valuable insights mercilessly into Chapters IV, V, VI, and disposed of them semi contemptuously as mere disturbances that occur during 'transition periods' when indeed the quantity theory is 'not strictly true'" (Schumpeter 1948, 234-35; Fisher 1913, 159-61).

Chapter IV, "Disturbance of Equation and of Purchasing Power during Transition Periods", included sections on "Tardiness of interest adjustment to price movements" and "How a rise of prices culminates in a crisis" (Fisher 1913, 55-58, 64-67). This chapter foreshadowed Fisher's later writings on the monetary theory of the business cycle, and provided the basis for Fisher's concluding chapter on the problem of stabilizing the purchasing power of money (1913, 319-48), since monetary instability mattered only because of the non neutrality of money during transition periods. Fisher (1913, 65n) acknowledged the similarity of the theory of crises presented in Chapter IV to that in a paper by his assistant, Harry G. Brown, that appeared in 1910 in the *Yale Review*, of which Fisher was an editor.

The message that the economics profession absorbed from *The Purchasing Power of Money* was contained in the chapters on the equation of exchange and the long-run neutrality of money, not in Chapter IV on transition periods. Thus, for example, Edwin Dean (1965, 9-28) reprinted substantial portions of Chapters II, III and VIII of Fisher (1913), but entirely skipped the chapters on transition periods and on indirect influences on purchasing power. Lawrence Ritter (1963, 82) cited Fisher (1913) as evidence that the pre-Keynesian quantity theory held that an increase in the money supply, even in a period of substantial unemployment, would only cause a proportionate change in the price level. The review of Fisher's first edition by

John Maynard Keynes (1911) also neglected those chapters to concentrate on Fisher's discussion of index numbers, the subject of Keynes' Adam Smith Prize essay. *The Purchasing Power of Money* was remembered by the economics profession for its version of the equation of exchange, $MV + M'V' = PT$, which incorporated bank deposits as well as currency, and allowed them to have different velocities of circulation.

In Chapter IV, Fisher offered a theory of credit cycles based on the distinction between real and nominal interest rates expounded in his American Economic Association monograph on *Appreciation and Interest* (1896). "Indeed, the chief object of this chapter is to show that the peculiar behavior of the rate of interest during transition periods is largely responsible for the crises and depressions in which price movements end" (Fisher 1913, 56). Money illusion lay behind this peculiar behavior:

Rising prices, therefore, in order that the relations between creditor and debtor shall be the same during the rise as before and after, require higher money interest than stationary prices require.

Not only will lenders require, but borrowers can afford to pay higher interest in terms of money; and to some extent competition will gradually force them to do so. Yet we are so accustomed in our business dealings to consider money as the one thing stable, -- to think of a "dollar as a dollar" regardless of the passage of time, that we reluctantly yield to this process of readjustment, thus rendering it very slow and imperfect. When prices rise at the rate of 3 per cent a year, and the normal rate of interest - i.e. the rate which would exist were prices stationary -- is 5 per cent, the actual rate, though it ought (in order to make up for the rising prices) to be 8.15 per cent, will not ordinarily reach that figure; but it may reach, say, 6 per cent, and later, 7 per cent. This inadequacy and tardiness of adjustment are fostered, moreover, by law and custom, which arbitrarily tend to keep down the rate of interest. (Fisher 1913, 57-58)

Fisher emphasized that when prices are rising, "The rate of interest rises, but not sufficiently", and that when prices are falling, "The rate of interest falls, but not sufficiently" (1913, 60, 68). He attributed this insufficient adjustment of nominal interest rates to confusion of real and nominal magnitudes:

If there were a better appreciation of the meaning of changes in the price level and an endeavor to balance these changes by adjustment in the rate of interest, the oscillations might be very greatly mitigated. It is the lagging behind of the rate of interest which allows the oscillations to reach so great proportions. On this point Marshall well says: 'The cause of alternating periods of inflation and depression of commercial activity ... is intimately connected with those variations in the real rate of interest which are caused by changes in the purchasing power of money.' (Fisher 1913, 71-72; Marshall 1907, 594. Fisher 1896, 79, gave a fuller quotation of the same passage from the 1895 edition of Marshall's *Principles*.)

That is, if changes in the price level were correctly perceived and anticipated, they would not affect the real interest rate or economic activity.

Fisher did not assume that borrowers had more accurate expectations of inflation than lenders, only that borrowers would perceive an increase in their money receipts, inducing them to borrow more for increased investment or production, before they realized that the purchasing power of money had changed. Similarly, what lenders would perceive at first would be an increased demand for loans, before they understand the change in the price level.

