Monissen, Hans G.

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Hans E. Loef und Hans G. Monissen

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Universität Würzburg
Lehrstuhl für Volkswirtschaftslehre,
insbesondere allgemeine Wirtschaftspolitik
Sanderring 2, D-97070 Würzburg
hans_g.monissen@mail.uni-wuerzburg.de
Tel.: +49/931/31-2951

5. Monetary Policy and Monetary Reform: Irving Fisher's Contributions to Monetary Macroeconomics

Hans-E. Loef and Hans G. Monissen*

1 INTRODUCTION

Irving Fisher, in a letter to his son Irving Norton Fisher, wrote that he had four chief causes at heart, 'the abolition of war, disease, degeneracy, and instability of money' (quoted in Barber, n.d., p. 1). Among those four causes, only one is of a direct economic source: monetary instability. He did not mention unemployment, real growth or income distribution. 'In fact, an unstable monetary unit breeds radicalism, whether the movements be up or down, deflation or inflation, if it goes far enough. The French had an aphorism "after the printing press, the guillotine" ' (Fisher, [1935a] 1936, p. 218). And in his *Principles* Irving Fisher reminds us that the problem of making the purchasing power of money stable is one of the most serious problems in applied economics (Fisher, [1912] 1918, pp. 256-257). Since money is not neutral during transition periods, changes in the price level tend to change the volume of trade. The idea of monetary induced fluctuations in economic activity is not unique to or even outlined by Irving Fisher in the first place. Ricardo, Marshall and Fisher as representatives of the mainstream classical and neoclassical view 'were seriously concerned that monetary expansion, associated with inappropriate low interest rates, would unduly stimulate the economy, while monetary contraction might precipitate a recession. Price fluctuations were regarded to be accompanied by output fluctuations' (Niehans, 1987, p. 420; cf. also Loef and Monissen, 1998). It follows immediately that in order to eliminate or at least to greatly mitigate the business cycle it is necessary to stabilize the price level (see Patinkin, 1990, p. 12; Patinkin, 1993, p. 4; and Barber, n.d., p. 6). 'Monetary policy, properly conducted, could thus eliminate the phenomenon of the business cycle' (Barber, n.d., p. 6; see also Dimand, 1993a, p. 170; and R.L. Allen, 1993, p. 14). This sounds totally monetaristic – and it is. Patinkin answers his former puzzlement or question why the Chicago School 'did not do justice to Irving Fisher – despite the fact that long before the Chicago School, Fisher had advocated the policy of stabilizing the price level as a means of mitigating – if not avoiding – cyclical fluctuation' (Patinkin, 1973, p. 456) 20 years later by his interpretation that Irving Fisher has become a follower and the Chicago school a leader on questions of monetary policy (Patinkin, 1993, p. 27). Stabilization of the price level was also proposed by many other quantity theorists as well as Keynes in his quantity theory period (Patinkin, 1993, p. 4, fn 4, and the literature mentioned there; Patinkin, 1972; and Laidler, 1991a; see also Tavlas, 1997).

Fisher's theoretical analyses of monetary fluctuations and the subsequent search and crusade for economic policy recommendations are generally summarized by R.L. Allen (1993, p. 14):

> Fisher saw fluctuations in the price level, inflation and deflation, and their consequences, as the prime economic evils of his time. He wanted to keep prices stable, wishing to avoid both deflation and inflation, and therefore, in his belief, the effects of the business cycle. He promoted among fellow professionals, as well as the public, monetary policy and institutional arrangements that he believed would stabilize prices, and therefore the value of the dollar, by controlling the money supply. The economic theory on which he spent more time than any other was the promotion of economic stabilization through monetary policy. To him economic stabilization meant price stabilization because he believed that movements in production correlated with price movements. He argued that money was the key to price movements. He proposed to alter the organization of the banking system so one part of each existing bank would become an independent institution. It would serve only to warehouse money, keeping all deposits fully available to depositors. Another part, an institution independent of deposit banking, would only

borrow from savers in order to lend to investors. The national monetary authority would regulate the supply of money by issuing assets in which this second part of the bank could lend money.

This is the essence of Irving Fisher's monetary reform proposals, especially as outlined in his *100% Money*. In order to reach his goal of stabilizing the purchasing power of money he wrote numerous articles and books, made speeches and wrote letters to representatives and even presidents of the USA. He used different analytical methods and theoretical levels to convince his professional colleagues, congressmen and the general public. For example, in the preface to the first edition of his *100% Money* Fisher encourages laymen to read his whole proposal as summarized in the first 30 pages (Part I) and to skip the more detailed discussions of the other parts because these are 'designed to meet the possible objections of bankers and of technical students of banking' (Fisher, [1935a] 1936, p. xvi).

Fisher's interest in and concern about the problem of stabilizing the purchasing power of money dates back to 1892, as soon as his economic studies began, with his first solution in 1911 in *The Purchasing Power of Money* (Appendix to Fisher, 1935b; see also R.L. Allen, 1993, p. 261). Besides his famous Ph.D. thesis, *Mathematical Investigations in the Theory of Value and Prices* (1892), one other paper with economic content was published in 1892 which might be considered as Irving Fisher's academic starting career as a monetary theorist.[1] From that time on he wrote and spoke in defense of stabilization of the purchasing power of money. Irving Fisher reports that since that time (until 1935), 'My secretary counts up: 99 addresses, besides 37 letters to the press, and 161 special articles, as well as 9 testimonies at hearings held by government bodies and 12 privately printed circulars, together with 13 books bearing on the subject' (I. Fisher, 1935b, autobiographical appendix).[2]

The first proposals to stabilize the purchasing power of money are based on Fisher's business cycle theories prior to the Great Depression. Since then, however, Fisher changed his views about the severity and origins of booms and depressions. Now over-indebtedness and deflation are of major concern and require appropriate monetary policy actions which lead temporarily to reflation and later on to normal periods of stable prices. One remedy was his proposed 'stamp-scrip-money'. The sub-title of his *100% Money* book stated clearly a second proposal which can prevent depressions: '100% Money. Designed to keep checking banks 100% liquid; to prevent inflation and deflation; largely to cure or prevent depressions; and to wipe out much of the National Debt'.

The present chapter is subdivided into two main parts. Part 1 discusses and describes Irving Fisher as a scientist and crusader in monetary policy and reform. It distinguishes four phases of his monetary proposals, starting with *The Purchasing Power of Money* and the compensated-dollar-plan in 2.1. The emphasis given to open market operations in conducting central bank policies is taken up in section 2.2, while the shift to a new interpretation of severe depressions and possible monetary rescues is discussed in 2.3. Irving Fisher's last period of monetary reform proposals is connected with his 100% money idea (section 2.4). The last sub-section (2.5) of the first part of this chapter is devoted to the question why with respect to practical political imple-mentations these proposals were not successful.

Part 2 tries to formulate a simple monetary macro-model of fluctuations and equilibrium conditions which are fundamentally Fisherian and can be traced back to his various writings in monetary theory and policy. Sub-section 3.1 outlines a quantity theoretic model with adaptive expectations which exhibits money neutrality in the long-run but non-neutrality in transition periods. The following paragraph (3.2) develops optimal monetary policy rules given the economic paradigm of the previous sub-section. It follows in particular that stabilizing the price level automatically stabilizes the economy, i.e. real output fluctuations. The chapter ends with a summary of the findings and concluding remarks.

