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RATIONAL EXPECTATIONS AND NEW CLASSICAL MACROECONOMICS

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1. Introduction: The Phillips-Curve

The Keynesian-Hicksian IS-LM model of macroeconomics has some trouble finding an explanation for wage and price movements. The relationship between unemployment and wage or price changes known as the Phillips curve seemed to provide the missing equation in the standard macroeconomic model (cf. Phillips 1958). One implication was that a trade-off between employment and price stability was possible, that more employment could be 'bought' at the price of more inflation. However, Milton Friedman (1969) and E.S. Phelps (1971) soon put a damper on those propagating active macroeconomic policies. Friedman introduced the concept of the Natural Rate of Unemployment (NRU), as an analogue to Knut Wicksell's natural rate of interest. At NRU, a kind of Walrasian equilibrium prevails, which allows for unemployment of the structural and frictional varieties, but excludes Keynesian unemployment following from deficient demand. For all practical purposes, NRU means full employment. Starting from NRU, unemployment can indeed be reduced in Friedman's view by expansive macro-economic (monetary and/or fiscal) policies, but only for a comparatively short time (a few quarters). Higher aggregate demand drives prices up. Employers perceive better market conditions and hire more labour. Workers interpret rising wage offers as relative wage increases and supply more labour. After a time people understand that nominal wage and price increases do not mean real wage or relative price increases, and employment and GNP return to their NRU values, though at a higher rate of inflation. People take account of expected inflation. The wage equation representing the Phillips-curve:

\[ W = a_0 + a_1 U \]  

was extended by an argument representing expected price increases:

\[ W = a_0 + a_1 U + a_2 P^* \]  

with \( W \) = wage rate, \( U \) = rate of unemployment, \( P \) = price level; a dot denotes rates of change and an asterisk denotes expected values.

In Friedman's view, economic agents do not suffer from money illusion, i.e., they will not, if full information is available, confuse nominal with real movements. Thus, \( P^* \) will converge to \( W \) (abstracting all the time from productivity increases) and \( a_2 = 1 \). NRU, i.e., the equilibrium value of \( U \), therefore is

\[ \text{NRU} = - \frac{a_0}{a_1} \]  

Demand-management measures induce a movement along a short-term Phillips-curve which is followed by a move of the short-term Phillips-curve. That move occurs when expectations adjust. The short-term curves all cut the long-term Phillips-curve, which runs vertical at NRU.

Phelps's reasoning differs only slightly from Friedman's. In Phelps's island parable workers may accept work at a certain wage rate on their own island, but may also row to other islands in order to collect information on wages prevailing there. They weigh up the income foregone if they spend time on collecting information and the additional future earnings that may be the fruit of their search activities. Unlike Friedman's workers, who increase their labour supply if (perceived) real wages rise, Phelps's workers simply seek the highest wages at which they can work a given number of hours a week. Like Friedman's
workers, they will first mistake increased nominal wage offers following from an expansionary impulse for better relative wage offers (in Friedman's case: better real wage offers) and cut short their search activities. When the higher nominal wage turns out to be a lower relative wage, they (or rather some of them) start rowing again and unemployment returns to NRU.

In the Friedman-Phelps story, unemployment is voluntary, it is search unemployment or frictional unemployment (barring structural unemployment of workers whose marginal productivity is too low to ever find work). It would be suboptimal, from a welfare-theoretic point of view, to try to reduce unemployment below NRU. A reduction can only be brought about by deceiving workers. It is another thing to reduce NRU itself, by removing frictions on the labour market, such as incomplete job information, minimum wage laws and housing controls (which impede regional mobility).

Restrictive macro-economic policies should in principle work out in the same way: a temporary reduction of employment and real production, followed by a return to NRU at a lower rate of inflation. Similarly, random shocks should not set in motion deviation-amplifying mechanisms. This implies that markets work satisfactorily. If not, there is a possibility that a positive shock works as explained by Friedman and Phelps, whilst a negative shock may lead to protracted unemployment, which in this case is of the involuntary variety. Even so, the lasting contribution by Friedman and Phelps is that expectations receive a systematic treatment in economic theory. Their emphasis on adaptive expectations can be seen as one manifestation of a more general rule that says that any empirically established economic relationship (in this case the short-term Phillips-curve) breaks down when policy makers try to exploit it (Goodhart's law).

