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and challenges of Clower's  
microfoundations of monetary theory**

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# Disequilibrium as the Origin, Originality, and Challenges of Clower's Microfoundations of Monetary Theory<sup>1</sup>

## Abstract

Robert W. Clower's article "A Reconsideration of the Microfoundations of Monetary Theory" (1967) deeply influenced the course of modern monetary economics. On the one hand, it questioned Don Patinkin's (1956) project to integrate monetary and Walrasian value theory. On the other hand, it was the fountainhead of the cash-in-advance models *à la* Robert J. Lucas (1980), one of the most widely used approaches to monetary theory since the 1980s. Despite this influence, Clower's (1967) project to integrate monetary and value theory remains an enigma. My paper intends to resolve it. This is a difficult task since Clower never completed the monetary theory outlined in his 1967 article. To overcome this difficulty, I characterize the intellectual context from which Clower's (1967) contribution emerged and have recourse to a reconstruction of his project. This reconstruction is based on the analysis of published and unpublished materials, written by Clower before and after the 1967 article. It is argued that Clower (1967) sought to elaborate a disequilibrium monetary theory whilst retaining the two pillars of Patinkin's integration, i.e., the introduction of money into utility functions and the real-balance effect. I trace the origins, account for the originality, and discuss the challenges of this project.

**JEL codes:** B21, D46, D5.

**Keywords:** integration of monetary and value theory, microfoundations of macroeconomics, disequilibrium, Clower, Patinkin.

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## Introduction

Economists have sought to formulate microeconomic foundations adapted to monetary economies at least since Léon Walras.<sup>2</sup> Among the important contributions to this long and still active search for a satisfactory monetary framework, Robert W. Clower's article "A Reconsideration of the Microfoundations of Monetary Theory" (1967) is often mentioned. Two reasons explain why. The first reason is that it contributed to question Don Patinkin's (1956) project to integrate monetary and value theory. Shortly after Frank Hahn's (1965) famous critique of Patinkin, Clower showed that the model developed in *Money, Interest, and Prices* did not portray a monetary economy. This problem was due to the Walrasian budget constraints. They did not exclude barter exchanges. Accordingly, they were not appropriate for analyzing monetary economies. To ensure that money was the counterpart of exchange, Clower proposed to dichotomize the Walrasian budget constraint into "expenditure" and "income" branches. Thus, individuals would be forced to have money to consume and to receive money in return for their sales. This dichotomized budget constraint is the second source of influence of Clower's article. In 1980, Robert Lucas built the seminal cash-in-advance model on it. As a result, Clower became the fountainhead of one of the most widely used approaches to monetary theory since the 1980s.

While Clower recognized that he inspired the cash-in-advance literature, he rejected it.<sup>3</sup> It follows a first puzzle: what was the specificity of Clower's approach to integrate money into macroeconomic models? Then, there is no clear relationship between the 1967 "Reconsideration" and the disequilibrium program of microfoundations sketched in "The Keynesian Counter-Revolution: A Theoretical Appraisal" (1965). On one side, Clower (1965) modeled how individuals behaved out of Walrasian equilibrium without paying attention to the role of money in the exchange process. On the other side, Clower (1967) restricted his analysis to the behavior of an individual evolving in a market-clearing context. On top of this, Clower rejected the money-type fixed-price disequilibrium models that economists such as Jean-Pascal Benassy (1975, 1975a, 1986) or Jean-Michel Grandmont and Yves Younès

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<sup>2</sup> On Walras's microfoundations of monetary theory, see Pascal Bridel (1997; 2002) and Antoine Rebeyrol (1999).

<sup>3</sup> "I have never liked being associated with the cash-in-advance literature, and the fact that people spell my name correctly does not make my any happier! What pains me most is the apparent inability of people to read accurately what I wrote. It should be made clear that the Lucas gambit, though it may owe inspiration to me, owes nothing more. There is no intellectual or logical link between his slope and mine! Let me leave at that!" (Letter from Clower to Peter Howitt, 04/29/1991). R.W. Clower Papers, Box 1-1999-0352, Rubenstein Rare Book and Manuscript Library.

(1972) built from the 1965 and 1967 articles.<sup>4</sup> It follows a second puzzle: did the 1965 and 1967 behavioral hypotheses intend to be articulated so as to lay the foundations of an original monetary macroeconomics? In short, Clower's project to provide microfoundations to monetary theory is an enigma. My paper intends to resolve it.

This is a difficult task for three reasons. First, the 1967 article is preceded by very few contributions to monetary theory, and in none of them did Clower intend to provide his own framework for analyzing monetary economies. Second, Clower simply formalized an optimization plan in his 1967 article. The kind of market structure in which individuals were supposed to evolve remained mysterious. Third, Clower never completed the monetary theory related to his 1967 microfoundations. To overcome these difficulties, I characterize the intellectual context from which the 1967 article emerged and rebuild Clower's project. Such a reconstruction is based on the analysis of published and unpublished materials, written before and after the 1967 article. Particular attention will be given to his correspondence with Patinkin in the 1960s, to the preliminary versions of the 1967 article, and to an unpublished manuscript "The Keynesian Paradigm: An Attempt at Reconstruction" (1971a).

In the process of rebuilding Clower's project, two interpretations of the 1967 article are challenged. The first one was expressed by Antoine D'Autume (1985), Meier Kohn (1988), and Mauro Boianovsky (2002). It asserted that Clower adopted an approach to monetary theory alternative to Patinkin. It was justified by an elementary logic. Like John R. Hicks (1935), Patinkin (1956) sought to provide microfoundations to monetary theory by justifying the integration of money into agents' utility functions. Yet, Clower (1967) argued that their proposals were not sufficient to model monetary economies and based his integration strategy on a reformulation of standard budget constraints. Therefore, his contribution would have been part of an alternative approach to monetary theory allegedly embodied by Dennis H. Robertson (1933), Karl Brunner (1951), and Sho Chieh Tsiang (1966), and in which budget constraints were modified to account for the circulation of money in the economy. The second interpretation of the 1967 article was expressed by D'Autume (1985) and Jérôme De Boyer des Roches (2003). It asserted that the projects underlying the 1965 and 1967 articles rested on two logically distinct ideas: the "dual-decision" process and the circulation of money through the economy.

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<sup>4</sup> "I refer, of course, to the fix-price models of Barro and Grossman, Drèze, Negishi, Grandmont, Benassy, Malinvaud, Varian, and other writers. Although I am an acknowledged 'grandfather' of all these 'babies', I disowned them at the 1980 Aix-en-Provence World Conference of the Econometric Society" (Clower, 1984: p. 267)

By contrast, I argue that the 1967 article is best seen as a reorientation of Patinkin's approach to monetary theory and not as a stark alternative. Clower (1967) sought to elaborate a disequilibrium monetary theory whilst retaining the two pillars of Patinkin's integration, i.e., the introduction of money into utility functions and the real-balance effect.<sup>5</sup> I trace the origins, account for the originality, and discuss the challenges of this project.