2 IRVING FISHER: MONETARY POLICY AND MONETARY REFORM

Fisher embodied two roles: one as a scientist and one as a crusader. 'These two roles of Irving Fisher's life cooperated and conflicted with each other to produce a long, varied, and complex life, full of contributions, contradictions' (R.L. Allen, 1993, p. 4). He did not hesitate to spend his own money to

finance his crusading campaigns. According to one of his biographers he spent more than $100,000 of his own money promoting the cause of economic stability during his lifetime (R.L. Allen, 1993, p. 15).

Even though R.L. Allen (1993, pp. 2-3) states that Fisher, in the economic field, espoused two principles encompassing three fundamental changes, which were monetary and tax reform by using his commodity-dollar standard, the 100 percent monetary reserve and the idea of taxing consumption, with respect to monetary reform, it is worthwhile distinguishing at least four phases in Irving Fisher's career as a reformer and a crusader.[3]

2.1 Monetary Scientist and Reformer

Phase 1 starts around 1911 and ends around the middle of the 1920s, even though central and fundamental ideas and issues continue to play a role in later episodes as well. The theoretical underpinning is, of course, Irving Fisher's *The Purchasing Power of Money* (first ed., 1911). However, in this important work monetary reforms are hardly mentioned, even though the theoretical argumentations point to the possible stabilizing role of monetary policy in the presence of fluctuating prices and output due to monetary (velocity) disturbances and other sources. Instead of designing specific monetary policy measures or institutional changes he relies on increasing knowledge and information on the part of the public to understand the underlying forces behind the quantity theoretic context.

Irving Fisher ([1911] 1985, p. 347) writes:

> we reviewed the principles determining the purchasing power of money and the practical problems involved. We then considered the possible methods of avoiding the evils of variability in purchasing power. Among these, one of the most feasible and important was found to be an increase of knowledge, – both specific knowledge of conditions and general knowledge of principles.

And, more important, he continues (Fisher, [1911] 1985, p. 348):

> It was suggested that the first step in this needed reform would be to persuade the public, and especially the business public, to study the problem of monetary stability and to realize that, at present, contracts in money are as truly speculative as the selling of futures, – are, in fact, merely a subdivision of future-selling.
>
> The necessary education once under way, it will then be time to consider schemes for regulating the purchasing power of money in the light of public and economic conditions of the time. All this, however, is in the future. For the present there seems nothing to do but to state the problems and the principles of its solution in the hope that what is now an academic question may, in due course, become a burning issue.

It was only in the second edition of *The Purchasing Power of Money* (1913) that Fisher added an appendix on *Standardizing the Dollar*, describing his plan for stabilizing the price level by means of a composite standard or his famous compensated-dollar-plan.

Fisher in his first years as a scientist had a rather negative attitude towards monetary policy advising;[4] however, this attitude changed a little later (after he recovered from his tuberculosis) and he became the impatient reformer and crusader, for which he is known from then on.

The monetary policy reform he advocated then was his famous compensated-dollar-plan as outlined in Fisher (1913) and Fisher (1920) with numerous smaller contributions, articles, discussions and comments on the same subject (see the relevant literature in Patinkin, 1993; and I.N. Fisher, 1961).

The idea is rather simple. If the relation (see Patinkin, 1993, p. 5)

> dollar price of basket of goods and services = gold price of basket *times* dollar price of gold holds true, then the general price level (the dollar price of basket of goods and services) can be kept stable by appropriately changing the dollar price of gold (that is the gold content of the dollar) by the monetary authority whenever the gold price of the basket changes.

Since this plan operates in the given context of the then prevailing gold-standard it was important for this plan not only to be accepted nationally but also by all the major economic powers of that time, i.e. by all other countries as well (Patinkin, 1995, p. 122).

The compensated-dollar-plan was essentially a commodity-dollar-plan, that is, the purchasing power of money was determined by the value of its gold content. Contrary to this view, in *The Purchasing Power of Money* it is the quantity of money which determines the general price level. But Fisher did not assign a

primary role to the quantity of money in his policy proposal.[5] Patinkin (1993, p. 9) replies to this and related puzzles by saying:

> that the person who is our present concern is not Irving Fisher the author of the scientific work on The Purchasing Power of Money, but Irving Fisher the deviser of a plan to be 'sold' to the economics profession as well as to the business community and government – and to be 'packaged' accordingly. The quantity theory of money was out of favor in some circles, so the plan should not be explicitly associated with it. The commodity theory of money had influential supporters, so the plan should be presented in language that had the sounds of that theory. The gold standard was sacred, so it should be emphasized that the plan did not involve its abandonment.

2.2 Modern Central Banking

In the middle of the 1920s Irving Fisher changed his mind, when he discovered that the volume of credit is more important than the volume of gold in determining the purchasing power of money. While his compensated-dollar-plan was invented at a time when the Federal Reserve System was just about to shape its status as a central bank, his new ideas concentrated on the ability and importance of the Federal Reserve's conduct of open-market operations. This was, at that time, a new monetary technique. By purchasing and selling government securities the central bank was now able to alter the lending capacity of commercial banks.

Barber (n.d., pp. 5-6) reports about Irving Fisher's activity in the light of his appreciation of the importance of open-market-operations:

> In the version of a price stabilization bill that Fisher supported in 1926, the Federal Reserve's capacity to alter the lending capacity of commercial banks through its open-market operation was identified as the primary instrument of monetary control. When endorsing this view, he noted that 'today it is the volume of credit that determines the purchasing power of the dollar – the price level – more than the volume of gold'. Even so he argued, 'You have got to have your gold control as well as your credit control, if you are going to prevent the terrible evils of inflation and deflation in the future' (Fisher, 1926). He held that the Federal Reserve's stabilizing role might be compromised unless discretionary authority to alter the gold content of the dollar were available.

2.3 Disaster and Rescue

For Irving Fisher the business cycle, that is, fluctuations in economic activity, is a monetary phenomenon. This is true for the general description of fluctuations prior to the Great Depression, as outlined in *The Purchasing Power of Money*, as well as his interpretations of the events after 1929. However, in *Booms and Depressions* the causes of severe depressions are emphasized as being over-indebtedness and deflation as a result of the break-down of the price level by contraction in deposits and reduction in velocities (Fisher, 1932, and 1933a; see also Dimand, 1994). Besides his different analytical and theoretical explanations of economic fluctuations he was sure by now that those depressions could be prevented and cured by appropriate monetary policy measures conducted by the Federal Reserve Bank System.

His practical monetary advice was reflation. Now reflation replaced his long-run theme of stabilization. However, reflation is not inconsistent with a stable purchasing power of money. Reflation does not mean inflation. 'The objective was simply to restore an earlier price level – say that of 1926. Once that had been accomplished, price stabilization would again be the order of the day' (Barber, n.d., p. 9).

The technical monetary procedures to stop deflation and to reflate were mostly known already. It could be done by means of his compensated-dollar-plan using commodity money or by his later approval of open market procedures. Stamped money, an idea of stamp scrip going back to Silvio Gesell, would, he thought, be able to increase velocity again (Fisher, 1933b). Dollar bills would depreciate in value by a particular amount each period (i.e., a week) unless a stamp in the same amount were affixed to them. This would increase velocity and discourage hoarding. The tax proceeds could in addition be used to support the creation of new jobs for the unemployed.