2. Rational expectations and New Classical Macroeconomics

The logic of Friedman's adaptive expectations implies that unemployment can be held below NRU at the cost of ever-increasing inflation, because with adaptive expectations, i.e., a weighted average of past and current inflation rates, expected wage or price rises lag actual increases and people continue to overestimate their relative or real income:

\[ E_t P_{t+1} - E_{t-1} P_t = b(P_t - E_{t-1} P_t) \quad 0 < b < 1 \]  

(4)

\( E \) is the expectational operator, subscripts denote periods.

But rational economic agents will notice that their forecasts are systematically wrong. They will take account of the ever-increasing inflation and not stick with adaptive expectations once they understand how the economy really works (cf Friedman 1976 pp. 230-31). This idea of rationality builds on a 1961 article by Muth, who proposed that expectations are "essentially the same as the predictions of the relevant economic theory" (Muth 1961 p. 315). His hypothesis was, more precisely, that "expectations of firms (or, more generally, the subjective probability distribution of outcomes) tend to be distributed, for the same information set, about the prediction of the theory (or the 'objective' probability distribution of outcomes)" (Muth 1961 p. 316). Predictions may be wide off the mark, but they are not systematically wrong. In other words, errors are not serially correlated.

Muth applied the concept of Rational Expectations (henceforth RE) to speculative behaviour and to the cobweb cycle. It has since with more or less success been applied to single markets, such as the foreign exchange market (see the chapter on Exchange Rate Determination, below). Lucas (1972) introduced the idea into macroeconomics. In a macroeconomic setting, the Phillips-curve has been reinterpreted as a supply function - which was sorely missing in the IS-LM
framework - and RE plus this supply function coupled to the idea of continuous market clearing gave New Classical Macroeconomics (NCME). NCME (a misnomer, according to Niehans, 1987, because classical economics was quite something else) was first used to outdo Friedman and other monetarists in their stand against policy activism. Though governments would be wise, in the monetarist view, not to exploit the short-term Phillips-curve trade-off between inflation and employment, because they would as likely as not intensify cyclical movements instead of counteracting them, it is in principle not impossible for them to affect real variables, such as employment and production. NCME went one better and denied that governments could systematically affect real variables. Tobin therefore coined the term 'Monetarism, Mark II' for NCME (Tobin 1980 p. xiii).

3. Policy-ineffectiveness

3.1 Monetary policy

NCME started out emphasising the ineffectiveness of stabilisation policies, first of all of monetary policy. It has later been argued by NCME proponents that this neutrality proposition had been overemphasised and that they never intended to take it seriously but meant to show that monetary policy measures may have quite different effects than one would expect under non-rational expectations (Sargent in Klamer 1984 p. 70, Minford 1986 p. 327). A common point of departure is the so-called Lucas supply function (here in a form that Minford and Peel 1981 call the Sargent-Wallace aggregate supply function):

\[ y^*_t = y_n + a_1 (P_t - E_{t-1} P_t) + u_{1,t}, \quad a_1 > 0 \]  

(5)

where \( y^*_t \) denotes real output at time \( t \), \( y_n \) the natural rate of output, corresponding with NRU, \( P_t \) the price level at time \( t \) and \( u_{1,t} \) is a serially uncorrelated random disturbance with mean zero. All magnitudes are expressed in logs.

Essentially, equation (5) is a reformulation of the Phillips curve. If actual prices equal expected prices, unemployment is at NRU and production is at its 'natural' level, apart from random disturbances. The economy is on the long-term, vertical Phillips curve. When price surprises occur, i.e., actual prices differ from expected prices, output differs from its natural level, as in Friedman and Phelps's microeconomic approaches.

The supply function is complemented by an aggregate demand function:

\[ y^d_t = M_t - P_t + u_{2,t} \]  

(6)

where \( y^d \) denotes the log of aggregate real demand.