## 1. Clower in Patinkin's controversy

In the early sixties, Clower was involved in the debate over monetary and value theory initiated by George C. Archibald and Richard G. Lipsey's (1958) criticism of *Money, Interest, and Prices*. On two occasions, he demonstrated that the "Classical" monetary theory defended by Archibald and Lipsey and criticized by Patinkin was valid. However, Clower considered that Patinkin had formulated the appropriate framework for analyzing the functioning of monetary economies. To make this point, I trace the roots of Patinkin's controversy. Archibald and Lipsey put forward the distinction between short-run and long-run analyses to criticize Patinkin. This distinction clarifies Clower's positions. On the one hand, Clower considered that Patinkin's framework was appropriate to explain the formation of the temporary equilibrium (short-run) but inappropriate to analyze the properties of the stationary equilibrium (long-run). On the other hand, he claimed that the functioning of monetary economies could be described only in a short-run framework. Clower concluded that the development of a useful monetary theory required following in Patinkin's footsteps.

### 1.1 Short-run vs. long-run analyses: a key distinction in Patinkin's controversy

By the late 1940s, Patinkin criticized "classical" monetary economics whilst developing his own framework to integrate monetary and value theory. The microeconomics expounded in *Money, Interest, and Prices* (1956) was the outgrowth of these theoretical reflections. Patinkin (1956) criticized the approach to monetary theory adopted by economists such as Walras, Vilfredo Pareto, Irving Fisher, or Knut Wicksell.<sup>6</sup> This approach, called the "classical dichotomy", consisted in separating the determination of relative prices from the determination of monetary prices. Relative prices were supposed to be set by the excess-demands for goods in the real sector of the economy while monetary prices were supposed to be set by a Cambridge or a Fisherine equation, in the monetary sector of the economy.

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<sup>5</sup> See Roy Weintraub (1979) and Ghislain Deleplace (1999) for other discussions about the relationship between Clower's disequilibrium program of microfoundations and his 1967 "Reconsideration" of monetary theory.

<sup>6</sup> List of names given by Patinkin (1956: p. 97).

According to Patinkin, this dichotomization of price determination was invalid. In other words, “Classical” monetary economics failed to explain consistently the formation of monetary prices. Patinkin maintained that there were contradictions between the homogeneity postulate of degree zero in money prices of the “classical” excess-demands for goods, the monetary equation, and Walras’ law. To make this point, he assumed an equiproportionate variation of monetary prices and discussed how reacted the market system. Following the logic of “Classical monetary economics”, Patinkin stressed two opposite conclusions.<sup>7</sup> On one side, market forces would have corrected the disequilibrium in the monetary sector of the economy. This was because the monetary equation was homogeneous of degree 1. On the other side, no market force would have counterbalanced the disequilibrium in the monetary sector of the economy. Because of the homogeneity postulate, individuals had no incentive to change their purchasing and selling plans. It followed that all the markets but the money market cleared. Since the money market could be ignored (by virtue of Walras’ law), its disequilibrium would not be signaled, and in turn, not resorbed. From there, Patinkin concluded that an infinite combination of monetary prices could be associated to a unique vector of relative prices. The level of monetary prices was undetermined. According to Patinkin, this indeterminacy resulted from the absence of a market mechanism linking the monetary and real sectors of the economic system. To fill this gap, Patinkin introduced real balances in utility functions and formulated the real-balance effect in a Hicksian temporary equilibrium model. Individuals were supposed to plan the quantity of real-balances that they needed to realize their transactions during the market period. The real-balance effect ensured the interaction between the real and monetary sectors of the economy during the tâtonnement process. This interaction ultimately allowed the economic system to reach a monetary equilibrium. Patinkin used this framework to demonstrate the propositions of the quantity theory of money. Thanks to the real-balance effect, a positive variation of the money supply held by individuals generated a positive variation of the demand for goods. Price level increased accordingly. This upward pressure continued until individuals held their initial and desired level of real-balances. Back in equilibrium, the price level had increased in proportion to the increase of the money supply. Moreover, real choices were no longer affected by money supply since individuals had no incentive to modify their real balances. Therefore, money was neutral and the quantity theory was validated.

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<sup>7</sup> According to Patinkin, the possibility to deduce two opposite conclusions (starting from the same set of assumptions) proved the inconsistency of “Classical monetary economics”, and in turn, its invalidity.

Patinkin's criticism of "Classical" monetary economics raised a controversy.<sup>8</sup> Archibald and Lipsey (1958) were among those who challenged its validity, and in turn, the need for using Patinkin's integration.<sup>9</sup> Their charge was based on the distinction between short-run and long-run analyses (1958: p. 2). The short-run analysis was concerned with the formation of the temporary equilibrium, i.e., the tâtonnement process on a given Monday of the Hicksian week. The long-run analysis focused on the static properties of the stationary equilibrium, i.e., a situation in which prices remained the same from market periods to market periods because individuals had no incentive to change their levels of consumption and real balances. In this context, Archibald and Lipsey (1958) claimed that the "Classical dichotomy" was valid. They argued that in statics, the issue of consistency concerned the existence (or not) of an equilibrium solution (1958: p. 11).<sup>10</sup> Thus, Patinkin's criticism could be invalidated by showing that a "classical" model determined relative prices, finite and positive monetary prices, with non-zero money stocks. Archibald and Lipsey used a numerical example to do so (1958: p. 14). They concluded that Patinkin's monetary framework was unnecessary to analyze the static properties of the stationary equilibrium. This conclusion was deemed to be particularly important since the quantity theory could be demonstrated by comparing stationary equilibrium positions (1958: p. 8). In stationary equilibrium, individuals' consumption was constant from market periods to market periods, and so was the level of real-balances. Thus, real-balances were no longer a variable and consumption decisions depended only on the level of real income (1958: p. 3). In view of this, Archibald and Lipsey argued that a variation of the money supply did not affect the real sector of the economy. The real-balance effect was therefore dispensable (1958: p. 8). It was sufficient to focus on the new stationary equilibrium. In this situation, the price level had increased in proportion to the variation of the money supply. Money was neutral and the quantity theory was validated.

Archibald and Lipsey's (1958) claims were discussed in a symposium on monetary theory published in 1960 by the *Review of Economic Studies*. Clower was one of the participants of this symposium.<sup>11</sup> With Burstein, he contributed to the rehabilitation of

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<sup>8</sup> For early reactions, see Walter Bradock Hickman (1950), Wassily Leontief (1950), Cecil G. Phipps (1950), and Stefan Valavanis (1955).

<sup>9</sup> "In this paper, we argue that the classical dichotomy is valid, and that the integration undertaken by Patinkin is therefore unnecessary." (1958: p. 1)

<sup>10</sup> Archibald and Lipsey acknowledged that the argument was already formulated by Hickman (1950). Their originality was to make the point by setting the conditions to have the excess-demand functions of the stationary equilibrium (1958: pp. 13-14).

