Self-fulfilling Expectations and *The General Theory*

Colin Rogers*

> It might be more accurate, perhaps, to say that the rate of interest is a highly conventional, rather than a highly psychological phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be. *Any* level of interest which is accepted with sufficient conviction as likely to be durable *will* be durable... J. M. Keynes (1936, p. 203)

I Introduction

The quotation from *The General Theory* summarises the self-fulfilling expectations or bootstraps property of Keynes's liquidity preference theory that Hicks and Robertson, in particular, found so puzzling. Hicks (1939, p. 164) could not accept a bootstraps theory and Robertson (1966, p. 174) described it as a grin without a cat. However, recent developments in macroeconomics suggest that on this issue Keynes was ahead of his time. The macroeconomics of self-fulfilling expectations or bootstraps equilibria is back on the agenda (Farmer, 1993). Consequently, in the spirit of the theme of this symposium "Keynes: Past, Present and Future" this paper re-examines the model of *The General Theory* from the perspective of modern developments in the macroeconomics of self-fulfilling expectations.

This endeavour is motivated by several factors. First, the criticism by Hicks and Robertson of Keynes's 'bootstraps' theory of the rate of interest needs reassessment in the light of modern developments in the analysis of self-fulfilling expectations. Second, the model of *The General Theory* has a major role for expectations and uncertainty but these properties were either largely suppressed or treated as a licence for "anything goes" in previous interpretations. Finally, interest in self-fulfilling expectations arises because it offers a possible solution to the problems of indeterminacy and multiple equilibria thrown up by the application of the rational expectations hypothesis in many modern macroeconomic models (Scarth, 1996). These difficulties are similar in form to those that have afflicted attempts to set out the formal structure of Keynes's model in *The General Theory* and which have obscured attempts to interpret Keynes's principle of effective demand. As I have argued elsewhere, the liquidity preference theory of the rate of interest and its bootstraps property is central to the principle of effective demand (Rogers, 1989). This in turn suggests that the notion of self-fulfilling expectations equilibria is central to the theoretical model of *The General Theory*. That is the theme which will be explored in this article.

With that brief introduction the remainder of the article is arranged as follows. Section II provides a brief outline of the relationship between rational expectations and non-uniqueness of equilibrium. Global uniqueness and stability of equilibrium are the exceptions and not the norm even in Walrasian general equilibrium systems. The rational expectations hypothesis in models of multiple *stationary* equilibria opens the way for the analysis of *stationary* self-fulfilling expectations equilibria. Section III surveys conceptual issues raised by the analysis of self-fulfilling expectations or bootstraps equilibria. Section IV then sets out a static model of *The General Theory* to illustrate Keynes's concept of self-fulfilling expectations equilibrium and its relationship to the principle of effective demand.

II Rational expectations and non-uniqueness

In macroeconomics attention has been refocussed on the properties of self-fulfilling expectations equilibria by the rational expectations hypothesis. However, the problem lies much deeper than this and is not due solely to the rational expectations hypothesis. The rational expectations hypothesis has largely focussed attention on multiple *non-stationary* rational expectations equilibria (bubbles). However, this article is concerned with multiple *stationary* rational expectations equilibria.

Concern that rational expectations models readily produced multiple non-stationary equilibria has eventually focussed attention on a ubiquitous non-uniqueness property inherent in the Arrow-Debreu structure. The rational expectations hypothesis *per se* is not the cause of this non-uniqueness 'problem'. Non-uniqueness of equilibrium is inherent in the Arrow-Debreu approach to 'aggregate' economics *without* rational expectations. It is now understood as a result of the Sonnenscheim-Debreu-Mantel analysis that aggregate Arrow-Debreu systems cannot ensure global uniqueness and stability of *stationary* equilibrium (Kirman, 1989). The difficulty here is that even with strong individualistic assumptions it is not possible to generate a monotonic aggregate excess demand function. All that can be asserted is that the aggregate excess demand function is continuous, satisfies Walras's Law and is homogeneous of degree zero.