If goods markets clear, \( y^*_t = y^d_t \) and \( P_t \) can be solved from equations (5) and (6):

\[ P_t = (M_t + a_1 E_{t-1} P_t - y_n)/(1 + a_1) \]  

(7)

We now introduce rational expectations. First assume that the money supply is known to be held constant or to follow a fixed rule, such that \( E_{t-1} M_t = M_t \). Given that \( E_{t-1} u_{1,t} = 0 \) and \( E_{t-t} u_{2,t} = 0 \), the rational expectation of \( P_t \) in period \( t - 1 \) is

\[ E_{t-1} P_t = (M_t + a_1 E_{t-1} P_t - y_n)/(1 + a_1) \]  

(8)

Combining equations (7) and (8), we find that
\[ P_t - E_{t-1} P_t = (u_{2,t} - u_{1,t})/(1 + a_i) \]  

or, in words, that deviations of actual prices from expected prices are completely random; and so are deviations of output from its 'natural' level, as shown by equation (5).

We now assume that the monetary authorities resort to an activist monetary policy. They decide to follow a proportional feedback rule, increasing the money supply when output falls short of the natural level and decreasing it when output exceeds the natural level:

\[ M_t = M_n + a_2(y_{t-1} - y_n) + u_{3,t} \]  

\[ M_n \] is the trend value of the money supply. An error term is added because the authorities are assumed not to be able to completely control the money supply.

With rational expectations, economic actors will lose little time in finding out what rule the authorities are following. At the end of period \( t - 1 \) they will form a rational expectation of the money supply in period \( t \):

\[ E_{t-1} M_t = M_n + a_2(y_{t-1} - y_n) \]  

Substituting equation (11) in equation (6) and taking expectations, we find that

\[ E_{t-1} P_t = [M_n + a_2(y_{t-1} - y_n) + a_1 E_{t-1} P_t - y_n]/(1 + a_i) \]  

and

\[ P_t - E_{t-1} P_t = (-u_{1,t} + u_{2,t} + u_{3,t})/(1 + a_i) \]  

Because economic actors take account of the monetary policy rule, prices do not systematically deviate from expected prices and monetary policy does not systematically affect real variables. The monetary authorities can only influence real output and employment by engineering surprise shocks in money growth. The more frequently they change their policy rule, the less easily the public is moved to revise its decisions. There may exist a short-term Phillips-curve after all, but it tends to disappear if the authorities try to exploit it. The more often the authorities change the money supply rule, the less easily will the public be fooled and the more vertical will the short-term Phillips-curve run (see Lucas 1973).

Strictly speaking, there is little sense in monetary policy as depicted above, because disturbances are not serially correlated. Measures taken to correct an output shock in one period only take effect in the next one. Nevertheless, the example serves to show that monetary policy cannot bring unemployment systematically below NRU. This is as well, because NRU represents a kind of macro-equilibrium and a systematically lower rate of unemployment requires economic agents to be deceived, which can hardly be optimal. It is another thing if policy can help to reduce fluctuations.

### 3.2. Policy effectiveness under NCME

NCME does not rule out a positive contribution of monetary policy to economic stabilisation. First of all, the authorities may have prior knowledge of economic disturbances. The measures they take will then have real effects. But an informational advantage really makes a weak case for active policy making. Either the information will be available to the public without much delay (Grossman 1980 p. 13, Wagner 1981 p. 5) or the authorities could make the information freely
available (McCallum 1980a p. 43).

It has been shown that slight modifications to the model discussed above may suffice to give the authorities the opportunity to reduce output fluctuations, at the cost of an increase in price fluctuations. Asako (1982), e.g., developed a model where current prices and expected future prices are mutually dependent, while expected future prices also depend on the money-supply rule. Current supply and demand depend upon the difference between current prices and expected future prices. Different money supply rules then result in different values for the variance of output. In non-linear models, the authorities can even influence the average value of output and employment: if they are able to manipulate the variance of the difference between actual and expected prices, and output depends in a non-linear way upon this difference, average output is affected by the money supply rule (cf Shiller 1978 p. 10, Snower 1984).