<sup>11</sup> In order of appearance in this special issue of the *Review of Economic Studies*, other participants were William J. Baumol (1960), Frank Hahn (1960), Ron J. Ball and Ronald Bodkin (1960), and Archibald and Lipsey

“Classical” monetary economics. They extended Archibald and Lipsey’s demonstration of the neutrality of money to a model in which individuals were supposed to hold bonds and capital assets. Later, in 1963, Clower claimed that “the classical dichotomy [was] unreservedly valid” (1963: p. 27). This suggests an unconditional defense of the “classical” monetary framework. Yet, there was a condition. It was solely valid in the long-run.

## 1.2 Clower and the validity of “Classical” monetary economics

Clower admitted the validity of “Classical” monetary economics at the stationary equilibrium. In the article co-written with Burstein, this position was stressed by showing that the property of invariance of the real equilibrium to a variation of money supply held even if bonds and capital assets were introduced in the model. Intuitively, the invariance proposition was questionable since individuals might decide to vary their real income by using the extra cash to buy bonds and/or capital assets. Yet, according to Burstein and Clower the proposition remained valid:

More generally, if we consider an economy in which all commodities except money are produced, consumed and held in the form of assets, and if the relevant supply and demand functions of the system depend only on relative prices and other real variables, then it can be shown that the equilibrium demand for commodities, for real bond income, for physical assets, and for real money balances are all invariant against a change in the nominal stock of money (1960: p. 36).

Burstein and Clower pointed out that the demand functions depended on real income and other real variables such as the “relative commodity prices, the rate of interest, the real bond income, and real money balances” (1960: p. 33). But, at the stationary equilibrium, individuals were supposed to start each market period with the same quantity of bonds, capital assets, and real-balances. Thus, these variables no longer appeared in individuals’ functions (1960: p. 34). Once the analysis was focused on the determination of market prices, real income was the remaining variable (1960: p. 35). Therefore, real equilibrium was not affected by variations in the stock of money.

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(1960). In an editorial note, it is claimed that Patinkin’s answer to Archibald and Lipsey (1958) was not included because of an “inability to agree on a suitable length” (1960: p. 29). Patinkin’s reactions were formulated in Chapter 3, section 7 of the second edition of *Money, Interest, and Prices* (1965).



In 1963, Clower demonstrated that the “classical dichotomy” was valid. His originality *vis-à-vis* Archibald and Lipsey (1958) was to show that Walras’ law remained an “identity”.<sup>12</sup> In their article, Archibald and Lipsey maintained that “the classical dichotomy [consisted] in building a model in which Walras’ law [did] not hold” (1958: p. 16). They argued that Walras’ law could not be valid whatever the values taken by the variables of the economic system since the physical volume of transactions and monetary prices were set separately. Patinkin’s scenario of a disequilibrium in the monetary sector without disequilibrium of same amount and opposed value in the real sector of the economic system was an evidence of the invalidity of Walras’ law (1958: p. 16). Archibald and Lipsey concluded that the “classical dichotomy” was valid only in equilibrium (1958: p. 17). Clower (1963) expressed the same viewpoint. Nonetheless, since “every classical economist whose writings [Clower knew] clearly subscribed with full force and fervor to Walras’ law” (1963: p. 27), he proposed to demonstrate that a model based on the homogeneity postulate, using a Cambridge equation, and accepting Walras’ law as an identity could set monetary prices consistently (1963: p.27). To do so, he assumed that the economic system was always in stationary equilibrium (1963: p.27).<sup>13</sup> Since the monetary sector of the economy was balanced, so also was the real sector. Accordingly, Walras’ law was valid. Besides, monetary prices were set by the Cambridge equation so as to ensure the smooth course of transactions determined by the equilibrium in the real sector of the economy (1963: p. 29).

### 1.3 The need to use Patinkin’s monetary framework

Whilst supporting the validity of the “Classical” framework in the long-run, Clower considered that it was not appropriate for analyzing the functioning of monetary economies in the short-run. This position was expressed in *Introduction to Mathematical Economics* (1957). In this book written with the mathematician Bushaw, Clower was concerned with the analysis of the static and dynamic properties of ‘stock-flow’ market models – i.e., a theoretical framework which pictured price determination processes by taking into account current activities as well as the resulting consequences on the stock of commodities present in the economy. Bushaw and Clower aimed to know whether or not their ‘stock-flow’ price theory could be an adequate foundation for Keynesian macroeconomics. Of course, its ability to

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<sup>12</sup> The term “identity” is borrowed from mathematics. It means that in a formal model, an expression is valid whatever the values taken by the variables under consideration.

<sup>13</sup> Clower (1965a) clarified the logic of his 1963 argumentation through a numerical example when he replied to the criticisms formulated by M.K. Rakshit (1965): “From the equation, for example, together with the assumption that the set of admissible values of is  $[-3; 3]$ , we obtain the identity. My derivations of Walras’ law and Say’s law follow the same pattern and are just as valid as this example” (1965a: p. 73)

portray monetary economies was a criterion. Accordingly, they devoted a section (“General Equilibrium and the Theory of Money”) to the issue of the formation of monetary prices. Bushaw and Clower pointed out that the ‘stock-flow’ price theory was dichotomous (1957: p. 174). They concluded that monetary prices were undetermined:

In fact, all individual excess flow demand and stock demand functions were shown earlier to be homogenous of order zero in all prices and income, implying that an equal proportionate change in all market prices  $P$  and in all income variables  $M$  will leave the equilibrium value of all variables [excess-flow demands] and [excess stock-demands] unaffected; and this being the case, it can be shown that the system does not determinate absolute money prices [...] The last expression is simply *Say’s law*; it asserts that the market excess demand for one commodity is determined as soon as the market excess demand for all other commodities (excluding money) is determined, and it asserts further (taken in conjunction with Walras’ law) that the demand for money is identically zero for every set of values of the price and income variables  $P$  and  $M$ . Thus, absolute prices are indeterminate in the [general equilibrium] system; only *relative* prices can be specified in terms of these models. And there is no way in which the *absolute* price level can be determined as a function of the quantity of money since the market excess demand equation for money is always satisfied identically (1957: p. 175).

This demonstration of the invalid dichotomy nearly paraphrased Patinkin. Like him, Bushaw and Clower linked the properties of homogeneity of degree zero of their market functions with those of Walras’ law to explain the indetermination of monetary prices.<sup>14</sup>

In the correspondence between Clower and Patinkin, Clower criticized the long-run approach developed in “Classical” monetary economics. Though interesting from a logical viewpoint, he claimed that the study of the logical properties of the stationary equilibrium was of little interest to understand monetary economies. By contrast, a short-run framework of the kind formulated in *Money, Interest, and Prices* would have been ideally suited:

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<sup>14</sup> In the quotation, Bushaw and Clower distinguished Say’s law from Walras’ law. Their distinction was the same as Patinkin’s (1956). Say’s law asserted that the aggregate value of the amounts of supply of commodities equaled the aggregate value of the amounts of demand for commodities. By contrast, Walras’ law asserted that the sum of the aggregate value of the amounts of excess-demands for commodities and of the excess-demand for money equaled zero. Put simply, Say’s law did not take into account individuals’ decisions to change the amount of money held. Walras’ law did.