Fisher's theory in Chapter IV did not justify his belief that the effects of short-run non neutrality of money would wash out in the long run. Since he rejected the notion of a true cycle, an inflationary period of high investment due to an increase in the money supply would be followed by perceptions of the price level adjusting and the price level reaching its new equilibrium, but not necessarily by an offsetting period of unusually low investment. The capital stock might thus be permanently altered by the inflationary transition period.

In Chapter IV, Fisher discussed how liquidation and failures result from debts contracted in money terms before an unexpected fall in the price level, and turn an adjustment into a crisis (1913, 67-68). This passage anticipated the emphasis on the role of nominal debt in Fisher's debt-deflation theory of great depressions (Fisher 1932, 1933b), which stressed that an unanticipated decline in prices would transfer real wealth from debtors to creditors, a redistribution which would reduce spending.

David Laidler (1991, 93-95) offers a brief but cogent discussion of Fisher's analysis in Chapter IV of *The Purchasing Power of Money* of movements of real and nominal interest rates during transition periods. Since the topic of Laidler's book is the quantity theory of money from 1870 to 1914, he unfortunately does not examine any of Fisher's post-1914 writings, apart from a bare mention (1991, 116 n5) of the existence of Fisher (1923). As a result, he fails to note that the monetary theory of fluctuations that Fisher presented in Chapter IV provided the basis for his later exploration of the effect of distributed lags of price changes on output and employment and for his work on money illusion, index numbers and the compensated dollar. In place of recognition that Chapter IV provided the basis of Fisher's monetary theory of fluctuations in output and employment, Laidler (1991, 95) notes only that "Fisher did recognise that quantities of goods produced might expand a little during the boom, and contract during the downswing."

Fisher's most emphatic expression of his concern with public misunderstanding of price level changes was *The Money Illusion* (1928), a book written to be accessible to the general public but first delivered as a series of lectures at the Geneva School of International Studies in 1927. "Almost everyone," wrote Fisher (1928, 4-5), "is subject to the 'Money Illusion' in respect to his own country's currency. This seems to him to be stationary while the money of other countries seems to change." He cited examples from the Central European hyperinflations of illusory profits from valuing inventories and depreciation at historical cost rather than replacement cost. His former student at Yale, James Harvey Rogers, found the striking case of an Austrian bank which controlled several paper mills and, to avoid charges of profiteering, adopted a mechanical system of pricing by a fixed mark-up over the cost of wood pulp. When one of the mills burned down and its stock of wood pulp had to be sold before being made into paper, that mill turned out to be

much more profitable than any of the others (Fisher 1928, 64-65). Fisher talked with twenty four Germans he chanced to meet while travelling in Germany during the inflation, and found that only one had any notion that the mark had changed. The others explained the high and rising prices "by the 'supply and demand' of other goods; by the blockade; by the destruction wrought by the War; by the American hoard of gold; by all manner of other things, -- exactly as in America when, a few years ago, we ourselves talked about the 'high cost of living,' we seldom heard anybody say that a change in the dollar had anything to do with it" (Fisher 1928, 6).

Fisher stressed the illusory nature of nominal interest and nominal wage gains during inflation. The average weekly wage of a German metal worker in December 1923 was 850 billion times the 1913 wage, but the cost of living was 1,250 billion times as high, a 30% loss of purchasing power. An American worker who deposited \$100 in a saving bank in 1896 would, at 4.5% compound interest, have \$300 in 1920, but would only be able to buy as much as \$80 would have done in 1896 (Fisher 1928, 96-97, 67-68). He was equally critical of the consequences of deflation, citing Henri Fuss of the International Labour Office as reporting that depression of trade and increased unemployment followed deflation in all of the twenty two countries that experienced deflation between 1919 and 1925, "with three unimportant exceptions" (Fisher 1928, 92). Italy attempted to raise the US dollar value of the lira from 4 cents to the prewar parity of 19.3 cents, but was forced by trade depression and unemployment to give up the attempt and peg the lira at 5.26 cents: "Had he [Mussolini] persisted almost all Italian business would have been plunged in bankruptcy and ruin" (Fisher 1928, 147-50).

