

INFORMATION AND EXPECTATIONS IN POLICY-MAKING: FRIEDMAN'S CHANGING APPROACHES TO MACROECONOMIC DYNAMICS

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Information and Expectations in Policy-Making: Friedman's Changing Approaches to Macroeconomic Dynamics

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Abstract

The paper shows how Friedman gradually came to incorporate the expectations formation process in his account of macroeconomic disequilibria. It is shown that Friedman's early Monetarism relies on slowly adjusting prices and wages, mainly because of long-term contracts. When he first addressed the expectations issue in his work macroeconomic dynamics Friedman actually considered *static* expectations. In the mid-1960s his anticipationist critique of the Phillips curve led Friedman to place at the centre of the analysis the idea that private agents progressively adjust their forecasts to a new informational environment. Nevertheless, adaptive expectations involve backward-looking behaviour regarding the price structure, without taking account of the probable effect of discretionary policy on the economy in the future; hence economic agents make systematic forecasting errors. Friedman eventually considered forward-looking behaviour in the 1970s but stopped short of fully embracing the rational expectations approach to economic policy. In Friedman's later Monetarism there is an echo of Friedman's early joint work with Savage regarding attitudes towards risk based on the subjective probability approach. But this is the residual outcome of a very lengthy process.

Keywords: Friedman, adaptive expectations, rational expectations, static expectations, dynamics, monetary economy.

JEL codes: B22, B31

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1. Introduction

With some economists one can read off their views on uncertainty and probability from their particular practices. This is precisely the case with Keynes, whose policy writings directly build upon his theory of the decision-making process under uncertainty that he developed in his *Treatise on Probability* (1921).² By contrast, it seems to us that in the case of Friedman there is a much more tenuous relationship between his basic practices in monetary macroeconomics and his early work with Savage, based on the subjective probability approach (Friedman and Savage 1948, 1952). Accordingly, our purpose is to show how Friedman gradually came to incorporate the expectations formation process in his account of macroeconomic disequilibria. Our basic aim is to argue that if in Friedman's later Monetarism there remains the reminiscence of Friedman's early joint work with Savage, this is the incidental outcome of a very lengthy process.

To make our case we proceed chronologically through all of Friedman's relevant publications. The next part of the paper is dedicated to Friedman's early works in monetary economics (1948-63), which showed no sign of connection with his arguments concerning attitudes towards risk. As we will see, Friedman's early macroeconomics mostly relied on nominal rigidities and inelasticities in price expectations driven by backward-looking behaviour. Section 3 of the paper highlights Friedman's shift towards the role played by expectations in macroeconomic dynamics when he came to elaborate his expectational critique of the Phillips curve, paying little attention to the expectations formation process (1966-72). In the last part of the paper we investigate the way in which Friedman moved progressively towards a specific treatment of the expectations formation process in his account of macroeconomic disturbances (1975-82). At the beginning of the rational expectations revolution, Friedman appeared somewhat sympathetic to this approach, while being cautious at both the theoretical level (because Friedman's macroeconomics was based on lags and delays) and at the policy level (because a rational expectations approach to policy-making based on the effect of 'surprises' was likely to undermine Friedman's special case for a monetary policy rule stated as a constant rate of growth in money supply). We also show that Friedman ended up with a much more critical stance towards rational expectations in the early 1980s, together with a late but explicit acknowledgement of Savage's use of 'personal probability' in his own research agenda.

² See Carabelli (2003), Carabelli and De Vecchi (2001), Rivot (2011, 2013a).

2. The young Friedman on macro-disequilibria and expectations: nominal rigidities and static expectations (1948-63)

A contemporary reader has mixed feelings when reviewing Friedman's first writings. Hirsch and de Marchi (1990) consider the 1942-1943 writings as "the early origins of Friedman's anti-Keynesianism" (Hirsch and de Marchi 1990, p. 187). Nelson (2009) also identifies significant elements of Friedman's Monetarism well before his paper from 1956.³ Lothian and Tavlas (2018) make the same case in arguing that Friedman, but also Schwartz, ceased holding Keynesian-type views in the middle of the 1940s.⁴

In our view, there is a more balanced view regarding Friedman's early Monetarism in the late 40s. To a certain extent it is the 'Keynesian flavour' of these writings that is striking - especially if the Keynes of *How Pay to the War* (1940, CW 9) is kept in mind (Rivot 2013b). Even Friedman's "Monetary and Fiscal Framework for Economic Stability" (1948) is very close to the Keynesian kind of stabilisation device that was fashionable at the time. While a 100 per cent reserve scheme for the banking system would eliminate the private creation of money, the transfer expenditures programme considered by Friedman would allow "absolute outlays [to] vary automatically over the cycle. They will tend to be high when unemployment is high and low when unemployment is low" (Friedman [1948] 1953, p. 137). Clearly, the aim of Friedman's 1948 policy scheme was to use the government's fiscal position to change the money supply so that money was the prime stabilisation device. But Friedman's proposal implies that public spending automatically adjusts to other components of aggregate demand, which echoes the Keynesian kinds of automatic stabilisers scheme