In an open economy with fixed exchange rates macroeconomic policies are bound to be non-neutral, even if they were expected by the public. This is because at least one price, the price of tradeables, is not free to move with the domestic price level. For a small country, this price is even fixed. An expected increase in the money supply will increase the nominal demand for both tradeables and nontradeables, driving up the price of nontradeables in the process. Production of nontradeables will increase and production of tradeables will fall as producers of nontradeables draw workers away from the tradeables industries. Nominal wages will rise in terms of tradeables and fall in terms of nontradeables (otherwise equilibrium on the labour market could not be maintained). When the aggregate price level is not very sensitive to the price of nontradeables, and nominal wage demands therefore do not rise to a great extent when nontradeables prices increase, aggregate employment may rise, provided labour demand in the nontradeables sector reacts relatively strongly to a fall in the product wage (nominal wage level relative to the price of the product of the industry) and labour demand in the tradeables sector is relatively insensitive to an increase in the product wage (cf Montiel 1987).

3.3. Fiscal policy

The discussion on the effectiveness of macro-economic stabilisation policies has tended to concentrate on monetary policy. After all, fiscal policies can hardly be neutral, as they affect on the one side government expenditure and therefore the system's demand functions, and on the other side tax rates and therefore labour supply and savings or the supply of loanable funds. For another thing, automatic stabilisers work automatically and are not dependent for their effectiveness on an informational advantage on the part of the authorities. Tax receipts, e.g., react automatically to variations in sales. Consequently, by varying the characteristics of the built-in stabilisers the authorities can influence output variability.

3.4. Superneutrality

Even if macroeconomic stabilisation measures were ineffective, policy measures might bear on the long-term growth path of the economy. A change in the rate of money growth and the concomitant change in the rate of inflation may affect investment by virtue of the Tobin or Mundell-Tobin effect (cf Tobin 1965, Mundell 1963, Mundell 1971 Ch. 2). Higher inflation, e.g., makes holding real capital more attractive relative to holding money. Investment is stimulated and per capita production increases. This effect can be included in rational expectations models by making the demand for capital an increasing function not only of the expected real return on capital but also of the expected rate of inflation (cf Fischer 1979). Alternatively, a real-balance effect can be introduced in the
consumption function. Higher inflation will induce people to reduce their real balances, which in turn affects consumption and in its wake the desired capital stock and therefore investment (McCallum 1980b pp. 727-'27, Begg 1982 pp. 147-'49). In case the long-term growth is not affected, there is superneruality. Superneruality is even less probable with fiscal policy, for the reasons mentioned.

4. Non-clearing markets and policy effectiveness

If markets are not assumed to clear continuously, i.e., if NCME is not maintained, policy effectiveness need not at all be impaired by RE. Some form of price stickiness is called for. One way of achieving this is to introduce contracts that fix prices or wages for a period during which the monetary authorities can react to new information. The public can then perfectly well forecast what policies the authorities will follow but, being bound by contracts, is not able to react to these policies.

A case in point is a model developed by Fischer (1977) in which at the end of each period new wage contracts are drawn up for one half of the work force for the next two periods. There is some serial correlation in disturbances, which means that policy measures that take effect only next period still make sense. The variability of output and employment can be reduced in this way. In a linear model mean levels of real variables cannot be reduced, as that would still imply that workers would be fooled, which they will only accept for the duration of the contracts. Repeated attempts to fool them would be answered by a revision of the contracts.

In another model, developed by Phelps and Taylor (1977), prices and wages are fixed before the money supply is decided upon. Inventories carry disturbances from one period to the next. Monetary policy thus is both possible and useful. In cases such as these, it is not true that a fixed money supply rule is optimal when the expectations of the public are rational, nor is it true that monetary policy which follows a feed-back rule is only optimal when the public's expectations are not rational (see for such a proposition Korteweg 1976 p. 500).