The source of the difficulty with aggregate Arrow-Debreu or Walrasian general equilibrium systems is identified by Kirman (1989, pp. 137-38) as the treatment of individuals as acting independently of each other.[1] To avoid the problem of non-uniqueness Kirman (1989, p. 138) suggests that it will be necessary "..to theorise in terms of groups who have collectively coherent behaviour". Thus even before the question of expectations arises the issue of collective coherent behaviour must be faced if the questions of global uniqueness and stability of equilibrium are to be addressed. Hence, despite the widespread practice to the contrary, macroeconomists have no basis in aggregate Walrasian theory for the belief in global uniqueness and stability of stationary equilibrium. As Kirman (1989, p. 137) explains:

> "However, if one examines carefully the terminology employed in the macroeconomic literature one constantly finds reference to 'the equilibrium' or 'the natural rate' and moreover a discussion as to how long the economy will take to return to equilibrium The underlying assumptions of uniqueness and stability are clear, yet as should be clear by now such assumptions have no theoretical justification."

The rational expectations hypothesis is related to the question of interdependence between agents because it is forced to address the issue once the claim to global uniqueness is given up. Hahn (1983, p. 228) summarises the situation as follows with respect to the Arrow-Debreu tradition:

> "In suitable circumstances [a rational expectations] equilibrium exists. But there may be many of them. This now raises the important point that I must have a view of which of the equilibria other agents think the economy is in before I can formulate "the true model"... In fact, having the true model will in general be quite insufficient to tell me what will be the case given any state of nature."

Farmer (1983) takes up this theme and argues that the traditional restriction of fundamentals to tastes, endowments and technology is not sufficient to model systems populated by smart agents. To close such systems in an analytical sense some information in addition to the relevant theory is required to explain how agents form expectations. What is required in addition is knowledge of agents 'belief' or forecast functions.

In other words, once we have multiplicity of stationary equilibria different forecasting rules may be rational (model consistent) so long as all agents use the same rule (and agents

know this). This set up leads to what is known as the 'average opinion' problem (Frydman and Phelps, 1983). If average opinion cannot be defined unambiguously equilibrium cannot be defined unambiguously either. In this context unless we know which equilibrium other agents have in mind it is not possible to define the relevant model on which rational (model consistent) expectations will be based. The average opinion problem leads naturally to an infinite regress if agents attempt to second guess 'average opinion'. As various commentators have noted Keynes (1936, 154-158) discusses the issue in terms of his beauty contest example which will be examined below. In technical terms this means that when agents take seriously the expectations of other agents a formal model becomes underidentified or underdetermined in the absence of agents' forecast function (Evans, 1983, p. 70). A solution to the average opinion problem requires some knowledge of the existing belief or forecast function.

The fundamental non-uniqueness problem outlined above must however, be distinguished from another form of non-uniqueness problem commonly encountered in the rational expectations literature. Ignoring the point that the rational expectations hypothesis does not prescribe the relevant economic theory so differences of opinion may emanate from this source, multiple *non-stationary* rational expectations equilibria may arise as a consequence of the rational expectations hypothesis in several circumstances. Within each theoretical tradition or model it is possible that the introduction of forward looking expectations (expectations of the values of future variables) more detailed dynamics (eg, additional lags) or the timing of information availability to different groups in the economy will generate a type of non-uniqueness problem (Scarth 1996 p. 105). This type of non-uniqueness issue relates to *non-stationary equilibria* or bubbles and should be distinguished from the multiple *stationary equilibria* discussed by Kirman (1989).

This form of the non-uniqueness issue arises naturally, for example, in the application of the method of undetermined coefficients in deriving equilibrium solutions under rational expectations. The method relies on conjectures about the appropriate reduced forms but there are no generally agreed principles which constrain these conjectures. A similar conclusion emerges with respect to the inclusion of forward looking expectations. Models with forward looking expectations require transversality conditions which may be more or less plausible. Attempts by McCallum (1983) to provide some guidelines to eliminate multiple nonstationary rational expectations equilibria appear to others as arbitrary or unconvincing (Scarth, 1996, p. 117; Hoover, 1988, p. 119). As many forecasters and modellers have lagged values of endogenous variables to capture persistence or inertia in observed time series it seems inevitable that the conjectured reduced forms will imply non-uniqueness of adjustment paths as the rule rather than the exception. Presumably forward-looking expectations are the rule rather than the exception which also suggests that the issue is of general rather than special significance.