Surely, it is more effective to carry this out to its logical (an rather uninteresting) conclusion; admit that the invariance results of A-L [Archibald and Lipsey] are perfectly general [proposition of Burstein and Clower] and then go on to point out that the full equilibrium [stationary equilibrium] systems for which these results hold are completely uninteresting for dealing with short-term problems [of money economies], whereas your model is ideally suited to deal with these. It is nice to know what is implied by full equilibrium, no doubt, but this is not the kind of comparative statics that I would use to inform my judgment concerning actual events.<sup>15</sup>

Clower considered that the empirical content of a dynamic analysis was higher than the one of a static analysis. This point was already made in *Introduction to Mathematical Economics*. According to Bushaw and Clower, “common sense and offhand observation would [have suggested] that in any fairly realistic model, the current state will seldom be an equilibrium state; [However] purely static theory [had] nothing to say about such non-equilibrium states” (1957: p.54). Since Patinkin (1956) studied the stability of the monetary equilibrium to address the formation of monetary prices and the demonstration of the quantity theory, Clower considered that Patinkin had identified the proper approach to monetary theory. Actually, in 1963, he praised the real-balance effect. This mechanism was presented as the basic ingredient to formulate dynamic analyses and so, to develop a useful monetary theory:

In singling out the real-balance effect as the *sine qua non* of monetary theory, Patinkin has correctly identified a major gap in classical doctrine. Because it has lacked an explicit dynamical framework, the classical theory has long been regarded as little more than an intellectual exercise. Patinkin’s treatment of the real-balance effect is an important first step towards the development of a useful theory of monetary dynamics (1963: p. 33).

In the early sixties, Clower advocated for a dynamic monetary theory, built on sound microfoundations, and able to demonstrate the quantity propositions. Since his approach rested on Patinkin’s, it is surprising that Clower never tried to develop the model formulated in *Money, Interest, and Prices*. One reason for this could simply be that Clower had nothing to say that had not already been said by Patinkin. This is what Clower suggested in a letter to

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<sup>15</sup> Letter from Clower to Patinkin (11/12/1959). R.W. Clower Papers, Box 4, Rubenstein Rare Book and Manuscript Library.

Patinkin dated from October 1960. At that time, Patinkin was working on a revised version of *Money, Interest, and Prices* (published in 1965) and asked Clower for comments. Clower confided that “[he could not] put [his] finger on any particular objections other than the minor ones mentioned in the present note”.<sup>16</sup> This attitude contrasts sharply with his 1967 charge against Patinkin’s microfoundations of monetary theory. How does one explain that?

## 2. Disequilibrium microfoundations of monetary theory

The circumstances underlying Clower’s “Reconsideration” of Patinkin’s microfoundations of monetary theory are clarified by two unpublished documents. The first one is a letter sent by Clower to Patinkin before the presentation of the draft of the 1965 article at the Royaumont Conference (held from 03/28/1962 to 04/07/1962). The second are the preliminary drafts of the 1967 article, written by Clower between 1965 and 1966. The analysis of these documents shows that the 1967 “Reconsideration” is rooted in Clower’s (1965) disequilibrium program of microfoundations. On the one hand, Clower’s (1965) criticism of Walrasian macroeconomics led him to question Patinkin’s integration of monetary and value theory. On the other hand, Clower’s (1965) disequilibrium interpretation of the *General Theory* was instrumental in shaping the 1967 microfoundations of monetary theory.

### 2.1 The 1965 criticism or how to challenge Patinkin’s monetary theory

By the late 1950s, Clower had two irons in the fire: to contribute in a critical and constructive way to the debate over monetary and value theory; and to provide disequilibrium microfoundations to Keynesian macroeconomics.<sup>17</sup> Since Patinkin made decisive contributions in these two fields of research, he became a preferred interlocutor during this period. In a letter sent in March 1962, Clower informed Patinkin that he had found an inconsistency between the microeconomics and the macroeconomics developed in *Money, Interest, and Prices*.<sup>18</sup> According to Clower, the demand functions used by Patinkin (1956) to address involuntary unemployment could not be deduced from Walrasian microfoundations. Clower argued that it was not possible to integrate income as an independent variable in workers’ demand functions. Indeed, income was supposed to be chosen by workers – after a consumption-leisure trade-off. Moreover, their standard optimization plans were always

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<sup>16</sup> Letter from Clower to Patinkin (11/10/1960). Patinkin’s Papers: Box 25, Rubenstein Rare Book and Manuscript Library.

<sup>17</sup> On the genesis of Clower’s (1965) disequilibrium program of microfoundations, see Plassard (2016).

<sup>18</sup> Letter from Clower to Patinkin (03/03/1962). D. Patinkin Papers, Box 25, Rubenstein Rare Book and Manuscript Library.

satisfied because of the tâtonnement hypothesis. Thus, realized income could not act as an additional constraint on workers' consumption plans in situation of involuntary unemployment. Clower concluded that there was an incompatibility between Walrasian microfoundations and Keynes' income analysis. This result was the heart of the 1965 paper.

In the letter, Clower used this criticism of Walrasian macroeconomics to question Patinkin's integration of monetary and value theory:

We all have our hobby horses, to be sure, but this one [the utility theory foundations of monetary theory] does not really fit too well with some of your other ideas – particularly the ideas adumbrated in the second half of your book on disequilibrium systems. [...] The very fact that you take initial money stocks as given, and income as given also, means that you are working with potential disequilibrium states for the consumer since, if you put factor services into the utility functions, and allow money balance to adjust over time, making balances a variable also, you immediately lose parameters and have to start dealing with more variables. But these variables are damned hard things to fit into general equilibrium models without getting classical conclusions (i.e., full equilibrium conclusion about full employment sales of factor services and full employment holdings of money balance). Then what can you say about the real balance effect? Note, in particular that you cannot legitimately put income into your demand functions in Part II of your book, if you suppose that individuals earn income from inside the system – for then income is not an independent variable.

The articulation between the 1965 argument and the criticism of Patinkin's integration of monetary and Walrasian value theory is not self-evident. Hence it is helpful to explain the quotation step-by-step. Clower accused Patinkin of focusing too much on the development of his foundations of monetary theory because that would not be in line with his disequilibrium interpretation of the *General Theory*. To explain why, Clower stressed a formal analogy between the integration of income and real balances as additional independent variables in individuals' demand functions. Clower probably considered that there would be undesired variations of the level of real balances in situations of disequilibrium. Thus, just as income, real balances would have to act as constraints on workers' consumption plans. But this was not possible under the tâtonnement hypothesis. Without rejecting this assumption, the

introduction of these variables would entail accepting full equilibrium conclusions. Accordingly, the real-balance effect would not properly account for the transmission of disequilibria from the monetary sector to the real sector of the economic system. Clower inferred that one fundamental pillar of Patinkin's monetary theory was faltering.