Admittedly models have been built where stabilisation policy is ineffective, even without instantaneous market clearing (McCallum 1977, McCafferty 1982). This can be seen as a testimony of the ingenuity of model builders, but not much more. Of more importance is the question why agents should conclude such contracts in the first place. This problem is tackled in section 7 below.

In a model with asset holdings monetary policy will generally be non-neutral, even with continuous clearing of all markets. Unforeseen price movements change the real value of nominally denominated government assets, provided they are considered to be net wealth (Minford 1986 p. 231). As for private debt, distribution effects may occur, i.e., creditors and debtors may react asymmetrically to changes in the real value of debt consequent upon unexpected price level changes.

5. Business cycles

A remarkable feat of NCME has been the construction of models that purport to explain business cycles within the framework of continuously clearing markets. If markets clear continually, business cycle movements imply cyclical movements of equilibrium output and employment. One might try to explain these movements by introducing exogenous shocks, such as technological changes (which make marginal productivity curves and labour demand move) and changing preferences as to consumption and leisure (which makes labour supply move). But, as Tobin (1980 p. 37, 1981 p. 37) notes, there is no reason why such moves should be auto-
A problem with multilateral business cycle models, apart from the fact that

imputed returns to prices of capital goods and consumption goods

led to a decline in the rate of interest. As a consequence, business cycles are caused by fluctuations

P. 179 in 1947, p. 173. In 1947, business cycles are caused by fluctuations

of course, constitute the measures of interest rates and the

production of goods, as well as the production of consumption goods, or both. This mechanism to reappear in domestic one

and to produce or consume goods, are caused by fluctuations in the level of business cycles. They have to be based on these mechanisms; the business cycles

and changes in the general level of consumption, reappear in domestic one

prices and quantities that characterize the business cycle.


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involuntary unemployment is denied, is that they do generate positive serial
correlation in consumption and production, as happens in real-world cycles, but
that they fail to generate positive serial correlation in investment (Dotsey and
King 1988 p. 5). Another very serious problem for empirical testing of the NCME
hypothesis is that with lagged income in the aggregate supply function it tends
to become observationally equivalent with Keynesian models.

6. Empirical implications of NCME

In equilibrium business cycle models, fluctuations in employment are not
deviations from NRU, but movements of NRU, apart from random disturbances. Darby
(1976) for the US and Benjamin and Kochin (1979 a, b, 1982) for the UK did not
hesitate to draw the conclusion that the unemployment of the 1930s was nothing to
worry about. Darby rested his case on a post-war finding that the government
spending multiplier was very small over a period of two or three years. In other
words, the five to seven per cent of the labour force employed in public
construction work in the US between 1934 to 1940 and officially counted as
unemployed, would in his view have been employed by private enterprise had the
government not taken them on. But of course the real government spending
multiplier can hardly be anything else than near-zero in a near-full-employment
economy as existed for large periods in the post-war era. This finding is totally
irrelevant for the 1930s. Moreover, even not counting those on public
construction work, unemployment was abnormally high (never lower than 9.2 per
cent, reached in 1937, as against 14.3 per cent including those on relief work, using
the same data as Darby).

Benjamin and Kochin argue that, had the British unemployment insurance
system in the interbellum been no more generous than it was in 1913, official
unemployment would have averaged seven per cent instead of fourteen. Without
denying that unemployment benefits may have played a role, it must be said that
Benjamin and Kochin seem to neglect the severity of the qualifications for
receiving benefits and to over-estimate the attractiveness of being on the dole
(cf Metcalf, Nickell and Floros 1982 pp. 387-393) whilst, moreover, their results
were not very robust (Ormerod and Worwisk 1982, Collins 1982). What is more,
Benjamin and Kochin do not allow for demand effects in their research strategy,
though those effects seem to explain British unemployment in the interbellum
quite satisfactorily (Broadberry 1983, Hatton 1983).