To sum up, although there are differences of opinion about the significance of multiple non-stationary rational expectations equilibria it seems that there is little dispute that the analytical techniques developed for the analysis has enriched the macroeconomists' tool kit and broadened their understanding of stability in a world populated by smart agents. By contrast the relationship between rational expectations and the existence of multiple *stationary* equilibria has been, until recently, relatively neglected. It is the existence of multiple stationary equilibria that are of interest for the analysis of self-fulfilling expectations.

III Self-fulfilling expectations equilibria

The formal treatment of self-fulfilling expectations is in its infancy and has been conducted largely within the confines of the Arrow-Debreu tradition (Farmer, 1993). Nevertheless there is no reason why the principles involved should be so confined (Scarth,

1996). To provide some insight into the issues this section will briefly outline the analysis of self-fulfilling expectations equilibria.

This section takes up some of the points raised in the previous section beginning with the question of non-uniqueness and the average opinion problem. Following Frydman and Phelps (1983) the analysis is presented in the context of the solution to an orthodox aggregate demand and supply model under rational expectations. The semi- or pseudo- reduced form for the price level (or inflation rate) of such a model has the form:

$$P_t = \alpha M_t + \beta E_{t-1} P_t + u_t \tag{1}$$

Note that this model takes for granted the uniqueness of stationary long-run equilibrium despite the fact that there is no theoretical basis for such a belief within aggregate Walrasian general equilibrium theory. The tacit acceptance of uniqueness does, however, make life easy under rational expectations. Under the rational expectations hypothesis the usual method of solution is to solve for the endogenous variable $E_{t-1}P_t$ by running the expectations operator through (1) and substituting the result back into (1). In this case the result is:

$$P_t = \alpha M_t + \phi E_{t-1} M_t + u_t \tag{2}$$

where $\phi = 1/(1-\beta)$ and the law of iterated expectations is applied trivially to $E_{t-1}(E_{t-1}P_t)$. This approach produces a 'proper' reduced form for the price level in terms of exogenous and pre-determined variables only. However, as Frydman and Phelps (1983, p. 7) and Hahn (1983) among others stress, this method only works if "...there is perceived and actual unanimity of beliefs across all agents in the model being analysed by the economist." If stationary multiple equilibria exist or if agents interpret policy changes and announcements differently it is necessary to take account of the expectations of other agents. Agents cannot be treated as if they act independently. In that case, even if each agent knows and uses the relevant model that is not sufficient.

The general expectation of P_t based on (1) would appear as: (Evans, 1983 and Frydman and Phelps 1983, p.9):

$$E_{t-1}P_t = \omega E_{t-1} M_t + \theta E^2_{t-1} P_t + \kappa u_t \tag{3}$$

If multiple stationary equilibria exist it is necessary to know in addition to the model what average opinion expects; that is the terms $E_{t-1}M_t$ and $E^2_{t-1}P_t$ are not so easily dealt with when unanimity cannot be taken for granted. For example, expression (3) suggests that if multiple stationary equilibria exist, or if the authorities change monetary policy, it will be necessary in either case for agents to make an estimate (guess?) of average opinion. In the case of a monetary policy switch agents must estimate $E_{t-1}M_t$ while in the case of multiple equilibria the law of iterated expectations cannot be applied until agents know which equilibrium other agents base their expectations on[2]. In that case they must estimate $E^2_{t-1}P_t$ from some other source. In either case the possibility of an infinite regress emerges if agents attempt to fathom what average opinion expects average opinion to be. Phelps (1983, p. 35) draws attention to the similarity between this situation and Keynes' (1936., p. 158) discussion of the beauty context:

> It is not just a case of choosing those which, to the best of one's judgement are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences

to anticipating what average opinion expects average opinion to be. And there are some, I believe, who practice the fourth, fifth and higher degrees.