Irving Fisher did not like public works and special fiscal policies to create new employment opportunities. His only recommendation in this respect was the provision of interest-free loans to those employers who agreed to enlarge their payrolls (Barber, n.d., p. 13).[6] Again all these sound very monetaristic. W. Allen (1993, p. 704) summarizes the analyses and policy recommen-dations as follows:

> In those early days of the Depression, Fisher persistently provided a basic orientation of monetarism in analysis and in policy prescription. 'The chief direct cause of the depression' (letter from Fisher to F.D. Roosevelt in 1936) was the one-third reduction of the money stock between 1929 and 1933, and 'the only sure and rapid recovery is through monetary means' (letter from Fisher to the Secretary of the President, 1934). He provided a stream of detailed proposals: devalue the dollar, most immediately in connection with raising prices generally; pursue aggressive open market operations in order to increase the money stock; provide governmental guarantee of bank deposits; use dated stamp scrip in order to maintain or increase monetary velocity; and, rather outside the realm of monetary policy, subsidize firms that increase their hiring of labor for minimum periods.

2.4 Monetary Policy, Banking Regulation and Currency Commission

Even though Fisher did not give up his compensated-dollar-plan entirely (Patinkin, 1993, p. 23) he advocated a system of monetary control from the middle of 1934 until his death which in essence was intended to stabilize the purchasing power of money by open market operations, velocity control and tightening deposit money and its velocity by a 100% reserve requirement.[7] Again the idea behind the monetary and banking reform is as simple as the proposal itself: divorce the process of issuing money from the general bank business by requiring private banks to back deposits of their customers by 100% central bank money. In Fisher's words ([1935a] 1936, pp. xvii and xviii):

> The essence of the 100% plan is to make money independent of loans; that is, to divorce the process of creating and destroying money from the business of banking. A purely incidental result would be to make banking safer and more profitable; but by far the most important result would be the prevention of great booms and depressions by ending the chronic inflation and deflation which have ever been the great economic curse of mankind and which have sprung largely from banking. And further: I have come to believe that that plan, properly worked out and applied, is incomparably the best proposal ever offered for speedily and permanently solving the problem of depressions; for it would remove the chief cause of both booms and depressions, namely, the instability of demand deposits, tied, as they now are, to bank loans.

In order to ensure the transition from the present less-then-100% reserve system to the new one a Currency Commission should be created (for example an Open-Market committee of the Federal Reserve Board) which would also be responsible for conducting the future issue of the money of the nation 'in accordance with a legal criterion of stabilization ... accomplished by open market operations, that is, buying and selling United States bonds and any other items made eligible, as well as gold and foreign exchange – also by changing the price of gold, silver and foreign exchange' (Fisher, [1935a] 1936, p. 21).

With respect to the Currency Commission the proposal sounds very modern. Open market policy with government securities should be the primary instrument, but exchange rate policy is considered as well. However, the Currency Commission is supposed to be tied to a kind of a monetary rule which ensures purchasing power stabilization.[8] The management of the monetary authority (Currency Commission) would 'increase or decrease the supply of money in order to meet whatever type of stabilization requirement should be prescribed in the law' (Fisher, [1935a] 1936, pp. 25-26). And 'to be most efficient, the Currency Commission should have no other function than the regulation of the value of the dollar' (Fisher, [1935a] 1936, p. 27). He did foresee the necessity of some discretion in the daily monetary policy operations, however, in a very narrow sense: 'In order to provide needed elasticity some continuous management of the money supply would be necessary, though this management need not require any more discretion than the discretion of a chauffeur who is ordered to drive a definite, prescribed course' (Fisher, [1935a] 1936, p. 24). Even more novel with its relation to modern practices in some countries (e.g. New Zealand) is the proposed technique 'for keeping the members of the National Monetary Authority on

course. If the price level deviated from the target norm by as much as ten percent for three consecutive months, its officers would automatically forfeit their jobs' (Barber, n.d., p. 18).

Fisher's 100% money plan was not uniquely created by him. It far antedates the 1930s. W. Allen (1993) starts the historical search with Hume, Ricardo and the Peel Bank Act of 1844. The idea was revived in the 1920s and early 1930s by Fredrick Soddy, a Nobel Laureate in chemistry (W. Allen, 1993, p. 705)[9] and later on by some economists at the University of Chicago, including Director, Douglas, Hart, Knight, Mints, Schultz and Simons.[10]

2.5 Reforms and Success

Even though great parts of Irving Fisher's proposals became well known to the public as well as academics and were incorporated in today's thinking about monetary reforms and strategies, his main goals and tasks were, in general and particularly in political terms, not attained.[11] This is also true for his consumption tax proposal. Especially with respect to the commodity dollar and 100% monetary reserves he failed completely (R.L. Allen, 1993, pp. 5 and 248).[12]

Reasons for these failures might be seen in Fisher himself and in his surroundings. His proposals for monetary policy and reform were largely motivated and accentuated by his nature to be a crusader. Fisher the scientist and analyst was only partly involved. Redundancy and impertinent insistence made the political addresses, congressmen and Presidents, to whom his numerous speeches, pamphlets and letters were directed, deaf.

Patinkin (1990, p. 2) observes:

> Fisher was very much of a pedant: someone who never said anything once what he could say three times. But though this unnecessary repetition may tax the patience of the reader, he would be seriously mistaken to disregard the economic significance of the point in question that Fisher was in each case making.[13]

His personal financial disaster in the Great Depression did not contribute to his reputation of being a good adviser in monetary affairs. However, some contemporary economists might regret that the Fisher-Simons revolution was aborted and this road of monetary reform with its emphasis on stable purchasing power of money and its modern type monetary macroeconomic paradigm was not taken. There was at the time a more challenging, maybe opportunistic, view of the macroeconomic and policy problems which led to the Keynesian Revolution (see Hotson, 1987). And, of course, Keynes found immediately and easily disciples who promoted his rather simple political messages among scholars and politicians. Fisher did not found or leave behind a 'school' of disciples. There was no 'New Haven Circus' to match Keynes's 'Cambridge Circus' as Barber puts it (Barber, n.d., p. 21). But as Niehans (1987, p. 422) remarks correctly, 'Great economists rarely founded schools, and the schools rarely produced great economists'.

3 A SIMPLE FISHERIAN MODEL OF PRICE AND OUTPUT DETERMINATION AND MONETARY POLICY DESIGN

Irving Fisher's monetary policy reform proposals and his political crusades were mostly motivated by his intrinsic belief that stabilizing the purchasing power of money is the primary and most important economic issue. In most parts his proposals were founded on his understanding of how the economy works, especially what determines the fluctuations in economic activity, the so-called business cycle.[14] There was no doubt for him that the origins of the disturbances are monetary. His monetary theory of fluctuations[15] would in modern terms be characterized as monetaristic or perhaps neo-classical. The theoretical basis of monetarism and the theoretical structure of the monetary model of Irving Fisher goes back at least to Hume (Wood, 1995, pp. 101-103, 104; Patinkin, 1995, p. 127; and Laidler, 1991b, p. 291).[16] Irving Fisher and monetarism and their emphasis on sluggish expectation formation, as opposed to

what now is commonly employed and termed rational expectations, share the same origin in the quantity theory.[17] A difference between Fisher and monetarism is to be found in their different interpretations of the equation of exchange. For Fisher it is mainly a reduced form of the determination of nominal income while for Friedman it is a money demand function.

Irving Fisher's reforms and crusades could be subdivided into four phases, as was done in the previous sections. The development of the theoretical foundations underlying these proposals can, however, be partitioned into two.