³ The points of Friedman's earliest Monetarism identified by Nelson (2009) are the following: first "a focus on monetary policy for the control of inflation"; second an argument for "treating prices and wages as endogenous variables at all levels of employment, in contrast to the Keynesian treatment (and Friedman's in 1942-43) of prices as insensitive to aggregate demand until full employment was reached"; third a plea for floating exchange rates; fourth the reject of "cost push factors as a source of sustained inflationary pressure"; fifth the rejection of "the notion of a long run trade-off between unemployment and inflation" (Nelson 2009, pp. 477-79)

⁴ "During the early-1940s, both Friedman and Schwartz held Keynesian-type views. Moreover, their views began to change as the decade wore on. By the middle of the 1940s Friedman was using a quantity-theory model in his analysis of inflation rather than the Keynesian income-expenditure theory that he had been using. And, by the end of the 1940s he and Schwartz were working closely together on their National Bureau project studying the cyclical behaviour of the money supply in the United States. So, it is very likely that Schwartz was then also at least starting to think in terms of a quantity-theoretic model. In short, the two economists were becoming monetarists, but not in the usual sense of the word "becoming," for at the time there was no intellectual position that could be called "monetarism." It was only as a result of their joint work and the work of a small group of other like-minded economists that the empirical relationships that are now regarded as the hallmarks of monetarism were uncovered and the term came into popular usage." (Lothian and Tavlas 2018, p. 758)

that Friedman would later utterly reject. In the paper dated 1948 Friedman already acknowledged two kinds of effects that would alter the efficacy of this proposal. First is the existence of price rigidities.⁵ Second, there are “lags of response”, which are of three different kinds: “(1) the lag between the need for action and the recognition of this need; (2) the lag between recognition of the need for action and the taking of action; and (3) the lag between the action and its effect” (Friedman [1948] 1953, p. 145).

For our purposes it is worth noticing that in the 1948 paper price rigidities and lags in the response of private agents are explicitly acknowledged, while Friedman would argue later on that nominal rigidities were a “catch-all excuse for all failures to provide a satisfactory explanation of observed phenomena” (Friedman 1976, p. 213). Besides, it should also be emphasised that Friedman was silent on the issue of expectations in his earliest macroeconomic works. The incorporation of expectations into Friedman’s monetary macro-economics would come later, and develop progressively.

The rise of the monetarist counter-revolution

The monetarist counter-revolution was in prospect even in the early 1950s. Friedman was already far from confining himself to a critique of Keynesian propositions. He advances his own arguments. It is worth mentioning here that Warburton plays a critical role. As shown by Lothian and Tavlas (2018) as well as by Tavlas (2019), Warburton is much more than a mere forerunner of Friedman’s monetarism. In fact, “Warburton had influenced Friedman’s thinking on the effectiveness of open-market operations in offsetting the effects of banking crises, on the monetary origins of the Great Depression and, possibly, on monetary rules” (Lothian and Tavlas 2018, p. 760).⁶

From the mid-1950s to the mid-1960s Friedman published several contributions in the field of monetary macroeconomics, dealing both with theoretical investigations and empirical findings. Here Friedman’s appraisal of expectations tends to be of

⁵ “Under existing circumstances, when many prices are moderately rigid, at least against declines, the monetary and fiscal framework described above cannot be expected to lead to reasonably full employment of resources, even though lags in other kinds of response are minor.” (Friedman [1948] 1953, p. 143)

⁶ Lothian and Tavlas (2018) and Tavlas (2019) build upon work by Bordo and Schwartz (1979, 1983) and by Cargill (1979), who already noticed the pioneering work of Warburton; they present him as a forerunner who anticipated Friedman’s thinking, but who did not influence him.

secondary importance. More importantly, myopic expectations are principally considered as a complementary factor to nominal rigidities and lags when explaining the temporary non-neutrality of money. Let us review Friedman's publications from this period where the issue of expectations is tackled – even when in a superficial and non-systematic manner.