The average opinion problem illustrates the point that under plausible circumstances knowledge of the model is not sufficient to determine a rational expectations equilibrium and that some additional information about expectations formation is required. There is no way of knowing *a priori* what dominates the two expectations terms on the RHS of expression (3) without some knowledge of what Farmer (1993) calls existing belief functions. Without this information the model is under-dertermined. As Phelps (1983, p. 37) suggests it seems reasonable to conclude that social habits, conventions and institutions may play a role in providing the underlying belief function and limiting the possibility of an infinite regress. That was indeed a suggestion made by Keynes and it will be taken up again in the next section.

Self-fulfilling expectations equilibria arise quite naturally in the context of rational expectations models with multiple stationary equilibria. If multiple stationary equilibria are possible then it is rational for any agent to base expectations on a particular equilibrium so long as all other agents do so. The point has been illustrated by Scarth (1995, pp. 118-120) using an extension of McCallum's (1980) model of costly output adjustment.

This model generates an aggregate price setting equation which can be combined with a traditional aggregate demand curve to illustrate the existence of a self-fulfilling expectations equilibrium based on "nonfundamentals". "Non-fundamentals' mean in this case that the model does not achieve its natural rate of output. The aggregate price setting equation is given by:

$$E_{t-1}(p_t^*) = p_t - (1-\Omega)(p_{t-1} - p_{t-1}^*) \tag{4}$$

and the aggregate demand curve is:

$$y_t = \theta(\bar{m} - p_t) + v_t \tag{5}$$

All variables are in logarithms and for simplicity units are chosen so that the logarithm of the natural rate of output and the money supply are zero[3]. To close the model it is necessary to define how agents form their expectations about p^*. The expectation based on fundamentals would select a value for p^* consistent with the natural rate of output so that $y_t = y_n = 0$ in expression (5) thus $p_t^* = v_t / \theta$. Alternatively agents may focus on the steady state value of $p_t^* = 0$ but in this case the structure of the model indicates that the natural rate of output will not be attained so it can be said that the equilibrium is based on "nonfundamentals'. However, as Scarth (1995, p. 119, italics added) stresses: "There is nothing implausible about [either option]...either rule is rational for an individual *as long as all other individuals forecast the average opinion of the market price in the same way*".

Once it is known which of the forecast rules is operative the solution to the model is determined and we have a simple illustration of the idea of stationary self-fulfilling expectations equilibria. Another interesting feature about this result is that Scarth goes on to show that the variances for both y_t and p_t are smaller under the "nonfundamentals" solution. Results such as these make it difficult to reject the argument due to Farmer that "the belief structure of private agents is part of the fundamentals- somewhat like tastes and technology- so that economists should study the several equilibria rather than search for some rationale to treat all but one as inadmissible" (Scarth, 1996, p. 122).

IV Keynes's analysis of self-fulfilling expectations equilibria

The previous sections outlined how the rational expectations hypothesis has focussed attention on the role that self-fulfilling expectations can play in equilibrium analysis once the question of multiple stationary equilibria is taken seriously. As we might have expected the idea of self-fulfilling expectations has been around for some time. For example, Woodford (1991, p. 77) notes that Lavington (1921) and other contemporary English monetary theorists made use of the idea to explain the business cycle. Consequently its appearance in *The General Theory* is not entirely novel. What is novel about the model of *The General Theory* is the idea of a stationary self-fulfilling expectations *equilibrium*. As I have argued elsewhere, *The General Theory* is not primarily concerned with the business cycle; its primary concern is with the existence of a long-period unemployment equilibrium (Rogers, 1996). From the perspective of this paper Keynes appears to argue for the existence of multiple stationary self-fulfilling expectations equilibria[4].

The have been many attempts to set out the model of *The General Theory* and I do not propose to add to that list. Instead, the model considered here introduces some minor refinements to version developed by Meltzer (1988). The model presented by Meltzer is selected because it appears to me to get closest to the theoretical structure presented by Keynes in a readily recognisable model. In addition the model incorporates expectations and implicitly sets out the concept of a self-fulfilling expectations equilibrium. There is very little new that needs to be added to Meltzer's structure to illustrate the points relevant to this paper.