Later, Clower found a more decisive way to challenge Patinkin's integration of monetary and value theory. The criticism was presented in the 1967 article. It stressed the possibility of barter exchanges in Patinkin's framework. The analysis of the preliminary versions of the 1967 article suggests that this criticism was a side effect of Clower's charge against *tâtonnement* economics:

For we found the ultimate source of anomaly in contemporary monetary theory [...], *the failure of the traditional trading constraint to impose any restriction whatever on means of payment used to discharge trading obligations*. This is, after all, the economic meaning of 'tâtonnement', 'recontract', 'synchronized trading' to convert all forms of market trading into particular species of the genus *barter*.<sup>19</sup>

In the drafts, Clower pointed out that in *tâtonnement* models, "a market authority [was] presumed to synchronize purchases and sales to ensure continuous multilateral coincidence of wants between market participants". Individuals transmitted information on their consumption and production plans. The market authority ensured the coordination between those plans and then facilitated the realization of transactions. Under these assumptions, it was as if the market authority acted as a "bargaining agent" and a "distribution center" for all the individuals of the economic system. According to Clower, this conception of trading activity implied that individuals could either sell their labor or their money balances to buy goods. Yet, a model in which goods were indistinguishable from money as a source of purchasing power portrayed a barter economy, not a monetary economy. Therefore, *tâtonnement* models could not be used to account for the functioning of monetary economies.

## 2.2 The 1967 article as part of Clower's disequilibrium program of microfoundations

Clower came to conclude that just like the integration of Keynes' income analysis and value theory, the integration of monetary and value theory required rejecting the *tâtonnement* hypothesis and providing a choice-theoretic basis for disequilibrium systems. From there, it is

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<sup>19</sup> R.W. Clower Papers, Box 2, Rubenstein Rare Book and Manuscript Library.

a short step to show that the 1967 article was part of Clower's (1965) disequilibrium program of microfoundations. First, the 1967 article can be viewed as the result of Clower's search for disequilibrium microfoundations to monetary theory. During the Royaumont conference, Clower claimed that the introduction of money as a new variable would have been a second step in his disequilibrium program of microfoundations. He explained that he decided not to introduce money in his model to facilitate the exposition of the "dual-decision" hypothesis and of its implications. According to Clower, such a strategy was also adopted by Keynes (1936):

The essential character of the dual-decision process would come out more clearly if one did not get into asset-holding problems at the outset. Naturally, one must get into this kind of things in order to make sense of the complete Keynesian system [...] A model that included money without including income as an independent variable would hardly qualify as a Keynesian model, whereas a model with income and without money could be called Keynesian (as Keynes' argument in chapter 2 of the *General Theory* so clearly indicated (1965a: p. 305).

In 1964, in a review of Milton Friedman and Anna Schwartz's (1964) *Monetary History of the United States 1867-1960*, Clower repeated the need to shape disequilibrium foundations to monetary theory. This would have been a way to account for the kind of correlations between the stock of money and monetary income described in this statistical work (1964: p. 65). In that respect, Clower regretted that Friedman and Schwartz did not try to sketch the analytical framework underlying their statistical study:

But alas, except that Friedman and Schwartz display a moderate antipathy to Keynesian economics and nowhere worry seriously about possible direct effects of current market transactions on current demand and supply conditions, this line of argument cannot be sustained either – except by gross prejudice. The *shading* of the argument is in the direction claimed, but the *substance* is not (1964: p. 76).

Finally, in the preliminary drafts of the 1967 article, Clower explained that the dichotomized budget constraint emerged as a solution to explain how individuals behaved in a non-market clearing context:

There is just one way to rid ourselves of the [contemporary monetary] theory, and that is to reformulate established microeconomic analysis. Following Keynes, I shall consider an economy in which trading takes place more or less continuously whether or not demand is equal to supply in all markets. Moreover, I shall assume that just one commodity in the economy, namely money, can be traded for all other commodities. These specifications force us to regard buying and selling as essentially independent (even if simultaneous) activities [...] Desired earnings appear not as an element of purchasing power in (1) [the “expenditure constraint”] but simply as a possibly unrequited demand for income in (2) [the “income constraint”].<sup>20</sup>

In “contemporary monetary economics”, individuals were supposed to make optimal decisions on the quantity of goods to purchase ( $d_i$ ) and sell ( $s_i$ ), and on the quantity of money to transfer to the next market period  $M_j - \underline{M}_j$  (with  $M_j$  and  $\underline{M}_j$ , the desired and initial quantities of cash) under the following constraint:<sup>21</sup>

$$\sum_{i=1}^n p_i(d_{ij} - s_{ij}) + M_j - \underline{M}_j = 0 \quad (1)$$

According to Clower, the form of this budget constraint implied that the capacity of individual  $j$  to sell the good  $i$  was granted. In other words, individuals formulated their consumption plans by considering desired receipts as an element of purchasing power. However, when disequilibrium trading took place, such an assumption was no longer relevant. Individuals may not be able to sell what they had planned at the prevailing market prices. Accordingly, standard budget constraint had to be reformulated so as to break the direct link between prospective sales and prospective purchases. Clower’s idea was to consider buying and selling activities as independent activities. This resulted in the dichotomized budget constraint:

$$\left\{ \begin{array}{l} \sum_{i=1}^n p_i(d_{ij} - s_{ij}) + M_j - \underline{M}_j = 0, \quad \text{if } d_{ij} - s_{ij} \geq 0 \\ \sum_{i=1}^n p_i(d_{ij} - s_{ij}) + m_j = 0, \quad \text{if } d_{ij} - s_{ij} < 0 \end{array} \right. \quad (2)$$

<sup>20</sup> R.W. Clower Papers, Box 2, Rubenstein Rare Book and Manuscript Library.

<sup>21</sup> Both in the drafts and in the 1967 article, Clower used the label “contemporaneous monetary theory” to refer “specifically to O. Lange, *Price Flexibility and Employment* and Don Patinkin, *Money, Interest, and Prices*; but also to certain portions of Hicks’s *Value and Capital* and Samuelson’s *Foundations*” (1967: p. 81).