Fisher attributed the effect of price changes on economic activity to changes in real interest rates resulting from incomplete perception of price level changes when they occurred and from mistaken price expectations held at the time that loan and other nominal contracts were signed. John Rutledge (1977) denied that Fisher interpreted the lag between inflation and the full adjustment of money interest rates in terms of price expectations. Rutledge held that Fisher did not assume money illusion, and did not mention Fisher's book, *The Money Illusion*. Rutledge showed that Fisher believed that real interest rates depend on past inflation rates during transition periods. However, this is consistent with attributing the changes in real interest rates (that is, the lagged adjustment of money interest rates to inflation) to slow adjustment of inflation expectations and perceptions.

Fisher pursued the relationship between changing price levels and the volume of trade in studies which he reported through the meetings and journals of the American Statistical Association and the International Labour Office. His 1923 paper, "The Business Cycle Largely a 'Dance of Dollar'", expanded on remarks Fisher made at the annual dinner of the American Statistical Association in New York City in December 1922. He was sharply critical of previous statistical work on fluctuations: "Hitherto the effort to explain and forecast the 'Business Cycle' has been chiefly empirical. I suspect that we shall, in the future, make greater progress by employing more analysis. ... The various business services which have sprung up during the last decade all seem to recognize that the price level is of vital importance, but its real role has been missed because the *price level* itself has been

looked to instead of its rate of change.... Some of these services, when the war wrought its havoc with prices, simply omitted the price curve altogether through the period of greatest disturbance although it was precisely under such circumstances that its role in disturbing business was most important and, as we shall see, most evident" (Fisher 1923,1024).

Fisher's argument for relating the rate of change of the price level to the volume of trade was that, together with the money rate of interest, it was one of the components of the real rate of interest, to whose variations Fisher attributed fluctuations in investment and income. Fisher used the business barometer of the American Telephone and Telegraph Company, adjusted for secular trend and seasonality, for T, the volume of trade, and the United States Bureau of Labor Statistics index for P, the price level. He plotted monthly series for P and its rate of change, P', from 1914 to 1922, concluding from the plot that P' oscillated around zero, providing "an oscillating barometer without the need of any of the usual corrections for secular and seasonal variations." He then plotted T against an eight-period weighted moving average of P', and calculated the correlation between the two series: "The 79 per cent correlation tells us that business dances attendance on the dollar." Fisher used linear lag weights with the greatest weight on the most recent price change: "the weights being 1, 2, 3, 4, 5, 6, 7, 8, for each eight consecutive ordinates of the 'derivative' P'" (Fisher 1923,1026-27). Fisher felt that the fact that the changes in prices preceded the values of T with which they were closely correlated showed that the direction of causality ran from price level changes to the volume of trade.

Fisher returned to the same topic at the next annual meeting of the American Statistical Association in Washington in December 1923, in a session whose proceedings were published by the Pollak Foundation for Economic Research as *The Problem of Business Forecasting*. The Pollak Foundation was directed by William T. Foster, and published primarily the underconsumptionist writings of Foster and Waddill Catchings. In his 1924 contribution to the Pollak Foundation volume, Fisher (1924, 50-52) reported a correlation of .86 between the volume of business and a moving average of price changes. He gave further results at the dinner of the American Statistical Association in New York in November 1924. Fisher (1925) found a correlation of .941 between the Index of Trade compiled by Warren Persons of Harvard, and a distributed lag of the rate of change of the Bureau of Labor Statistics monthly index of wholesale prices. "So far as I know, this is the first attempt to distribute a statistical lag" remarked Fisher(1925, 183), counting his 1923 and 1924 papers as part of the same research project.

The data showed some striking extreme values, with wholesale prices rising at an annual rate of 72.6 per cent in April 1917, and falling at a rate of 97.8 per cent a year in November 1920. Fisher used the April 1917 inflation to illustrate the distributed influence of price level changes, with his Chart 2 showing 3 per cent of the influence on T being felt in May 1917, 6 per cent in June, 7 per cent in each of July and August, a bit less than 7 per cent in September, decreasing to 4 per cent in February 1918, and a total of not quite 7 per cent for the four months September to December 1918. Fisher thus derived the lag weights in his 1925 paper from

examination of the impact of a major price shock, while in his 1923 paper he had arbitrarily imposed linearly declining weights.

Fisher followed these three papers correlating the volume of business with a distributed lag of price level changes with a paper in the *International Labour Review* reporting a correlation of .90 between unemployment and a distributed lag of price changes in the United States over the period September 1915 to December 1924 (Fisher 1926). Fisher (1933a) discussed "The Relation of Employment to the Price Level" again at a joint session of the Econometric Society and the American Association for the Advancement of Science in December 1932, graphing the movements of employment and a distributed lag of price changes, but not reporting any correlation coefficients. Fisher (1936a) again reported to the American Statistical Association on the close link between United States factory employment and a distributed lag of past changes in the wholesale price index. In *The Theory of Interest* (1930, 416-42), Fisher reported strong correlations between money interest rates and distributed lags of past price level changes.