The model presented by Meltzer (1988) consists of three equations, an IS curve, an LM curve and an aggregate supply curve;

$$Y / W = A[i^e(u), r, E; K] \qquad \text{IS} \qquad (6)$$

$$Y / W = L[i^e(u), M / W] \qquad \text{LM} \qquad (7)$$

$$P = Z[W, Y / W; K] \qquad \text{AS} \qquad (8)$$

This version of Keynes's static model differs only slightly from that presented by Meltzer in that in distinguishes between the marginal efficiency of capital, r, and the expected nominal rate of interest, $i^e(u)$[5]. This distinction is central to the principle of effective demand which is, surprisingly, overlooked by Meltzer. The other variables are defined as follows; Y/W is nominal income in wage units, while E refers to what Keynes called the state of long term expectations. The capital stock is denoted by K while M refers to the money supply. The variable u stands for the state of uncertainty while P is the price level. It should be stressed that equations (6) to (8) refer to a *laissez faire* economy whose essential characteristic is the private control of investment. In Keynes's model government is assumed to have no role in investment.

Inspection of the model reveals that it is obviously under-determined. There are only three equations to determine nine variables, $Y, W, P, M, K, i^e(u), r$, u, and E. Keynes treats W, M and K as predetermined and assuming a given state of uncertainty, u, long-term expectations, E, are also held constant. But that still leaves three equations to determine four variables; Y, P, r and $i^e(u)$. Keynes's solution to this question reveals: (a) that he was proposing what amounts to a self-fulfilling expectations equilibrium, and; (b) the principle of effective demand is consistent with that concept of equilibrium. Keynes treats $i^e(u)$ as an independent variable and relates E and $i^e(u)$ in bootstraps fashion. Equilibrium exists when $i^e(u) = r$; the marginal efficiency of capital adjusts to the expected nominal rate of interest.

The key element in Keynes's scheme is the treatment of $i^e(u)$ as an independent variable to be explained by the 'belief functions' in the financial sector. The expected nominal rate of interest is an independent variable determined by interaction between the monetary

authorities and the expectations of agents in financial markets about its appropriate level. Once such views are widely accepted the expected nominal rate of interest becomes 'durable'. Expectations become self-fulfilling and as noted in the previous section forecasting rules become rational so long as all agents use the same rule. The basis for this analysis of the rate of interest rests of Keynes's rejection of the existence of a unique natural rate of interest as generated by the forces of productivity and thrift.

In *The General Theory* Keynes's replaces the Wicksellian concept of the natural rate with the marginal efficiency of capital and reverses the direction of causation between the expected nominal rate of interest and the marginal efficiency of capital. Keynes argues that in a monetary system the liquidity premium on money determines the risk free rate of return to which the marginal efficiencies of other assets must adjust if they are to be produced at a profit. Given a durable expected nominal rate of interest equilibrium is established by equality between the expected nominal rate of interest and the marginal efficiency of capital. In other words, when expressed in Marshallian terminology, investment was pushed to the point at which the demand price of capital goods equals the long-period supply price (Rogers, 1989). In such equilibria the marginal efficiency of capital collapses to what looks like Wicksell's natural rate but in Keynes's (1936, p. 242) scheme there are many such natural rates dependent on the level of the expected nominal rate of interest:

> "In my *Treatise on Money* I defined what purported to be a unique rate of interest, which I called the *natural rate* of interest - namely, the rate of interest which, in the terminology of my *Treatise*, preserved equality between the rate of saving (as there defined) and the rate of investment.....I had, however, overlooked the fact that in any given society there is, on this definition, a *different* natural rate of interest for each hypothetical level of employment. And, similarly, for every rate of interest there is a level of employment for which that rate is the 'natural rate, in the sense that the system will be in equilibrium with that rate of interest and that level of employment. Thus it was a mistake to speak of *the* natural rate of interest....I had not then understood that, in certain conditions, the system could be in equilibrium with less than full employment."