First, the monetary theory of fluctuations in its normal version was set out in *The Purchasing Power of Money* in 1911 and his *Principles* in 1912 (Fisher, [1911] 1985; and Fisher, [1912] 1918). Numerous articles enlarge and deepen the theoretical description of a fluctuating economy, especially his 'The business cycle largely a "dance of the dollar" ' (1923) and his 'Sta-tistical relation between unemployment and price changes' (1926) which was reprinted in 1973 as 'I discovered the Phillips curve'.

Second, after the experience of the Great Depression, Irving Fisher's theoretical concerns shifted to the description and the possible prevention of severe booms and depressions, which he considered mainly the result of debt and deflation (Fisher, 1932 and 1933a; see also Dimand, 1993a).

This section of the chapter deals mainly with Fisher's normal theory of fluctuations and not with his debt-deflation theory, even though in special circumstances the model presented is able to produce severe deflations, however not caused by the debt-problem, which is not modeled.[18]

There are some attempts in the economic literature to outline Fisher's monetary theory of fluctuations. Among them are Dimand (1994), Humphrey (1990, 1992a) and Monissen (1989). The first two, however, in our opinion use rather non-Fisherian elements like a Walras-Keynes-Phillips model (Dimand, 1994, which, however, is designed to model the debt-deflation situation) as in Tobin (1975) or an excess money-demand equation to model price changes (Humphrey, 1990 and 1992a). The present chapter is based on Monissen (1989); it deviates in some respects, however, from the formu-lations made there.

3.1 A Simple Fisherian Monetary Model

The model consists of four equations which describe prices and output as determined in the output and money markets:

$$m + v = p + y, \tag{5.1}$$

$$y = y^p + \lambda(p - p^e) \text{ for } \lambda > 0, \tag{5.2}$$

$$v = \bar{v} + g(p - p_{-1}); \quad g \geq 0, \tag{5.3}$$

$$p^e = \alpha p_{-1} + (1-\alpha) p^e_{-1}; \quad 0 < \alpha \leq 1. \tag{5.4}$$

All variables are in natural logarithms, $m =$ nominal money supply, $p =$ price level, $y =$ real output, y^p = potential output, v = velocity, p^e = expected price level, α, λ and γ are parameters with the given restrictions. The lower index –1 indicates the previous period $t-1$. The actual period t is not explicitly designated, i.e. $m = m_t$ applies.

Equation (5.1) states the quantity equation in logarithmic form. It can easily, under certain assumptions, be derived from Fisher's famous version of the quantity equation

$$MV + M'V' = PY \tag{5.1a}$$

where the variables have the same economic meaning, except for being levels and not their logarithms. M denotes central bank money used by private agents (currency), M' denotes private bank deposits, and V and V' are the appropriate velocities.

Assuming that both velocities are equal ($V = V'$) equation (5.1a) can be written as

$$(M + M')V = PY$$

where by definition of M and M' the sum of the two can be expressed as central and private bank money in private non-bank agents' portfolio; this, of course, is equal to the money definition M_1 in modern terms .[19]

If the ratio $c = M / M'$ is determined by the non-bank agents, and private banks are required to hold a fraction r of deposits M' in central bank's money as required reserves R than the simple money supply process $M_1 = bB$ emerges, where $b = \frac{1+c}{r+c}$; and $B = M + R$ is defined as the uses side of the monetary base, assuming the sources side to be completely controlled by the monetary authority. Combining these assumptions the relation

$$M_1V = PY \quad \text{or} \quad bBV = PY \qquad (5.1b)$$

holds. Taking natural logarithms on both sides of (5.1b) equation (5.1) results with m being interpreted as the logarithm of either M_1 or bB. Since M or B are, but M_1 or b are not controllable by the monetary authority, formulation (5.1b) must be considered by designing an appropriate monetary policy rule.

Equation (5.1) is a variant of the quantity equation (on the origin and formulations of the quantity equation see, for example, Humphrey, 1984; Niehans, 1990, p. 277; Laidler, 1991b, p. 291; Marget, [1938-1942] 1966; and Morgan, 1995, p. 20), but not the outcome of the quantity theory (see below). As mentioned before, it is not interpreted as a money demand equation as by Friedman (1956), but rather as a reduced form determining nominal output demanded. Therefore the resulting monetary theory of price and output fluctuations is not the same as in modern monetaristic versions as, for example, the one of Laidler (1976), even though the conclusions with respect to the origin of fluctuations and their possible political remedies are equivalent.

Equation (5.2) determines the real output supplied and looks similar to the famous Lucas-supply equation (Lucas, 1973) or the expectations-augmented Phillips-curve with an Okun's law relation involved (see Dimand, 1994, p. 102; Dimand, 1993a, pp. 167-168; Laidler, 1991b, pp. 199-300; Tavlas and Aschheim, 1985, p. 295; and R.L. Allen, 1993, p. 182). However, the formulation is originally by Fisher; even so he did not write out the equation in its mathematical form (see Fisher, [1926] 1973). His descriptions in his 1926 article incorporated all the ingredients which constitute what is now known as the Lucas-supply function: Deviations of real output supplied from its normal or potential level y^p are explained by unexpected prices. (On the natural rate hypothesis and Irving Fisher see Dimand, 1994, p. 102.)

Fisher ([1926], p. 785) writes, 'It has likewise been recognized that inflation carries with it a great stimulation to trade and an increase in employment (or decrease in unemployment)'.

And he continues ([1926], p. 787):

> The principle underlying this relationship is, of course familiar. It is that when the dollar is losing value, or in other words when the price level is rising, a business man finds his receipts rising as fast, on the average, as the general rise of prices, but not his expenses, because his expenses consist, to a large extent, of things which are contractually fixed, such as interest on bonds; or rent, which may be fixed for five, ten, or ninety-nine years; or salaries, which are often fixed for several years; or wages, which are fixed sometimes, either by contract or custom, for at least a number of months. For this and other reasons, the rise in expenses is slower than the rise in receipts when inflation is in progress and the price level is rising or the dollar falling.[20]

In *The Purchasing Power of Money* Fisher describes the relationship between inflation and the business cycle as the result of the dynamics of interest rate adjustments in the following way (Fisher, [1911] 1985, pp. 58-59):

> As prices rise, profits of business men, measured in money, will rise also, even if the costs of business were to rise in the same proportion. ... Of course such a rise of prices would be purely nominal, as it would merely keep pace with the rise in price level. The business man would gain no advantage, for his larger money profits would buy no more than his former smaller money profits bought before. But, as a matter of fact, the business man's profits will rise more than this because the rate of interest he has to pay will not adjust itself immediately. Among his costs is interest, and this cost will not, at first, rise. Thus the profits will rise faster than prices. Consequently, he will find himself making greater profits than usual, and be encouraged to expand his business by increasing his borrowings.