Fisher (1926, 497) observed that

The fact that deflation causes unemployment has been well recognised for many years in isolated instances, such as the great deflation of 1921 in America or the corresponding post-war deflation in Great Britain, Czechoslovakia, or Norway. It has likewise been recognised that inflation carries with it a great stimulation to trade and an increase in employment (or decrease in unemployment). And yet, strange as it may seem, when applied to the so-called "business cycle", these relationships have been almost wholly overlooked. When, for instance, Mr. Hoover had his committee of experts study unemployment and make a report to him three years ago, almost every other factor that might influence employment was given careful consideration, but references to inflation and deflation were almost wholly absent.

In this passage, Fisher, without naming Wesley Mitchell, contrasted his monetary theory of economic fluctuations with Mitchell's real theory of cycles in economic activity. *Business Cycles and Unemployment*, the report to a committee of the President's Conference on Unemployment (in which Commerce Secretary Herbert Hoover was the leading figure), was written under the supervision of Mitchell, the research director of the National Bureau of Economic Research (see Mitchell 1923). The National Bureau approach attributed fluctuations to underlying periodic oscillations, and attempted to uncover these cycles by statistical investigation of leads and lags in time series, with little role for *a priori* theory. Fisher's stress in the opening of his 1923 paper to the need for more use of economic theory in business cycle analysis was a criticism, just as his reference to the "so-called business cycle" was a rejection of cyclical theories of fluctuations. Wesley Mitchell's view that economic fluctuations were cyclical and had real rather than monetary causes was widely shared. His Columbia colleague, Henry Ludwell Moore (1923), attributed economic cycles to meteorological cycles. Joseph Schumpeter (1935, 1939) interpreted fluctuations as a forty month Kitchin cycle superimposed on a nine or ten year Juglar cycle and a fifty five or sixty year Kondratieff cycle.

Modern business cycle theories, whether real or monetary, reject the explanation of economic fluctuations as superimposed cycles of constant periodicity and amplitude, siding on this issue with Fisher against Jevons, Kondratieff, Mitchell, Moore and Schumpeter. The term cycle is now used in the name of the field only for historical reasons.

Ralph Hawtrey of the British Treasury was the only prominent contemporary of Fisher to hold a theory of fluctuations as strictly monetary as that of Fisher. Fisher's influence can be discerned in *Good and Bad Trade*, Hawtrey's first presentation of his theory. Hawtrey discussed Fisher's distinction between real and nominal interest rates (1913, 44-46) and his compensated dollar proposal for stabilization (1913, 256-59), but did not mention the name of any other economist. Hawtrey recalled, in a 1961 foreword to a reprint (1913, vii), distinguishing real and nominal interest rates in 1909: "Here, I thought was a discovery, but I was disillusioned when I learnt from an economist friend [perhaps Hawtrey's fellow Apostle, Keynes?] that the principle was one already recognised, and had been expounded in Irving Fisher's work, *The Rate of Interest*." In his 1927 paper on "The Monetary Theory of the Trade Cycle and its Statistical Test", Hawtrey considered the problem of how to test his monetary theory of the trade cycle against A. C. Pigou's theory that waves of optimism and pessimism cause fluctuations in investment (Pigou 1927), but did not mention that Fisher or anyone else had ever attempted to carry out any statistical testing of the monetary theory of fluctuations.

In a series of six empirical papers, Fisher offered striking evidence of a strong correlation between output or employment and a distributed lag of past inflation. As Thomas Humphrey (1982, 1985) has noted, earlier writers such as David Hume and Henry Thornton had posited a stimulative effect of rising prices on output and employment, but Fisher's calculation of the Pearsonian correlation coefficients provided the first statistical analysis of the relationship. The first regression estimating what would now be called the equation of the Phillips curve was made by Jan Tinbergen in 1936. Fisher assumed causality from inflation to output and unemployment, since the price changes happened first, while A. W. Phillips (1958) considered the tightness of the labor market, as measured by unemployment, as a cause of changes in money wage rates. As James Tobin (1987, 375) noted, Fisher was one derivative short of the Friedman and Phelps accelerationist or expectations augmented Phillips curve. Fisher stressed the distinction between actual and expected inflation, and shifted attention from the price level to its rate of change, but did not take the next step of moving on to changes in the rate of inflation.