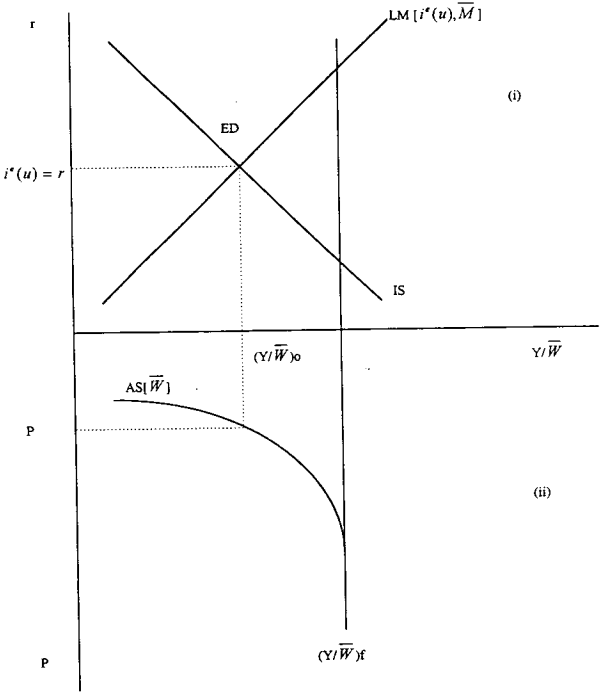
Once such a durable equilibrium has become established the condition $i'(u) = r$ determines the point of effective demand beyond which it is not profitable to expand production. Any attempt to do so would drive demand prices below supply prices and entrepreneurs would make losses. Say's Law fails; supply does not create its own demand in Keynes's world of bootstraps equilibria. In Keynes's model the endogenous variables are Y, P and r and the equilibrium solution is illustrated in Figure 1.

This is the essence of the principle of effective demand and the source of Keynes's unemployment equilibrium that has eluded Keynesian economists for so long. One obvious reason for the failure of Keynesian economists to get to grips with the principle of effective demand is that it only emerges when the possibility of bootstraps or self-fulfilling equilibria are taken seriously. That has not been the case until recently. The bootstraps perspective is enlightening because it reveals clearly that the crucial nominal rigidity in Keynes's system is not the money wage (a view now generally accepted) but the *expected* nominal rate of interest.

Keynes (1936, p. 204) continues the quotation which opened this paper by noting that although the rate of interest may fluctuate:

> ".... it may fluctuate for decades about a level which is chronically too high for full employment; - particularly if it is the prevailing opinion that the rate of interest is self-adjusting, so that the level established by convention is thought to be rooted in objective grounds much stronger than convention -the failure of employment to attain an optimum level being in no way associated, in the

FIGURE 1


r
LM [$i^e(u), \overline{M}$]
(i)
ED
$i^e(u) = r$
IS
$(Y/\overline{W})o$
$Y/\overline{W}$
AS[$\overline{W}$]
P
(ii)
P
$(Y/\overline{W})f$

minds either of the public or the authority, with the prevalence of an inappropriate range of rates of interest."

Following Meltzer (1988, p. 175) the self-fulfilling expectations property of Keynes's equilibria is easily demonstrated. The expected nominal rate of interest, $i^e(u)$ can be treated as a function of expected real money balances (in wage units) and the state of long term expectations:

$$i^e(u) = i[(M/W)^e; E]. \tag{9}$$

However, it is also the case that long-term expectations are a function of expected real money balances and the expected nominal rate of interest, Meltzer (1988, p. 175):

$$E = E[(M/W)^e; i^e(u)] \tag{10}$$

As both M and W are treated a given by Keynes in the static model the circular relationship between E and $i^e(u)$ clearly reflects the bootstraps or self-fulfilling expectations property of Keynes's equilibrium that so offended Hicks and Robertson. Meltzer (1988, p. 175) notes this property of Keynes's analysis by quoting the lines at the head of this paper about the durability of the expected rate of interest.

Meltzer goes on to note that although we can think of Keynes's treatment of expectations as model consistent they are not entirely independent or objective because: "People try to find out what others are doing". In other words Keynes's treatment of expectations also involves what Frydman and Phelps call the average opinion problem. In Keynes's model without the unique natural rate of interest agents have no objective way of determining the 'correct' value of the expected nominal rate of interest. Hence, as losses may be incurred by deviating too far from average opinion- because that will determine the outcome- agents seek to shadow average opinion. To assist them in that endeavour Keynes's argued that rational agents relied on widely held conventions and rules of thumb - what Farmer (1993) now calls 'belief functions'.