As mentioned by Nelson (2009), as early as in Congressional Testimony from 1952 Friedman mentions expected inflation, and insists on the crucial role played by stable inflationary expectations:

Rather than regarding the objectives of high employment and of price stability as inconsistent, I think that fundamentally price stability will promote a high level of output by avoiding a good many of the interruptions to output that we have had in the past, by giving people stable expectations, and so on.

(March 25, 1952, testimony, in Joint Committee on the Economic Report (1952, p. 727; quoted by Nelson 2009, pp. 478-79)

Friedman's "Quantity Theory of Money – A Restatement" (1956) pulls together the main threads of his early Monetarism. It restates the Quantity Theory of Money in terms of a stable demand function for money, where the demand for money depends on a wide range of parameters: from real income, the current and anticipated rate of inflation, the current and anticipated rate of interest, the proportion of non-human and human wealth, as well as tastes and preferences regarding the holding of money. One of the challenges of this restatement is converting this explanation of the demand for money into a determination of output and prices; that is, disentangling fluctuations in prices on the one hand from fluctuations in output on the other. On this very specific issue, Friedman proves very careful.⁷

In this 1956 paper expected inflation is mentioned explicitly, which amounts to sufficient proof of Fisher's influence on Friedman, and especially of his *Appreciation and Interest* (1896), in which Fisher stated that the difference between the nominal interest

⁷ "Even under the most favourable conditions [i.e. a rigid relation between demand for money and all the variables], equation (13) [of money demand] gives at most a theory of money income: it then says that changes in money income mirror changes in the nominal quantity of money. But it tells nothing about how much of any change in Y is reflected in real output and how much in prices. To infer this requires bringing in outside information, as, for example, that real output is at its feasible maximum, in which case any increase in money would produce the same or a larger percentage increase in prices; and so on." (Friedman [1956] 1987, p. 297)

rate and the real interest rate was explained by expected inflation.⁸ Friedman also emphasised that “there is no reason why this variable should be the same for all” (Friedman [1956] 1987, p. 295), which accounts for individual heterogeneity in the process of forming expectations. This statement echoes the early work done by Friedman with Savage (Friedman and Savage 1948, 1952), which relied on Savage’s idea of personal probability rather than on Knight’s treatment of decision-making process under risk or uncertainty (Knight 1921).⁹ For “the attempt to substitute subjective probability for uncertainty came at an early stage of the Chicago counterrevolution, in particular, Friedman and Savage (1948)” (Freedman et al. 2016, p. 617). On the one hand, Friedman himself would later make it clear in his textbook *Price Theory* (1976) - *but not in the version of that textbook published in 1962* - that the argument he developed with Savage relied on the idea of personal probability, as proposed by Savage himself.¹⁰ On the other hand, Friedman would later argue that the distinction between uncertainty and risk developed by Knight is simply irrelevant once one relies on personal probability:

The personal probability approach bypasses much of the dispute in the literature about ‘objective’ and ‘subjective’ probabilities. One way the personal probability approach can be linked with that distinction is to classify those sets of probabilities as ‘objective’ for which personal probabilities of the group in question agree, and as ‘subjective’ for which they disagree. An example especially relevant for economics is the distinction stressed by Frank Knight between ‘risk’ and ‘uncertainty’, ‘risk’ in essence corresponding to so-called objective probabilities, ‘uncertainty’ to subjective probabilities. This distinction largely loses its force if the personal probability approach is adopted.

⁸ See Dimand and Gomez-Betancourt (2012). Bordo and Rockoff (2013) investigate Fisher’s influence on Friedman’s monetary economics as well as on his policy views.

⁹ While Marshall rejected the principle of utility maximisation in frameworks involving uncertainty, Friedman and Savage show that this general principle can still hold if one considers that the utility function is first considered as convex and then concave with income (Friedman and Savage 1948, p. 297), which amounts to relaxing the idea of the constantly diminishing marginal utility of money. This restatement of Marshall’s utility maximisation principle under risk allows them to reconcile subscription to insurance with the activity of gambling. In the first case one prefers a certain but low loss of money in comparison to the loss of a high sum of money at a low risk; in the second case one prefer a large gain despite its low probability as compared with the certain loss of a small amount of money.

¹⁰ He argued in particular: “The assertion that individuals act as if they assigned personal probabilities to all possible events is an hypothesis about behaviour, not a description of individual psychology or an assertion that an individual will give a meaningful answer to a question about the probability he assigns to an event, such as the continuation of parliamentary democracy in Britain” (Friedman 1976, p. 84).