The “expenditure” branch of the budget constraint (2) asserted that in a monetary economy, demand was “effective if it [involved] a combination of desire with money purchasing power”; the “income” branch of the budget constraint (3) asserted that “intra-period receipts” ( $m_j$ ) were a demand for monetary income.<sup>22</sup>

From there, analytical arguments can be raised to emphasize the disequilibrium features of the 1967 microfoundations. First, the dichotomized budget constraint aimed to reproduce the logic of the “dual-decision” hypothesis. Assume that some individuals fail to sell the quantity of goods planned at the prevailing market prices. The “intra-period receipts” would be lower than the one planned. Because of that, the money balances that individuals sought to hold to finance their expenditures and to transfer money purchasing power from one market period to another would be also lower than the ones planned. Individuals would be therefore forced to recalculate new consumption plans, on the basis of their realized monetary income. This is the dual-decision process expounded in the “Counter-Revolution” paper. The only difference is that income constraints would appear after a delay depending on the quantity of money initially held by individuals.<sup>23</sup> Second, the way Clower sought to close his 1967 model aimed to leave room for involuntary unemployment.<sup>24</sup> This intention appears clearly in the preliminary drafts of the 1967 article:

To say that an unemployed man has an unsatisfied desire for money income makes sense. To suggest (as does traditional theory) that the same man has an unsatisfied desire for money seems not only senseless but silly. The point to emphasize is not verbal but substantive: transactors in a money economy are directly responsive to changes in actual as distinct from virtual income flows. This is *not* true in a money economy as it is in a barter system that  $p_1x_1 + p_2x_2 + p_3x_3 = 0$  for all admissible values of the variables, i.e., Walras’ law does not hold. What is true is the very different proposition  $p_1x_1 + p_2x_2 +$

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<sup>22</sup> R.W. Clower Papers, Box 2, Rubenstein Rare Book and Manuscript Library. The quotations can be found also in the 1967 article (p. 87).

<sup>23</sup> Clower supported this view in the course of the discussions held at the Royaumont Conference: “But if one had assets, the dual decision hypothesis would be relevant since, unless one supposed that assets somehow got replenished without getting purchased, a chronic gap between desired and actual factor sales would sooner or later force all assets to the zero level unless the gap was reflected instead in reduced demand for commodity flows” (1965a: p. 308).

<sup>24</sup> “As in established theory, the money value of the sum of all excess demands, including the excess demand for reservation money balances and for money income, is identically zero; hence a proposition analogous to what has come to be known as Walras’ law applies to transactor in a money as well as to transactors in a barter economy” (1967: p. 88).

$p_3x_3 - (\bar{y} - \underline{y}) = 0$ , i.e., commodities, valued at prevailing market prices, is identically equal to his unsatisfied desire for income. This proposition might be called Keynes' law to distinguish it from Walras' law, or Say's law, neither of which is valid for a money economy. Keynes of course does not state this proposition explicitly, but his discussion of involuntary unemployment in chapter II of the *General Theory* implies it. For the term differs from zero only if there is involuntary unemployment in Keynes' sense of the term.<sup>25</sup>

A charge against Lange's theory underlined the presentation of "Keynes' law". In Lange's (1945) perspective, depression was viewed as a long tâtonnement process during which both the labor market and the market for goods would have been in a situation of excess-supply because of an excess-demand in the money market (Goulven Rubin, 2011). In Clower's (1965) disequilibrium model, such a scenario could not happen. Since the tâtonnement hypothesis was rejected, it was necessary to make a distinction between "effective" demands (deduced from constrained optimization plans) and "notional" demands (deduced from standard optimization plans). For a purchase decision to be effective, individuals had to sell before. They needed to have a purchasing power. Thus, workers could not even express a demand for money if they did not have sold their labor before. They could express only an unsatisfied demand for monetary income in situation of involuntary unemployment.

To conclude, there are strong grounds for believing that the 1967 "Reconsideration" of Patinkin's microfoundations of monetary theory is rooted in Clower's (1965) disequilibrium interpretation of the *General Theory*. The results of the "Counter-Revolution" article can be used to explain both the 1967 criticism and the main features of the 1967 microfoundations. This raises the following issue. Since Clower (1965) required rejecting the Walrasian macroeconomics of Hicks (1939), Lange (1944), and Patinkin (1956), to what extent the 1967 proposals remained in Patinkin's program to integrate monetary and value theory?

### 3. An original reorientation in Patinkin's program to integrate monetary and value theory

Since Clower (1967) criticized the monetary theory developed in *Money, Interest, and Prices* and paved the way for an alternative class of models, it is often considered that his approach was part of an alternative tradition. Yet, in *Monetary Theory: Selected Readings* (1969),

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<sup>25</sup> R.W. Clower Papers, Box 2, Rubenstein Rare Book and Manuscript Library.

Clower never mentioned the alternative tradition allegedly embodied by Robertson (1933), Brunner (1951), and Tsiang (1966). Besides, analytical arguments show that Clower sought to reorient Patinkin's program, not to break with it. To make this point, it is necessary to outline the monetary theory contemplated by Clower. This reconstruction is based on the analysis of published and unpublished materials. Most of these materials were written by Clower after the 1967 article.

First, Clower (1969) inserted the "Reconsideration" article in the section devoted to the program opened by Patinkin (1956):

The selections of Part two sketch the story of this [Classical] dichotomy from its very origins to very recent times. The end – or apparent end – of the story is unfolded in the selections appearing in part three [in which both an extract from *Money, Interest, and Prices* and the 1967 paper are presented] and part four [titled "Monetary Theory and Keynesian economics" in which the 1965 paper is presented] (1969: p. 19).

Clower (1969) suggested that the reason why *Money, Interest, and Prices* and the "Reconsideration" paper took part in the same tradition was that the same kind of monetary theory was sought:

Looking at the problem of price behavior from a theoretical point of view, however, one finds it difficult to see how any significant role can be assigned to money in the long-run unless money is also assumed to play an important role in short-run events; and if money is assigned an important role in short-run economic analysis, then a *separate* long-run theory of money should not be necessary. Long-run conclusion should follow from short-run assumptions. However that may be, the fact is that until the appearance in 1936 of John Maynard Keynes' *General Theory of Employment, Interest, and Money*, most professional economists took it for granted that all economic problems of any practical importance could be adequately handled using established techniques of demand-and-supply analysis, thereby presupposing that money was as such a 'veil' in the short-run as it was in the long-run – for at no stage in pre-Keynesian economics was any serious attempt made to build peculiarly monetary assumptions into the micro-foundations of economic analysis (1969: p. 19).

Following in Keynes' footsteps, the goal would have been to formulate a non-dichotomous model, built from microeconomic behavior, and able to explain the dynamic of actual monetary economies so as to show the non-neutrality of money in the short-run without abandoning the neutrality proposition in the long-run.

Second, Clower kept advocating for a money-in-the-utility-foundation to monetary theory. In *Money, Interest, and Prices*, Patinkin considered that money displayed positive utility because of a stochastic payment system. It was assumed that individuals received their income and made their expenditure at different times during the Hicksian week. Therefore, individuals would have sought to hold money to make their payments. Clower rejected Patinkin's random payment process. In the preliminary drafts of the 1967 article, he argued that it "[involved] synchronization [of exchange] and [gave] completely artificial rationale to the theory of money". To explain the monetary nature of the market system, Clower assumed the existence of organized markets and considered that the activity of exchange was costly:

Widespread acceptance of a definition of money that emphasizes its role as a means of payment would be of little consequence were this changed perspective not associated with important advances in the theoretical understanding of market exchanges processes in the real world. Perhaps, the best way to approach this subject is to observe that the existence of organized markets in which certain commodities play an exclusive role as means of payment does not permit us to assert that there will exist a positive demand for such commodities for purposes of exchange. The most obvious way to get around this difficulty is to suppose that it costs each individual something in terms of time and efforts to engage in the activity of exchange (1971: p. 111).