Keynes's model is illustrated in Figure 1 which can be used to relate the self-fulfilling expectations property of the equilibrium to explain some of the other main features of *The General Theory*. In panel (i) The position of the *LM* curve is determined by the level of the expected nominal rate of interest given the money supply M. Keynes's is somewhat ambivalent about the status of M but probably treated it as given to focus attention on the causal role of the expected nominal rate of interest. Given the state of long-term expectations and uncertainty in the financial sector the state of liquidity preference determines the position of the demand for money schedule. The self-fulfilling property of expectations ensures the durability of the expected nominal rate of interest. The expected nominal rate of interest then determines the point of effective demand as the marginal efficiency of capital adjusts to equality with it. Point ED in panel (i) represents the point of effective demand beyond which it is not profitable for entrepreneurs to expand production. But the level of output $(Y/W)o$ is not sufficient to employ the labour force. In Marshallian terms the economy is in a long-period unemployment equilibrium. The demand prices of goods equals their long-period supply prices and entrepreneurs have no incentive to expand output and employment (Rogers, 1989). Self-fulfilling expectations can destroy Say's Law.

The argument so far deals with the question of the existence of a self-fulfilling expectations equilibrium in a static context. What about the issues of stability or persistence? How is it possible for an unemployment equilibrium to persist? Keynes suggests that in the absence of outside intervention a sub-optimal level of activity could last for decades. But

surely, falling wages and prices via the Keynes's and Pigou effects would move the system back to full employment equilibrium in the long run?

To answer this question it is necessary to move beyond the static model and consider the question of dynamic adjustment in Keynes's system. The effective operation of Keynes and Pigou effects is not completely ruled out in Keynes's model but the probability of a successful adjustment is considerably diminished. In Keynes's model the consequences of price and wage flexibility are far more complex than in the simple classical world. For flexible wages and prices to restore or achieve full employment in Keynes's model they must operate so as to produce a point of effective demand consistent with full employment. To do that they must automatically change perceptions so that the self-fulfilling expectations equilibrium is consistent with full employment. That is no easy task. (See Rogers, 1997 for a more comprehensive discussion).

In particular, wage stability is important for the stability of the system as a whole. In Keynes's system the aggregate supply curve is dependent on the historically determined level of money wages and from expressions (9) and (10) it is apparent that the expected level of money wages plays an important role in the determination of the expected nominal rate of interest. The durability of the expected nominal rate of interest rests on the stability of long-term expectations and thus the level of money. Stability in the level of money wages is essential to the determination of any equilibrium - be it full or unemployment - in Keynes's system. The fact that Keynes's is postulating a self-fulfilling expectations equilibrium means that changes to key variables in the underlying belief functions may raise doubts about the reliability of those functions or conventions and make for a period of chronic instability.

Without the stability of money wages and prices it is not possible to pin down expected long-period supply-prices (the position of the AS curve in Figure 1) or the expected nominal rate of interest. In this sense Keynes's model is based on a wage standard. Nevertheless, assuming that wages do fall in the face of unemployment this would indeed increase the real money supply measured in wage units which would tend to lower the market rate of interest. However, this may increase uncertainty which in turn increases liquidity preference which may in turn cause an *increase* in the expected nominal rate of interest (Meltzer (1988, 174)):

> "Changes in nominal values are capable of temporarily changing the actual level of output, but they do not change the expectations that dominate $[i^e(u)]$ and the equilibrium level of output. On the contrary, frequent changes in W may raise $[i^e(u)]$ by increasing price level volatility [GT, p. 267, 269]."

Thus the key question to answer when assessing changes in Keynes's system is: How do these changes impact on the underlying belief functions and, consequently, what happens to the point of effective demand? There is no automatic mechanism in Keynes's model which ensures that flexibility in nominal magnitudes will impact on the underlying belief functions so that the point of effective demand coincides with full employment in the long run. Keynes's world of bootstraps equilibrium cannot be made self-adjusting to full employment equilibrium by nominal wage and price flexibility.