It is impossible to review the literature on empirical testing of RE and
NCME here. We will just give an idea of what is involved in such tests. For
expectations to be rational they must be both efficient and consistent.
Expectations are efficient if one-period forecasts and realisations share a
common autoregressive pattern:

\[ X_t = \sum_{i=1}^{n} a_i X_{t-i} + u_{1,t} \]

\[ E_{t-1} X_t = \sum_{i=1}^{n} b_i X_{t-i} + u_{2,t} \]

Efficiency requires that \( a_i = b_i \) for all \( i \), which means that expectations should
be generated by the same process that generates the variable to be forecast.
Otherwise, expectations are biased. Forecasts are consistent if the multiperiod
forecasts are obtained recursively, with the rational forecasts being substituted
for the as yet unobserved realisation of the series. On top of that, rationality
requires orthogonality, i.e., absence of serial correlation of forecast errors u
with known past errors. Using inflation expectations data from surveys held over a long period by J. Livingston, Pesando (1975) found that the information used in the six-month forecasts was not applied consistently to generate twelve-month forecasts. It was also found, not only by Pesando but by others researchers as well, that agents made systematic forecast errors (see Carlson and Parkin 1975, Sheffrin 1983 pp. 17-23; an update of Carlson and Parkin by Batchelor and Orr 1988, however, was inconclusive). The outcome on orthogonality was mixed (Batchelor and Orr 1988). Similar results have been found for interest-rate forecasts (B.M. Friedman 1980).

Rational expectations have been very extensively applied in models of financial markets. The idea is that markets are efficient, which means that expectations are rational and arbitrage is quick. In other words, frictions are minimal and all available information is rapidly reflected in prices. See on this the chapter on exchange rates.

One upshot of RE and NCME is that expected changes in money growth affect the rate of inflation, whilst unexpected changes first of all affect real variables. Tests based on this idea have been reasonably positive for NCME, see Wogin (1980) for Canada 1927-'72, Attfield, Demery and Duck (1981) for the UK 1963-'78, Barro (1977, 1978) for the US 1941-'73, Bomhoff (1979 Ch. 4) for the Netherlands 1953-'76. Less positive results, however, have been reported by Barro and Rush (1980) for the US 1941-1980 and negative results by Driscoll, Ford, Mullineux and Sen (1983) for the UK over the post-war period through 1979 and Paleologos (1986) for post-war Greece. In such tests much depends of course on the way expectations are modelled. Apart from that, there is the problem of observational equivalence, i.e., the fact that the time series are compatible with several rival theories (cf Sargent 1976, see for an especially lucid discussion of the econometric issues involved Attfield, Demery and Duck 1985).

If anticipated changes in money growth only affect the rate of inflation, it should be possible to reduce inflation by means of a restrictive monetary policy without serious side-effects in the form of unemployment. Eckstein (1981) concluded from simulations with the 800-equation DRI-model (from Data Resources, Inc) for the US that there is great resistance of factor prices to demand management, including monetary policy. It appeared that changes in long-term expectations take time (Eckstein 1981 pp. 60-62, 79). Gradual price adjustment was also reported by Gordon (1982) for the US, 1890-1980. This might explain why disinflation policies in the US starting in 1979 (cf Mankiw 1986 p. 218), in Britain under Mrs Thatcher, also starting in 1979 (cf Attfield, Demery and Duck 1985 pp. 195-'97), and in Chile under Pinochet after 1973 (cf Corbo and de Melo 1987) initially caused a sharp rise in unemployment. The public possibly first sits back to see if the government’s policy is credible, i.e., will not be reversed.

7. NCME and market clearing

NCME imposes not only RE but also continuously clearing markets. We have seen above that initially policy ineffectiveness was postulated but that it was later admitted that this idea was oversold. Shocks may cause multi-period deviations from trend output and employment. This could, however, be explained without abandoning the continuous-clearing postulate. Continuous market clearing seems hard to defend, though. We have already cited evidence of gradual price adjustment. It has been emphasised that some degree of price stickiness may be preferable for both sellers and buyers. Okun stressed the fact that continuous market clearing implies the universality of organised auction markets, resembling Walras's model. Such markets can only exist for products that are standardised and can be viewed as homogeneous by a prospective buyer who places orders through a broker. Markets for other products, heterogeneous goods, are search or customer markets. Sellers in these markets are price makers and,
Therefore, quantity takers. A demand shock will initially alter quantities and leave prices unchanged. Sellers have an incentive not to change prices too frequently. They have a kind of implicit contract with their customers. Shopping is costly. If customers can be sure of the prices advertised by their suppliers, they will return for repeat buys. With frequent price adjustments, customers will spend more time shopping around, so it is in the interest of both seller and buyer to enter into an implicit contract (Okun 1981 Ch. 4).