Both in the 1969 book and in published papers, Clower (1968; 1970; 1971) stressed that the realization of transactions presupposed a degree of organization of trading activity. Clower assumed the existence of organized markets where individuals could acquire goods against money. Previously, individuals would have accepted to use money in transactions to reduce the costs of exchange. Because of the double coincidence of wants, Clower considered that it was costly to find a trading partner. The use of money would lower these costs. Accordingly, money yielded utility and so, could be introduced in utility functions.<sup>26</sup>

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<sup>26</sup> Note that when Clower (1967) expounded his optimization plan, real balances were introduced in the utility function (1967: p. 88).

Third and final point, Clower intended to modify, not to reject Patinkin's technology of exchange. In *Money, Interest, and Prices*, Patinkin used the Hicksian week. He assumed that individuals formulated their plans on Monday. Before midnight, a tâtonnement process ensured the coordination between individuals' plans. The rest of the week was devoted to the realization of transactions. In an unpublished manuscript written in 1971 "The Keynesian Paradigm: An Attempt at Reconstruction", Clower referred to an institutional apparatus close to the temporary equilibrium period. The differences with respect to Patinkin's technology of exchange were due to the rejection of the tâtonnement hypothesis:

The representative market specialist is assumed to act as a broker in exchange transactions among individuals. Specifically, the specialist is assumed to post at the end of each hour a money price at which he proposes to execute trades during the next hour. Individuals who wish to buy and sell units of any particular commodity then communicate unconditional purchase or sale orders to the specialist that are to be executed, if possible, at the price already posted. In general, quantities offered for sale at the posted price will not be equal to quantities demanded for purchase, so the specialist will not be able to execute all orders that are communicated to him during any given hour. If demand exceeds supply, he executes all sale orders. If supply exceeds demand, he executes all purchase orders. He then informs transactors of trades that have been completed, debits and credits appropriate cash accounts, and adjusts price in accordance with familiar rules (p.8).<sup>27</sup>

Clower had to rationalize the organization of exchanges in a non-tâtonnement framework. To do so, he assumed that individuals dealt with "market specialists" (i.e., traders), on independent markets. Each trader had to find the equilibrium price on his respective market without having information on the economic situation prevailing in other markets and without seeking to coordinate the economic activities of the entire system. Beyond this decentralization, Clower's technology of exchange was very close to the Hicksian week. On the one hand, Clower maintained a time slicing within the market period. Traders were supposed to set monetary prices at which transactions would take place thereafter. Of course, the posted price had no reason to clear the market. Under these circumstances, the short side of the market always dominated and traders modified the monetary price to remove

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<sup>27</sup> Robert W. Clower's Papers: Box 2, Rubenstein Rare Book and Manuscript Library.

discrepancies between supply and demand. On the other hand, traders were supposed to execute transactions. They gave information on the quantities effectively exchanged, ensured the deliveries of goods, and were supposed to debit and credit individuals' cash accounts.

To conclude, Clower reoriented Patinkin's (1956) integration strategy to provide microfoundations to monetary theory. Money was introduced in utility functions. But the procedure was not justified by the existence of a random payment process. Money yielded utility since there were transaction costs. Then, an institution set prices and rationalized the organization of exchange. But it was not the Walrasian auctioneer, who was supposed to know the set of individuals' excess-demands, to adjust the economy-wide price vector, and to authorize transactions only when all markets cleared. Clower assumed the existence of independent markets where traders set prices and organized monetary exchange in a non-tâtonnement context. This resulted in an original framework. From the beginning, Clower wanted to use "it to investigate U.S and British experience with problems of structural unemployment and inflation".<sup>28</sup> According to Clower, this required formalizing his disequilibrium monetary model and studying its stability properties. Next section discusses the theoretical challenges posed by this project.

#### 4. Disequilibrium or the challenges posed by Clower's microfoundations of monetary theory

The formalization of Clower's disequilibrium model was challenging. Clower identified a first challenge in "The Keynesian Paradigm: An Attempt at Reconstruction" (1971a): to model individuals' behavior out of equilibrium. As a reminder, individuals were supposed to decide on the quantity of stocks of commodities and money to hold as well as on the quantities purchased and sold. Under these circumstances, when disequilibrium trading took place, undesired variations of stocks would have implied that the choice-theoretic model "set additional side constraints relating changes in actual stocks of various commodities to realized purchases and sales" (p. 10). This would have resulted in "an extremely complex model of individual behavior" (p. 10). In "Reflections on the Keynesian Perplex" (1975), Clower identified a second challenge: to model traders' behavior, and in turn, market adjustment processes. Each trader was supposed to set prices "in response to his own

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<sup>28</sup> This quotation is taken from a research proposal written circa 1965. Its title was "Structural Unemployment and Inflation: A Study of Some Disequilibrium Properties of a Market Economy". R.W. Clower Papers, Box 5, Rubenstein Rare Book and Manuscript Library.

conception of the adequacy of his existing stocks in relation to present and prospective sales” (1975: p. 201). This resulted in a twofold difficulty: to consider a large quantity of variables including the “costs of holding inventories, costs incurred in adjusting prices, and expectations of future market conditions.” (1975: p. 201); and to account for the variety of price behavior occurring in markets (1975: p. 201).

Besides, Clower discussed the challenges posed by the study of money-type non-tâtonnement processes. In the 1971 manuscript, he argued that stability analyses:

so far proved to be almost impossibly difficult, partly because the analytical problems involved are so complex, partly because so few people have been working at the task and those few have not found it easy to decide just what kind of model specifications should be adopted (p. 12).

To study the functioning of disequilibrium systems, it was necessary to account for spillover effects. Typically, in situation of involuntary unemployment, workers’ inability to sell the quantity of labor desired implied revisions of consumption plans. This was the scenario expounded in the “Counter-Revolution” paper. When money was introduced, there was an additional difficulty. Clower (1971a) stressed that undesired variations of stocks and the resulting effects on the quantity purchased and sold had to be taken into account. This would make the formal study of non-clearing market dynamics too complex to be carried out. Beyond this technical difficulty, Clower (1971a) pointed out the lack of interest for disequilibrium dynamics. He argued that economists were much more interested in studying the equilibrium properties of the economic system than in analyzing its behavior out of equilibrium.<sup>29</sup> Accordingly, it was difficult to make any progress in the study of the dynamics of non-clearing markets. Clower added that it was all the more difficult to make progress since the dialogue between the few economists interested by disequilibrium issues was complicated.<sup>30</sup> There was too much diversity in the modeling of disequilibrium systems, or

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<sup>29</sup> Frank Hahn expressed a similar position to justify the development of non-tâtonnement models. In his presidential address to the Econometric Society, he stressed that “the study of equilibria alone [was] of no help in positive economic analysis. Yet, it [was] no exaggeration to say that the technically best work in the last twenty years [had] been precisely that” (Hahn, 1970: p. 12).