Rutledge (1977, p. 204) summarizes Fisher's emphasis on transition periods and the impact of inflation on real variables:

> Fisher's theory of appreciation and interest, as he advised his readers many times, was based on the crucial distinction between periods of full equilibrium and those of transition, or disequilibrium. Fisher explained that in steady state equilibrium, nominal interest will be bid up by exactly the rate of inflation, and real interest will remain unchanged. But the overwhelming impact of inflation during the transition period is on real variables: real interest, real profit, real investment and real income. In fact Fisher argued that the real effects of inflation on interest were the major determinants of booms in business activity.[21]

The relationship between inflation, nominal and real interest rates, credit and business activity is somewhat similar to Knut Wicksell's treatment of the same subject.[22]

Equation (5.3) states that velocity v is a constant $\bar{v}$, determined by exogenous factors, in addition to endogenous forces which are in operation during transition periods. And transition periods are the important economic situation, not the equilibrium ones. It is surprising that Fisher's biographer R.L. Allen turns Fisher's explicit statement about the relative importance of equilibria and disequilibria (transition periods) upside-down (Fisher, [1911] 1985, pp. xiii, 55, especially 71, 72, 165; Fisher, [1912] 1918, Chapter X; and R.L. Allen, 1993, p. 118; see also Patinkin, 1990, pp. 10-13). But even Keynes in his review of Fisher's *The Purchasing Power of Money* neglected Chapter 4 on transition periods which led Fisher, in the preface to the second edition of his work, to explicitly point to his lengthy treatment of this issue in his *Elementary Principles*. The powerful short-run effects of money during transition periods was already noticed by Hume in 1752 and fully articulated by Thornton in 1802 (on this special point see Niehans, 1987, pp. 416-417).

Patinkin (1993, p. 3) is correct in stating:

> Though most of 'The Purchasing Power of Money' (...) is devoted to the long-run proportionality between the quantity of money and the price level, Fisher attached great importance to Chapter 4 of the book on 'transition periods', in which this proportionality did not obtain. ... It is accordingly in this chapter that Fisher develops his theory of 'crisis', or what we now call 'cycles'.[23]

As Morgan (1995, p. 3) points out, Fisher's Purchasing Power of Money 'contains at least four models of money showing considerable variety of form (including visual, analogue, mathematical and methodological) and range of function'. The models she distinguishes are: the accounting-balance model; the connecting-reservoirs model; the model of Boyle's law and the money-circulation model. In the accounting-balance model the equation of exchange is illustrated and discussed in arithmetical, mechanical and algebraic forms (Morgan, 1995, p. 11; and Patinkin, 1990, p. 2). It is the mechanical version which enables Fisher to illustrate the dynamic forces and adjustments during transition periods, which in modern language would be described by means of difference or differential equations.

As Morgan (1995, p. 17) observes:

> The balance introduces a completely new element into the equation of exchange. In the arithmetic example, a simple change in one element necessitates a matching change in one of the other elements to maintain equality. In the mechanical illustration a similar change in one element creates an oscillation of the arms of the balance as part of the process of coming back into a position of rest. The model here introduces a new element into the discussion of the equation of exchange – a new theory about the behaviour of the economic system in 'transition periods'.

It is somewhat surprising that Fisher the mathematician and author of *Appreciation and Interest* did not make use of difference or differential equations. But as Niehans (1990, p. 375) points out, it was only in the 1920s that economists discovered differential and difference equations, which then became the major tool in business cycle research following Ragnar Frisch's propagation and impulse problems in 1933.[24]

Equation (5.3) incorporates the idea of transition periods outlined above. Fisher made it clear that velocity is far from being constant (Wood, 1995, p. 104; Fisher, [1911] 1985, pp. 55, 63, 64, 320). Moreover, velocity is a function of expected price changes or the expected inflation rate. The positive correlation between velocity and expected inflation seems to be a major assumption in theories following the quantity theoretic tradition, as the Chicago School and the Cambridge approach (see Patinkin, 1969, pp. 50, 51; Laidler, 1991b, pp. 292-293; Tavlas and Aschheim, 1985, p. 295). For Fisher ([1912] 1918, p. 56) it is the discrepancy between nominal and real interest rates which can be approximated by the expected inflation rate, which constitutes the cycle or the fluctuations in economic activity: 'The peculiar

behavior of the rate of interest during transition periods is largely responsible for the crises and depressions in which price movements end'. When prices are rising, the nominal interest rate rises but not sufficiently, and when prices are falling, the nominal interest rate falls, but not sufficiently. This insufficient adjustment is attributed to confusions between real and nominal magnitudes (Fisher, [1912] 1918, pp. 60 and 68; Dimand, 1993a, p. 163; and Patinkin, 1993, p. 4). In the end this confusion points to money illusion which he was eager to eliminate by educating the public (Fisher, 1935a, p. 195; Fisher, [1912] 1918, p. 71; Fisher, 1928; see also Dimand, 1993a, pp. 164 and 169; and Patinkin, 1993, p. 27. A short historical note is provided by Niehans, 1987, pp. 418-419).

Expected inflation may well be destabilizing by increasing or decreasing velocity in such a way that the economic system might be far from being stable. 'If velocity is *sufficiently* sensitive to inflation, the latter, once started, can accelerate without limit even in the absence of any monetary expansion' (Laidler, 1991b, p. 292). And Patinkin summarizes (1969, p. 50):

> Thus, if individuals expect prices to rise and earnings to be good, they will dishoard – that is, increase in velocity of circulation. But the crucial point here is that these expectations will be self-justifying: for the very act of dishoarding will cause prices to rise even further, thus leading to further dishoardings, and so on. In this way a 'cumulative process' of expansion is set into operation which 'feeds upon itself' and which has no 'natural' limit. Conversely, an indefinite 'cumulative' process of hoarding, price declines and depression and further hoarding is set into operation by the expectation that the price level will fall and/or that earnings will be poor. Thus the economic system is essentially unstable.

In equation (5.3) the actual inflation rate ($p - p_{-1}$) is incorporated instead of the expected rate. This can – by referring to equation (5.2) and (5.4) – be justified by assuming a faster rate of reaction in financial markets than in output markets.[25]

The last equation (5.4) constitutes price expectations as they are made by the numerous agents in the output market. It assumes adaptive expectations in the now well known form. Restricting α to one reduces the complexity of the model considerably without losing anything of its major economic content, as will be shown below. Equation (5.4) captures Irving Fisher's ideas about sluggish adjustment in expectations and the observed non-neutrality behavior of actual individuals. Together with the supply function (5.2) it also points to Irving Fisher's innovative calculations of correlations between unemployment or output and distributed lags of changes in the price level.[26]

The monetary macroeconomic model (5.1) to (5.4) in Fisher's tradition of describing economic fluctuations, long-run equilibria and transition periods can easily be solved.[27] Equation (5.5a) is a second-order inhomogeneous linear difference equation in p:

$$p + \frac{(1-\alpha)(\gamma-1)-\lambda+\gamma}{1+\lambda-\gamma} p_{-1} - \frac{(1-\alpha)\gamma}{1+\lambda-\gamma} p_{-2}$$

$$= \frac{1}{1+\lambda-\gamma}\left[m + \bar{v} - y^p - (1-\alpha)(m_{-1} + \bar{v}_{-1} - y^p_{-1})\right] \text{ for } 1+\lambda \neq \gamma. \qquad (5.5a)$$

The corresponding characteristic equation (5.5b) points to a rather complex dynamic behavior of the price level p (and the output level y which can be solved as a similar difference equation out of equations (5.1) to (5.4):

$$q_{1,2} = -\frac{(1-\alpha)(\gamma-1)-\lambda+\gamma}{2(1+\lambda-\gamma)} \pm \sqrt{\frac{(1-\alpha)\gamma}{1+\lambda-\gamma} + \left[\frac{(1-\alpha)(\gamma-1)-\lambda+\gamma}{2(1+\lambda-\gamma)}\right]^2} \qquad (5.5b)$$

where the $q's$ constitute the familiar part in the general homogenous solution to equation (5.5a).