Nominal wage rigidities can be explained by the costs of changing nominal wages or of indexation (Corden 1987 p. 173, Minford 1986 p. 321). Nonetheless, if inflation is high and variable, indexation clauses are likely to be included in wage contracts and contracts will have a shorter duration. Imperfect information may be more important in practice, as emphasized by New Keynesian economists (cf. Greenwald and Stiglitz 1987 pp. 123-15), who follow in Okun’s steps (Okun 1981 Ch. III). They point to such facts as the imperfect information that employers have about employees and the costs of taking on new personnel. It may be preferable from the point of view of maximizing profits to boost the morale of the workforce that is employed by the firm by keeping wages high rather than taking on people who are willing to supply labour at a lower wage. The cost of selection procedures and also that of training of new personnel is far from negligible. For employees, searching for other jobs may be costly (see, apart from Okun, also Hahn 1980 p. 288).

Empirical evidence of sticky prices, apart from the study by Gordon mentioned above, was found by Silverston (1973) and Rotemberg (1982). Sticky wages and prices were found by Gordon (1983) for post-war USA, but not for post-war Britain and Japan. Carlton (1986) studied individual transactions price data collected by G. Stigler and J. Kindahl and found that prices can be quite rigid, prices to individual buyers in some industries remaining constant for several years. Price rigidity was positively correlated with the degree of concentration in the industry concerned.

The above implies that that unemployed workers may offer their labour services below the going wage rate and still be refused employment. Employers may quite rationally prefer to hire at a fixed wage and ration the posts offered. In other words, there are quantity constraints and the system does not function like a Walrasian general-equilibrium system where all agents are price takers and the auctioneer makes sure that an optimum is found. Nor would it do to introduce non-market-clearing and retain the other aspects of the Walrasian model (Lucas 1987 Ch. 5). That model does not admit of involuntary unemployed remaining unemployed even though they offer their labour services at a rate below the going market rate. It only determines hours of employment and wages, neglecting quits and fires.

In the goods markets there are quantity constraints as well. In the real world firms are price setters who set output targets on the basis of expected sales. Deviations of output from trend result from faulty sales forecasts, not from incorrect price expectations, as in NCME models (cf Forman 1980 p. 38). Furthermore, in the real world communication and coordination between markets is time-consuming and costly (Gordon 1981 p. 526). Decisions made in one market during one period may only affect other markets during the next period, and economic agents in any one market are constrained by conditions prevailing in other markets which lack the flexibility of Walrasian markets. Firms may be unable to lower their selling prices at short notice after a negative demand shock, for instance, because their suppliers will only after a lapse of time be willing to adjust the prices of inputs. A demand shock therefore first affects quantities and only after a period of time will prices react. In such a non-NCME world stabilisation policies may be quite effective. Rational expectations are not precluded and may even strengthen the effectiveness of stabilisation measures. Agents may, e.g., hold that with a higher money stock the demand for goods will be higher. Higher expected demand for the next period may improve employment expectations for the next period, depress savings for the current period and in
that way increase demand and employment for the current period. There is in that case not a unique RE equilibrium (cf Hahn 1982, Tobin 1980 p. 45; see Begg 1982 section 6.4 and Neary and Stiglitz 1983 for models in this vein).

Arguably real monetary economies are characterised by the very properties that NCME leaves out, such as transaction costs, apart from information costs to some degree, and economies of scale that preclude perfect competition. Essentially, NCME models, often one-good models, describe a world where money is inessential. They have to rely on quite improbable suppositions to explain economic fluctuations. Neither firms nor workers are likely to confuse price level and relative price movements for other than restricted periods or small changes. The Friedman-Phelps approach and the Lucas supply function are not well-founded.