Fisher's empirical papers supported the monetary theory of economic fluctuations presented in Chapter IV of *The Purchasing Power of Money*, finding startlingly high correlations of .90 between unemployment and inflation and of .941 between the volume of trade and inflation. These results agreed with Fisher's theoretical argument that correlation would be found between output and the rate of change of prices, rather than the level of prices. Fisher made little attempt in his empirical papers to show that the inflation, which affected output, depended in turn on changes in the money supply, which he took as already established in *The Purchasing Power of Money*. The economics profession took little note of this

research project, which Fisher reported to the American Statistical Association rather than to the very different audience of the American Economic Association. Even the republication in 1973 of the fourth of the six empirical papers as "I Discovered the Phillips Curve" failed to attract attention to the other articles.

Fisher's enthusiasm for his theory of the business cycle as a dance of the dollar appears to have led him to seek higher correlations in ways that would now be regarded as questionable, such as replacing the index of business activity used in his 1923 paper with an index from another source, which yielded a higher correlation for his 1925 article. Fisher (1926) graphed data from 1903 to 1925, but reported a correlation coefficient only for 1915-1924. He had previously improved a correlation coefficient by truncating the sample period in an earlier controversy over the quantity theory of money. After Warren Persons found a correlation of only .23 between the actual price level and the price level predicted by a constant-velocity version of the equation of exchange for the period 1879 to 1901, Fisher (1913, 294) obtained a correlation of .97 by using the sample period 1896 to 1908, dropping the years of falling prices before 1896 (see Humphrey 1972). Fisher (1913) correlated the actual and predicted price levels as though the long run relationship Fisher postulated between money and prices held in the short run, without the adjustment period discussed in Chapter IV and his later papers, in which monetary changes would affect real output.

Fisher's monetary theory of economic fluctuations motivated his work on index numbers and distributed lags. A reliable price index was needed for testing the monetary theory of the cycle, for educating the public about changes in the purchasing power of money, and as the basis for a monetary policy that would stabilize the price level, rather than just stabilizing the price of gold. Fisher's major work on the subject, *The Making of Index Numbers* (1922), was Publication No. 1 of the Pollak Foundation for Economic Research, directed by William T. Foster and largely financed by Waddill Catchings. As a highly specialized work of more than five hundred pages, it did not appeal to commercial publishers. Fisher established the Index Number Institute in New Haven, and reported on its weekly index of wholesale prices in the *Journal of the American Statistical Association* each year from 1923 to 1930 (except 1929), a period when he was reporting to the same audience on the monetary theory of the business cycle. These articles succeeded his annual articles on the equation of exchange, which appeared in the *American Economic Review* each June from 1911 to 1919. Fisher was not only a pioneer in applying statistical techniques such as correlation and distributed lags, but also did much to construct the price indices to which they were applied.

Fisher wished to eliminate the real consequences of changes in the purchasing power of money by educating the public about the differences between real and nominal variables, eliminating the money illusion. Agents would then negotiate contracts avoiding nominal rigidities, such as the "stabilized bond" issued by Rand Kardex (later part of Remington Rand), of which Fisher was a director (Fisher 1928, 122-23). He also proposed stabilizing the purchasing power of money by varying the gold content of the dollar so as to peg the price of a basket of commodities, rather than just the price of gold, a plan similar to Jevons' tabular standard and Marshall's

"unit" (Fisher 1913,332-48, 494-502 and many other books and articles). This compensated dollar plan was based directly on Fisher's monetary theory of economic fluctuations. Since Fisher attributed fluctuations in economic activity to changes in the purchasing power of money, he urged that monetary policy be used to stabilize the economy by stabilizing the purchasing power of money.

Fisher's analysis of the non neutrality of money in the short run was thus not just a passing recognition of transition periods in which the quantity theory of money does not hold exactly, but was rather a continuing theme in Fisher's writings which tied together many of his contributions. Fisher's work on index numbers and distributed lags, and his crusade for monetary reform, stemmed from his monetary theory of business fluctuations. Starting from his earlier distinction between real and nominal interest rates, he analyzed how output and real interest rates change during transition periods when the money rate of interest initially fails to adjust sufficiently to changes in the price level. Redirecting the attention of business cycle researchers from the price level to its rate of change, Fisher conducted path-breaking statistical analysis to support his theory that economic fluctuations followed, not a cycle, but the dance of the dollar. The technical sophistication of correlation analysis with distributed lags led Fisher to present this work primarily to audiences of statisticians and in statistical journals, and its importance was not appreciated by the economics profession of the day.

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