The system (5.5a) exhibits stable and unstable regions as well as cycles and no cycles depending on the values of the parameters involved. As can be easily demonstrated, the parameter γ of equation (5.3) is of crucial importance for the dynamic behavior of the system, whereas parameter α is of minor importance. Assuming, for example, $\gamma = 0$ and $0 < \alpha < 1$, equation (5.5a) reduces to a first-order difference equation which is always stable since the resulting stability condition $\frac{1-\alpha+\lambda}{1+\lambda} < 1$ is fulfilled.

Assuming instead $\alpha = 1$ and $\gamma > 0$ a first-order difference equation emerges as well, however, with a different dynamic behavior as in the former case. This assumption does not essentially eliminate the rich dynamic properties of the system of equations (5.1) to (5.4) and therefore the major economic contents, but reduces the complexity considerably. Therefore, for the rest of the present chapter we assume without much loss of generality the simplified version of the adaptive expectation scheme in equation (5.4) with $\alpha = 1$, that is $p^e = p_{-1}$.

This qualification leads to equation (5.5) instead of equation (5.5a).

$$p - \frac{\lambda - \gamma}{1 + \lambda - \gamma} p_{-1} = \frac{1}{1 + \lambda - \gamma}\left[m + \bar{v} - y^p\right] \text{ for } 1 + \lambda \neq \gamma. \qquad (5.5)$$

The steady-state or long-run equilibrium p^* is established when $p = p_{-1} = p^*$ holds true:

$$p^* = m + \bar{v} - y^p. \qquad (5.6)$$

Equation (5.6) is the long-run quantity theoretic solution in determining the price level. Thus, equation (5.6) and not equation (5.1) contains all the quantity theoretic elements.[28] Given constant velocity $\bar{v}$ and constant (or exogenously determined) potential real output y^p the price level p^* is uniquely determined by the money supply stock m. As was noted earlier in the text the long-run equilibrium (5.6) is not the typical situation. Changes in the variables on the right-hand side of equation (5.6) throw the system out of equilibrium and lead to the normal situation of transition periods towards a new equilibrium. The transition period with respect to prices is given by the general solution to the first-order difference equation (5.5) in equation (5.7):

$$p = p^* + (p_0 - p^*)\left(\frac{\lambda - \gamma}{1 + \lambda - \gamma}\right)^t \qquad (5.7)$$

where p^* is the equilibrium value given in equation (5.6) and p_0 is the starting value of p in period $t = 0$. The system will be stable and converges to the equilibrium value p^* continuously, provided the parameter restriction $\lambda > \gamma$ holds true. If $1 + \lambda < \gamma$ is given, however, the system will be unstable without cycles. Fluctuations around the equilibrium value p^* result whenever the parameters λ and γ are in the regions $\lambda < \gamma$ and $1 + \lambda > \gamma$. The cycles[29] will be damped if in addition $\lambda > \gamma - ½$ holds true and explosive if $\lambda < \gamma - ½$. For $\lambda = \gamma - ½$ the cycles show a constant amplitude. As mentioned before the relation $\gamma = \lambda + 1$ is excluded since in this case the price level p at time t is not determined. For the special case $\lambda = \gamma$ the system will always be in equilibrium. Looking at equations (5.1) to (5.4) with the restriction $\alpha = 1$ it can be seen that a higher output $y > y^p$ as a result of $p > p^e = p_{-1}$ is provided by a higher velocity due to $p > p_{-1}$. In the more general system with $0 < \alpha < 1$ this special case does not emerge, however.

Given any value of λ the system will become unstable whenever γ increases beyond the limits indicated. As was pointed out verbally, extreme hoardings or dishoardings might lead to abnormal velocity movements when γ takes on high values. In these cases severe booms or (perhaps more likely) severe depressions may happen. The initial shocks or impulses in Ragnar Frisch's terms for these developments could be a monetary policy action by changing, for example, the money stock m erratically. A shock in velocity or in permanent output might induce these developments as well.

The monetary model of fluctuations (5.1) to (5.4) can of course be solved for the real output y, too, which in the theory of business cycles is the more familiar approach. The relevant calculations lead to the first-order difference equation (5.8) in y, where again $\alpha = 1$ is assumed:

$$y - \frac{\lambda - \gamma}{1 + \lambda - \gamma} y_{-1} = \frac{1}{1 + \lambda - \gamma}\left[\lambda(\Delta m + \Delta\bar{v}) + y^p - \gamma \Delta y^p\right]; \quad 1 + \lambda \neq \gamma. \qquad (5.8)$$

The usual way to establish the steady states or long-run equilibrium values of real output y^* is to assume $y = y_{-1} = y^*$ and $y^p = y^p_{-1}$ which leads to equation (5.9):

$$y^* = y^p + \lambda(\Delta m + \Delta\bar{v}) \qquad (5.9)$$

Equation (5.9) states that in the long run real output is equal to its potential level and depends on the growth rates of money supply and long-run velocity. It seems as if positive money growth rates can raise long-run equilibrium real output y^* permanently above the potential level y^p. That would mean that although money is neutral in the long-run, as can be seen by equations (5.6) and (5.9) it is not super-neutral according to equation (5.9). Does that mean that Blaug is correct in stating for the whole quantity theory of money, that money is not neutral in both senses in the short run and not super-neutral in the long run? (Cf. Blaug, 1995b, pp. 29-34; and Niehans, 1987, pp. 413, 418-419; but see Patinkin, 1995, pp. 123 and 124; and Patinkin, 1987.)

Blaug (1995b, pp. 29-30, emphasis in original) writes:

> This theorem came to be known in the 1930s as 'neutrality of money' (Patinkin, (1987) but it was a familiar quantity-theory proposition all through the nineteenth century long before a memorable name for it had been invented. Alongside this long-run theorem about neutral money ran the notion that money in the short-run was almost certainly non-neutral; here too, the inspiration was Hume (and possibly Richard Cantillon) who had argued, not only that the *level* of output in an economy is invariant to the *level* of the money supply, but also that it can be raised by a positive *rate of change* of the money supply ... . What was called 'neutral money' in the interwar period has come to be known more recently as the vertical long-run Phillips curve or the 'policy ineffectiveness' proposition of the New Classical Macroeconomics. Hume apparently did not believe in the neutrality of money with respect to a sustained rate of change of the money supply; in other words, he denied what is now called 'superneutrality'. Had he expressed himself in modern language, he would have repudiated Friedman's notion of a natural rate of unemployment and insisted on the existence of a trade-off between output and inflation even in the long-run.

Contrary to Blaug's interpretation the present quantity theoretic model does not confirm this view. Equation (5.9) is not the correct long-run steady state description of the economy. In establishing the long-run equilibrium (5.6) with respect to prices it was assumed that $p = p_{-1} = p^*$, that is, $\Delta p = \Delta p^* = 0$. Equation (5.6), however, states that $\Delta p^* = 0$ provided $\Delta m = \Delta \bar{v} = \Delta y^p = 0$ (or, more, generally $\Delta m + \Delta v = \Delta y^p$). But only the assumption $\Delta y^p = 0$ was used in deriving equation (5.9). Therefore, to be consistent with the long-run price behavior, Δm and $\Delta \bar{v}$, too, must equal zero (or, more, generally, $\Delta m = -\Delta \bar{v}$), which leads to equation (5.10) and ensures long-run neutrality and super-neutrality:

$$y = y^* = y^p. \tag{5.10}$$

Of course, during transition periods, money is neither neutral nor super-neutral. And as mentioned before, transition periods are the normal situations.[30]

The general dynamic solution with respect to real output is given by

$$y = y^* + \left(y_0 - y^*\right)\left(\frac{\lambda - \gamma}{1 + \lambda - \gamma}\right)^t \tag{5.11}$$

where the same stability considerations apply as in the case of the price equation (5.7).