V Concluding remarks

If non-uniqueness of stationary equilibrium is the norm rather than the exception in aggregate economies populated by smart agents then it seems that the question of self-fulfilling expectations must be taken seriously as some theorists have recently argued. From the perspective of *The General Theory* this is welcome if belated news and would come as no surprise to Keynes. It has been argued in that the durable unemployment equilibrium proposed

by Keynes in *The General Theory* is an equilibrium of this type and many of the theoretical puzzles that have bedevilled Keynesian scholars are swept away once it is recognised.

* Department of Economics, University of Adelaide, GPO Box 498, Adelaide, SA 5005.

Notes

1 Problems of non-uniqueness or multiple equilibria also arise within the Arrow Debreu tradition when markets are incomplete. Markets may be incomplete because agents are not born when they are open (incomplete participation) or because the number of securities that agents may use to transfer income between periods is less than the states of nature. Under the latter circumstances it is not possible to produce a single life cycle budget constraint. Consequently, multiple versions of Walras's Law and equilibria can result. Farmer (1993) provides a useful overview of the issues.

2 Frydman and Phelps (1983) discuss this case in some detail.

3 The parameter Ω depends on the costs that firms incur when output differs from its natural level. See Scarth (1996, p. 118) for details.

4 On the question of multiple equilibria I differ from Meltzer (1988).

5 The general form of the marginal efficiency of capital should be written as, $r^e(u)$, to indicate that it is also a forward-looking variable which depends on the state of uncertainty and the state of long-term expectations. However, in long-period (stationary) equilibrium $r^e(u)=r$ (Rogers, 1989). For present purposes that is all that is required of the marginal efficiency of capital.

References

Evans, G. (1989) The Stability of Rational Expectations in Macroeconomic Models, in Frydman, R. and Phelps, E. S. (eds) *Individual Forecasting and Aggregate Outcomes*, Cambridge, Cambridge University Press.

Farmer, R. E. A. (1993) *The Macroeconomics of Self-fulfilling Prophecies*, Cambridge, Massachusetts, MIT Press.

Frydman, R. and Phelps, E. S. (eds) (1983) *Individual Forecasting and Aggregate Outcomes*, Cambridge, Cambridge University Press.

Hahn, F. (1983) Comment, in Frydman, R. and Phelps, E. S. (eds) *Individual Forecasting and Aggregate Outcomes*, Cambridge, Cambridge University Press.

Hicks, J. R. (1939) *Value and Capital*, Oxford, Clarendon Press.

Hoover, K. D. (1988) *The New Classical Macroeconomics* , Oxford, Blackwell.

Kirman, A. (1989) The Intrinsic Limits to Modern Economic Theory: The Emperor has no Clothes, *Economic Journal*, Conference Proceedings, 99, 126-139.

Lavington, F. (1921) *The English Capital Market*, London, Metheun

McCallum, B. T. (1980) "Rational Expectations and Macroeconomic Stabilization Policy: An Overview", *Journal of Money Credit and Banking*, 12, 716-746.

McCallum, B. T. (1983) "On the Non-uniqueness in Rational Expectations Models: An Attempt at Perspective", *Journal of Monetary Economics*, 11, 137-167.

Meltzer, A. (1988) *Keynes's Monetary Theory: A Different Interpretation*, Cambridge, Cambridge University Press.

Robertson, D. (1966) *Essays in Money and Interest*, London, Fontana.

Rogers, C. (1989) *Money, Interest and Capital*, Cambridge, Cambridge University Press.

Rogers, C. (1996) "The General Theory: Existence of a Monetary Long-period Unemployment Equilibrium", in *The Second Edition of The General Theory*, edited by Riach, P. and Harcourt, G. C., London, Routledge.

Rogers, C. (1997) Post Keynesian Monetary Theory and the Principle of Effective Demand in *Money, Financial Markets and Macroeconomics*, edited by A. Cohen, H. Hagemann and J. Smithin, Kluwer.

Scarth, W. M. (1996) *Macroeconomics: Introduction to Advanced Methods*, (second edition) Toronto, Harcourt, Brace and Company.

Woodford, M. (1991) Self-fulfilling Expectations and Fluctuations in Aggregate Demand, in Mankiw, N. G. and Romer, D. (eds) *New Keynesian Economics*, Massachusetts, MIT Press.