<sup>30</sup> Note that Clower closely followed the literature on non-tâtonnement models. In the archives, one can find repeated references to the models developed by Hirofumi Uzawa (1960), or Hahn and Takashi Negishi (1962). Besides, in a footnote of “Theoretical Foundations of Monetary Policy”, Clower (1971) accumulated few other references: “Thus far only limited progress has been made in this direction [the formal study of the dynamic of non-clearing markets]. Cf. Herschel Grossman, ‘Theories of Markets without Recontracting’ [...], Herschel Grossman, ‘A General Disequilibrium Model of Money and Income’ [...]; and Peter Frevert, ‘Disequilibrium in a

more generally, of decentralized economies. For instance, Clower (1971a) argued that he did not want to follow the approach of “Ostroy, Veendorp, Starr and others [that consisted in dealing] with marketless models in which trade [took] place between pairs of individuals on terms that [were] decided by individual bargaining” (p. 5). Moreover, in private correspondence, Clower repeatedly stressed the differences between “the disequilibrium models [...] of Negishi, Hahn and Uzawa [and] his own contribution [which implied] a redefined budget constraint that makes money enter the demand equations in a manner quite different from any other commodity”.<sup>31</sup>

In the end, Clower stuck to a stationary equilibrium analysis. Typically, he acknowledged that “transactions and other costs of market exchange should be introduced into microeconomic analysis via the formulation of an explicit dynamic model in which holdings of commodity and money inventories at any given point in time [were] a function of market purchases and sales” (1970: p. 427). But “conceptual and mathematical difficulties [were considered to be] too great, for it to be regarded as a practical possibility at the present time” (1970: p. 427). Therefore, he studied only the properties of “stationary solutions to implicit dynamical systems” (1970: p. 427). Besides, Clower’s approach remained informal when he sketched his disequilibrium model. Either in the 1971 manuscript or in “Reflections on the Keynesian Perplex” (1975), there was no formal description of traders’ behavior and of the market adjustment rules.

## Conclusion

My paper aimed to provide a detailed study of Clower’s (1967) project for monetary economics. The 1967 article seemed to come out of the blue. It was preceded by a few published contributions to monetary theory. And in none of them did Clower clarify his own conception of the foundations of monetary economics. Moreover, Clower never completed the monetary theory related to his 1967 microfoundations. To overcome these difficulties, the solution was to characterize the intellectual context from which Clower’s (1967) contribution emerged and to rebuild his project.

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Macroeconomic Model’ [...] Reference should also be made to recent (but as yet unpublished) work by Richard W. Ruppert and Robert Russel (‘Intermarket Spillover of Excess Demand and the Stability of Non-Tâtonnement Adjustment processes’), and by John Ledyard (‘Growth, Stability, and a Disequilibrium Action Process’) (1971: p. 112). Unfortunately, these papers were not published and I did not find them in Clower’s archives.

<sup>31</sup> Letter from Clower to an unidentified recipient (11/05/1968): Robert W. Clower’s Papers, Box 1, Rubenstein Rare Book and Manuscript Library.



Clower's 1967 microfoundations outlined a reorientation in Patinkin's program to integrate monetary and value theory. Initially, Clower was involved in Patinkin's controversy. In this context, he defended the validity of the "Classical" theory. Yet, Clower considered that Patinkin had identified the major gaps of "Classical" monetary economics as well as the proper framework for understanding the functioning of actual monetary economies. At that time, in a way, Clower had nothing to say about monetary economics that had not already been said by Patinkin (1956). The situation changed when Clower realized that Walrasian microfoundations were incompatible with Keynesian macroeconomics. This result led Clower to challenge the monetary theory expounded in *Money, Interest, and Prices*. In particular, Clower stressed that the model developed by Patinkin (1956) portrayed a barter economy because of the tâtonnement hypothesis. Since this assumption was a source of anomalies, its rejection and the formulation of a choice-theoretic basis for disequilibrium systems became the *sine qua non* of monetary theory. The 1967 article was the result of Clower's search for disequilibrium microfoundations to monetary theory. This search did not lead to the formulation of a complete model. Yet, the monetary theory contemplated by Clower was identified. Two results followed. First, Clower retained Patinkin's approach to monetary theory. Like Patinkin, Clower sought to provide a non-dichotomous monetary theory, based on sound microfoundations, and able to demonstrate the quantity propositions. To do so, Clower maintained the two pillars of Patinkin's integration, namely the introduction of money into utility functions and the real-balance effect. In this context, Clower dissociated himself from Patinkin because of his disequilibrium perspective. For instance, the Walrasian auctioneer was no longer supposed to perform the coordination of economic activities. Instead, Clower assumed the existence of "market specialists" who set prices and organized disequilibrium trading on independent markets. In short, Clower (1967) redirected Patinkin's program. There was no break with it. Second, the formalization of Clower's disequilibrium monetary model and the study of its stability properties posed challenges. On the one hand, Clower had to model how individuals revised their choices about the stocks to hold and the quantity to produce or consume in situation of disequilibrium, and how they interacted with "market specialists" on each market. On the other hand, Clower needed to face the technical difficulties posed by the formal study of disequilibrium dynamics. In the end, he did not meet these challenges. Consequently, he never completed his project to provide disequilibrium microfoundations to monetary theory.

Despite this failure, Clower's reconsideration of the integration of monetary and value theory found an echo. The need to formulate a decentralized model in which money mattered because of its role as a medium of exchange was inspiring for Ostroy. Ostroy acknowledged that "[Clower] was responsible for [his] interest in monetary theory"<sup>32</sup> while he was just a PhD candidate at Northwestern University.<sup>33</sup> Later, Ostroy played a decisive role in the emergence of search models, one of the most widely used approaches to monetary theory since the 1980s. Clower (1967) was also inspiring for Axel Leijonhufvud, when he was a PhD student at Northwestern University.<sup>34</sup> In the book based on his dissertation *On Keynesian Economics and the Economics of Keynes* (1968), Leijonhufvud welcomed Clower's (1967) "preliminary attack" on the "transaction structure", an "important" problem for monetary theory (1968: p. 90). Finally, Clower influenced the development of the field of money-type non-tâtonnement economics. In *General Competitive Analysis*, Kenneth J. Arrow and Hahn (1971) introduced money in a non-tâtonnement framework whilst acknowledging that "the discussion when a medium of exchange [was] present [owed] its point of departure to Clower" (p. 346). Therefore, Clower's (1967) influences extends well beyond Lucas (1980) and the cash-in-advance literature. Such a large sphere of influences is the mark of seminal ideas.

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<sup>32</sup> Letter from Ostroy to Clower, (12/02/1965): Robert W. Clower's Papers, Box 1, Rubenstein Rare Book and Manuscript Library.

<sup>33</sup> Ostroy received his PhD in economics at Northwestern University. His dissertation *Exchange as an Economic Activity* was defended in 1970.

<sup>34</sup> Clower was one of Leijonhufvud's PhD advisors.

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