3.2 Monetary Policy Design to Ensure Stable Purchasing Power of Money

Equations (5.1) to (5.4) describe Fisher's quantity theory version of the model economy. Monetary policy is supposed to optimize a given objective function subject to the economic structure. A natural version would be for the monetary authority to attain a predetermined but stable price level $\bar{p}$, in which case the objective function

$$L_p = (p - \bar{p})^2 \tag{5.12}$$

should be minimized with respect to the money supply m under the condition of equations (5.1) to (5.4) or equivalently equation (5.5).

The resulting calculations lead to the optimal money supply rule:

$$m^* = y^p - \bar{v} + \bar{p} + (\lambda - \gamma)(\bar{p} - p_{-1}). \tag{5.13}$$

Assuming the target price level $\bar{p}$ to be equal to the equilibrium level p^* it follows that

$$m^* = y^p - \bar{v} + p^* + (\lambda+\gamma)(p^* - p_{-1}). \qquad (5.13a)$$

Inserting (5.13a) into (5.5) yields $p = \bar{p} = p^*$.

The first three terms on the right hand side of equation (5.13) or (5.13a) capture the quantity-theory aspects. The last term is needed to eradicate the fluctuations in p and is in accordance with the optimal control theory result that an optimal policy rule should contain as many lags as the underlying structural model of the economy. Using, for example, equation (5.5a) instead of equation (5.5) as the relevant economic model, the resulting equation for the optimal money stock would contain two lags in p instead of only one in equation (5.13).

Even though the monetary authority can stabilize the purchasing power of money by applying equation (5.13) or (5.13a), it should be remembered that m is the natural logarithm of either M_1 or bB. The central bank can by open market operations (Fisher's second phase of monetary reforms) only control B. To completely control M_1, Fisher's last policy recommendation should be applied, that is, 100% money reserves. This change in the banking system leads to a money supply consisting only of base money, $M_1 = B$, or a money multiplier b of one.

It could also be argued that the object of monetary policy is to control the real output y. An optimal output rule could be established by minimizing the objective function

$$L_y = (y - \bar{y})^2 \qquad (5.14)$$

with respect to Δm and the structure given in equation (5.8). Since only changes in m influence y (or m and m_{-1}), the policy instrument in this case must be the growth rate of M_1. Assuming the target output level $\bar{y}$ to be equal to the potential output y^p, the optimal $(\Delta m)^*$ is given in equation (5.15) with the usual and similar interpretation as in the optimal price level case.

$$(\Delta m)^* = \Delta y^p - \Delta\bar{v} + \left(\frac{\lambda-\gamma}{\lambda}\right)\left(y^p_{-1} - y_{-1}\right). \qquad (5.15)$$

Inserting equation (5.15) into equation (5.8) it follows of course that $y = y^p$.

It looks as if the monetary authority could follow two alternative monetary rules to stabilize the economy. Fisher, however, was sure that stabilizing the purchasing power of money ensures stabilizing the economy (see the discussion and arguments in sections 1 and 2 above). Therefore, by using the money rule (5.13) or (5.13a), prices or the purchasing power of money not only are stabilized but real output should also be stabilized.

In order to establish the relationship proposed it can easily be demonstrated that both rules (5.13) and (5.15) are equivalent, provided the monetary authority seeks a constant price level target, i.e. $\Delta\bar{p} = 0$.

Differencing equation (5.13) once and assuming $\Delta\bar{p} = \Delta p^* = 0$ it follows that

$$\Delta m^* = \Delta y^p - \Delta\bar{v} - (\lambda-\gamma)\Delta p_{-1}.$$

Using equation (5.2) and (5.4) we get

$$\Delta p_{-1} = \frac{1}{\lambda}\left(y_{-1} - y^p_{-1}\right).$$

Combining both equations equation (5.16) emerges:

$$\Delta m^* = \Delta y^p - \Delta\bar{v} + \frac{\lambda-\gamma}{\lambda}\left(y^p_{-1} - y_{-1}\right). \qquad (5.16)$$

which is equivalent to equation (5.15), i.e. $\Delta m^* = (\Delta m)^*$, the growth rate of the optimal money supply which ensures stable purchasing power is the same as the optimal monetary growth rate which leads to output stabilization given the dynamic context.

4 SUMMARY AND CONCLUSION

Irving Fisher's monetary policy recommendations were motivated by two underlying forces. First, they were backed by an outgrowth of his theoretical investigation in monetary problems in general and his quantity theoretic foundations in particular. Second, among his concerns to relieve society from what he considered major evils of his time, instability of money was the economic problem he ranked highest. Even though both forces supported each other, in some circumstances they seemed to be obstacles to each other as well. Proposing his compensated-dollar-plan, for example, Irving Fisher endorsed the gold standard for political and practical reasons, while his theoretical concern about stabilizing the purchasing power of money was centered around the money stock as outlined in *The Purchasing Power of Money*. His crusades in monetary policy campaigns were sometimes in contrast to his sound and profound theoretical analyses of monetary problems.

The present chapter discusses four episodes or phases of Irving Fisher's monetary policy proposals. The first phase beginning about 1910 and ending in the middle of the 1920s was centered theoretically around his major work on monetary theory, *The Purchasing Power of Money*, and his policy proposals of the compensated-dollar-plan. Even though Irving Fisher did not give up this idea completely, he later changed his views about the design of monetary policy. In his second phase Irving Fisher outlined a rather modern idea of central bank policy conducted by open market operations in selling and buying government bonds. The experience of the Great Depression after 1929 not only changed Irving Fisher's personal financial situation but also his theoretical views about the origins of booms and depressions. While milder business fluctuations are mostly originated by monetary forces behind the money supply and/or velocity behavior, severe booms and depressions are unleashed by over-indebtedness and deflation. In any case, for him, economic fluctuations were a monetary phenomenon. His practical monetary advice in his third phase of monetary policy proposals consequently became reflation to cure deflation, which of course was not inconsistent with his life-long concern with the stable purchasing power of money. His last period of monetary policy reforms started in the middle of the 1930s. The creation of a currency commission as an Open-Market Committee of the Federal Reserve Board represented his institutional design for the conduct of monetary policy to ensure price stability. Monetary policy control was completed by banking reform suggestions which in essence resulted in his 100%-reserve requirement proposal.

In order to combine Irving Fisher's theoretical views about the monetary economy and the monetary origins of business cycles and his policy proposals to keep the purchasing power of money stable, a simple Fisherian Monetary Model is outlined in the second part of this chapter which contains the essential quantity theoretic insights of Irving Fisher. Together with his emphasis on transition periods, non-neutral or non-rational expectations and his early discovery of the relation between inflation and employment in 1926 a simple monetary model of fluctuations emerges which incorporates the long-run steady state properties of the quantity theory and exhibits neutrality and super-neutrality in equilibrium but not in transition periods, which of course, are the normal cases.