8. Rational expectations: positive contributions and problems

The RE hypothesis has a lot going for it. RE as such do not imply policy ineffectiveness (as we have seen, not even NCME precludes policy effectiveness). RE have, though, brought home the fact that expectations concerning policy measures affect the outcome of those measures. This led Lucas (1976) to make short shrift of econometric model simulations of economic policy measures. He argued that, as agents take account of the government's policy, the structural parameters of the model cannot be assumed to be stable. The logic of this Lucas critique seems unassailable. More generally, RE have made us aware that models where economic agents make systematic mistakes offer unexploited opportunities for profit making. This runs counter to economic insights and intuition.

Still, the applicability of RE seems restricted. RE presuppose a 'true' probability distribution of outcomes which is known by agents. This means that it only fits situations characterised by Knightian risk, not uncertainty, i.e., recurring stochastic processes (Lucas 1977 p. 15). One might try to 'rescue' RE by introducing subjective or Bayesian probability, but different people may hold widely diverging beliefs about the future, whilst RE models usually postulate identical beliefs about probability distributions of future events (Bray 1985 p. 167). This does, however, not seriously handicap RE in comparison with other suppositions. It is a universal problem. There is no way to get rid of Keynes's 'dark forces of time and ignorance' (Keynes 1936 p. 161).

If, because of unforeseen shocks, the structural parameters of the system change, it seems reasonable to expect a learning period during which agents assemble information about the new structure. In that case we are back with a kind of adaptive expectations (B.M. Friedman 1979 p. 36, Stijnen 1980 p. 92). It is not of the naive adaptive kind, though, where agents make systematic errors of the kind described by Milton Friedman in his attack on the idea of a long-term Phillips-type trade-off between inflation and employment. An obvious case is when a new government announces that it will reverse the pernicious policies of its predecessor. Especially when similar policy intentions in the past only paved the way to hell, as so often happens with good intentions, agents will tend to adopt a wait-and-see attitude first. Only after it has become clear that a new regime, e.g. a liberalised foreign-trade regime, is there to stay, investors will change their behaviour accordingly and, in this case, move from import-competing industries to export industries.

In the course of a learning process, economic agents take decisions based on incomplete information, i.e., a false model of the system, and in that way make the system itself change. Convergence to a RE equilibrium requires agents to improve their forecasts faster than the model changes (Runde and Torr 1985). There are some obstacles standing in the way of the implied feedback. It often takes considerable time before the outcome of a decision is known and then it may be difficult to attribute it to a particular action, and there is often no information about what would have happened had other decisions been taken.
(Tversky and Kahneman 1986 p. S274). Another thing is that some models admit of multiple equilibria, as noted earlier (section 3.2, above). Optimism and pessimism may be self-fulfilling (Fischer 1988 p. 325), which opens the way for government policies. This is the case when the values of today's endogenous variables depend on today's expectations of tomorrow's exogenous variables (see for such a model the chapter on exchange rates). Again, this is not peculiar to RE models, but an inescapable feature of dynamic models with expectations as to the future. To complicate matters, agents may quite rationally expect other agents not to base their decisions on so-called market fundamentals, such as real growth, money growth and interest rates, and base their own decisions on those expected decisions by others. This opens up the possibility of rational speculative bubbles, a subject more pursued in the literature on RE in financial markets than in RE macromodels. We will return to it in the chapter on exchange rates. Finally, there is disturbing evidence from psychological tests that people judge the likelihood of a future event by its similarity to current events, ignoring both prior information and the quality of current evidence (e.g., sample size) and underestimating uncertainties (A. Tversky and D. Kahneman, cited by Arrow 1982 p. 5). Also, it was found that alternative descriptions of a problem often influence decisions (Tversky and Kahnemann 1986 p. S251).

It seems fair to conclude that NCME neglects some of the basic features of a monetary economy, but that RE have a useful, though limited role to play, e.g., in providing a research strategy for some kinds of markets.
This chapter is a rewritten version of Visser 1984.

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