Monetary policy is optimally designed by solving a simple objective function which incorporates stable prices with respect to the monetary economy model outlined above. The resulting policy rule ensures stable purchasing power of money and automatically stabilizes the real economy as well. The optimal money supply rule for base money should in Irving Fisher's understanding be completed by his 100%-reserve requirement to assure a complete control of the (M_1)-money stock as well. The optimal money base rule can be seen as a prototype of an activistic policy rule like the recommendations of Friedman (1960, 1968, 1985), McCallum (1985, 1987) or Meltzer (1984, 1985, 1987). Other modern proposals like those, for example, of Hall (1983), Tobin (1983), Taylor (1985) or Barro (1986, 1989) could also be connected with Irving Fisher's work on monetary policy design, which, however, is not taken up, but would be worth including in future investigations.

NOTES

* The authors acknowledge helpful comments by Volbert Alexander, John S. Chipman, Robert W. Dimand and Thomas M. Humphrey.

1 Translation and translator's Note for 'The Geometrical Theory of the Determination of Prices' by Léon Walras. A second paper in 1894 was read to the British Association for Advancement of Science: 'The Mechanics of Bimetalism'. See I.N. Fisher (1961, pp. 2-3).

2 R.L. Allen (1993, p. 129) restricts the period under consideration from 1912 to 1934. See, however, the citation of Fisher on page 261 in R.L. Allen (1993).

3 The following owes much to William I. Barber's unpublished manuscript (Barber, n.d.).

4 Barber states, 'What was needed instead, he then argued, was quiet, detached analysis to strengthen the theoretical foundations upon which informed policies could be built. Premature action would lead to nothing but mischief' (Barber, n.d., p. 2).

5 This oddity was noticed by Schumpeter (1948) and Patinkin (1993). See Barber (n.d., p. 3).

6 On the general discussion about monetary financed fiscal policies in the policy proposals by the Chicago school and before 1933 see Tavlas (1997).

7 On this monetary strategy see especially Fisher ([1935a] 1936); W. Allen (1993); Tolley (1962); Hotson (1987) and Tavlas (1975).

8 Fisher actually discusses several possible outlines for a monetary statute to embody his 100% money plan. Among them are: fixed total money supply, fixed per capita money supply and fixing the purchasing power. Theoretically Fisher preferred a fixed fraction of the per capita income of the country. Fisher ([1935a] 1936, pp. 22-27).

9 Allen writes that Soddy was at Cambridge University, but actually he was professor of chemistry at Oxford (1919-1936) after he worked with the physicist Sir Ernest Rutherford at McGill University, Montreal, and the chemist Sir William Ramsay at University College, London.

10 On the discussion who persuaded whom and who took the lead in this policy proposal see especially Patinkin (1969); W. Allen (1993); Barber (n.d.) and Tavlas (1975).

11 Niehans is skeptical even in this respect when he writes, 'By and large, however, these tracts contributed little of lasting value'. (Niehans, 1990, p. 270).

12 See also Tavlas (1997) on the role of Chicago economists and questions on why the Great Depression happened and what could have been done to avoid it.

13 Later in his article Patinkin writes about Fisher's crusades in monetary affairs: 'Thus, to be quite frank, on this issue, as well as the many others that he espoused at various stages of long lifetime (healthy exercise, vegetarianism, world peace, prohibition), Fisher was a crank'. (Patinkin, 1990, pp. 12-13; on this see also R. Allen, 1993, p. 129).

14 Fisher did not like the description of the ups and downs of economic activity like sine waves, which became popular with the work of Ragnar Frisch (1933).

15 See Fisher ([1911] 1985, pp. 66 and 70); Fisher (1923); Fisher (1925); Dimand (1993a, pp. 167, 168, 170); Dimand (1994, p. 96); Laidler (1991b, pp. 300-301); Morgan (1995, pp. 24-25); R.L. Allen (1993, pp. 111, 116, 181); Patinkin (1993, pp. 3-4); Tavlas and Aschheim (1985, p. 301) and Barber (n.d., p. 7).

16 Blaug (1995a, p.1) even points out that the 'roots go all the way back to the sixteenth century in the writings of the Salamanca School, one of the oldest scholarly traditions in the whole of economics'.

17 On the quantity theory, Irving Fisher, Monetarism, Milton Friedman and the controversy about the Chicago Tradition see Patinkin (1969); Tavlas (1975); Tavlas (1997); Humphrey (1971); Humphrey (1973); Patinkin (1990, especially pp. 24-28); Patinkin (1995); Niehans (1987, p. 413); Niehans (1990, p. 277); Blaug (1995a, p. 1); Blaug (1995b, pp. 27, 28, 30-35); Laidler (1991a); Laidler (1991b, pp. 302-303); Fisher ([1912] 1918, pp. 156, 163); Fisher ([1911] 1985, pp. vii, 14, 152, 181-183, 319); and R.L. Allen (1993, pp. 12, 113).

18 See, however, Dimand (1994) who uses a Walras-Keynes-Phillips relationship according to Tobin (1975) to model a debt-deflation situation and who argues that Tobin's WKP model bears little resemblance to Keynes or Phillips but does to Fisher.

19 On the relation between M and M' see Fisher ([1911] 1985, pp. 50, 53 and 54); Fisher ([1912] 1918, pp. 180, 183 and 184) as well as Patinkin (1993, p. 8); Wood (1995, p. 113) and R.L. Allen (1993, p. 115).

20 Compare this to the ideas of Fischer (1977) and Taylor (1979 and 1980) about long-term contracts, staggered wage settings and rational expectations.

21 See also Fisher (1896, 1907 and 1930).

22 See Rutledge (1977, p. 202) and our paper on Knut Wicksell's monetary macroeconomics (Loef and Monissen, 1998).

23 See also Patinkin (1990, p. 13).

24 Niehans (1990, p. 375) and Frisch (1933). Samuelson's short note (1959) giving credit to Alvin Hansen's mathematically incomplete formulation of the multiplier-accelerator principle which led him to formulate it in an exact difference equation form points in the same direction of a rather late introduction of this mathematical tool in economics. We owe this hint to J. Ehlgen.

25 We owe this argument to a comment by V. Alexander on an earlier version of this chapter.

26 See Fisher ([1926] 1973, 1933c, 1936, 1937); Dimand (1993a, p. 161) and Patinkin (1993, p. 4, fn 3). Of course, Fisher did not know the term or the content of what is now called rational expectations. However, he always stressed the point, that people misperceive the actual purchasing power of their currency.

27 First, lag equation (2) once, multiplying it by $\lambda(1-\alpha)$ and add the result to the combination of equation (2) and (4). Second, insert equation (3) and the result of step 1 into equation (1). Re-arranging terms leads to equation (5a). If the condition $1+\lambda \neq \gamma$ is not fulfilled, the price level in the system (1) to (4) will not be determined.

28 On Fisher's distinction between the equation of exchange and the quantity theory of money see Fisher ([1912] 1918, pp. 152 and 156-157); Blaug (1995b, p. 29); Patinkin (1990, pp. 2-3) and Patinkin (1995, p. 123).

29 In a strict sense 'cycles' emerge only if a sine or cosine wave results from an underlying higher order difference equation which cannot happen with a first-order equation as given in (5). Fluctuating values of p around p^* as a result of a negative magnitude of $\frac{\lambda-\gamma}{1+\lambda-\lambda}$ in equation (7), however, can be interpreted as 'business cycles' accordingly.

30 The same problem and solution results in Laidler's monetaristic business cycle model, but with a somewhat different interpretation. See Laidler (1976, pp. 80-82).

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