The issue of expectations is taken up indirectly in Friedman's 1958 paper "The Supply of Money and Changes in Prices and Output". This would later be reprinted in *The Optimum Quantity of Money* (1969). Friedman's main purpose was to argue for a monetary determination of price movements in both the long run and the short run, with the direction of influence between the supply of money and prices as the major issue. Here Friedman acknowledges once again all the difficulty involved in disentangling changes in output from changes in prices where money income is changing, despite the fact that, in the long run, there is undoubtedly a stable relation between money supply and prices.¹²

In his 1958 paper the issue of expectations is tackled indirectly when Friedman discusses the relationships between movement in output and movements in prices, and in particular the respective merits of a slight deflationary tendency compared to a slight inflationary tendency. Yet, this treatment of expectations, and especially of the "advantages of stable price expectations" (Friedman [1958] 1969, p. 183) is very much implicit. On the one hand, because prices and wages are sticky, and more precisely because costs (and in particular wages) are stickier than selling prices, "generally rising prices will tend to raise profit margins, giving enterprises both a bigger incentive to raise output and to add to capital and the means to finance the capital needed" (Friedman [1958] 1969, p. 182). On the other hand, rising prices are detrimental to efficiency and "make it more difficult to maintain the appropriate structure of relative prices" (Friedman [1958] 1969, p. 174). All in all, each tendency has its own merits,

¹¹ A similar statement is made in Chapter 16 of *Price Theory*, dedicated to profits: "In his seminal work, Frank Knight drew a sharp distinction between risk, as referring to events subject to a known or knowable probability distribution and *uncertainty*, as referring to events for which it was not possible to specify numerical probabilities. I have not referred to this distinction because I do not believe it is valid. I follow L.J. Savage in his view of *personal probability*, which denies any valid distinction along these lines. We may treat people as if they assigned numerical probabilities to every conceivable event [...]. Sometimes people will agree – we then may designate the probabilities 'objective'; sometimes they will not – we will then may designate the probabilities 'subjective'. But this classification is subject to change" (Friedman 1976, p. 282).

¹² "The relationship between changes in the stock of money and changes in prices, while close, is not of course precise or mechanically rigid. Two major factors produce discrepancies: changes in output, and changes in the amount of money that the public desires to hold relative to its income." (Friedman [1958] 1969, p.174). The two factors of discrepancy mentioned there correspond to the existence of price rigidities and to the lags that were already acknowledged in Friedman's "Monetary and Fiscal Framework for Economic Stability" (1948).

provided it is easily predictable.¹³ “But unpredictable and erratic changes of direction in prices are apparently as disturbing to economic growth as to economic stability” (Friedman [1958] 1969, p. 184). Here, the crucial issue is how to stabilise the state of private expectations regarding the relative price structure in order to minimise departures from the equilibrium level of employment. It is noticeable that Friedman remains silent about the expectations formation mechanism.

Another contribution relevant to Friedman’s treatment of expectations, and which would also be reprinted in *The Optimum Quantity of Money* (1969), is the paper “The Demand for Money: Some Theoretical and Empirical Results” (1959a). This aimed at refuting the Keynesians at both empirical and theoretical levels. At the empirical level, Friedman argues that the Keynesians are wrong in claiming that the demand function of money is very unstable. Accordingly, they are also wrong at the theoretical level in considering the interest rate as a major determinant of the demand for money (through the speculative motive). In that paper, Friedman explicitly refers to his work on consumption and the permanent income hypothesis (in his *Theory of the Consumption Function* 1957) to argue in favour of stable demand function for money, despite its apparent variations in the short-period: if one interprets money as a durable good, its demand depends on permanent income and not on current income. So the permanent income hypothesis implies that the economy is much less sensitive to changes in investment than to changes in the stock of money, the effect of the latter operating through spending instead of the interest rate (and in turn through investment). The argument then implies the much greater potential of monetary policy in comparison with fiscal policy. In our view, this reference to the permanent income hypothesis highlights the way that the pro-cyclical nature of income velocity is explained by stickiness in long-term price expectations:

To put the matter in terms of economics rather than arithmetic, our analysis suggests that holders of cash balances determine the amount to hold in light of their longer-term income position rather than their momentary receipts – this is the justification for distinguishing measured from permanent income. By the

¹³ “All in all, perhaps the only conclusion that is justified is that either rising prices or falling prices are consistent with rapid economic growth, provided that the price changes are fairly steady, moderate in size, and reasonably predictable” (Friedman [1958] 1969, p. 184).

same token, they may be expected to determine the amount of cash balances to hold in light of longer-term price movements – permanent prices, as it were – rather than current or measured prices. (Friedman [1959a] 1969, pp. 120-21)¹⁴

So Friedman's argument for a stable demand for money is based on the idea that, in the short period, economic agents hold static expectations. They take their decisions according to what they consider to prevail as "permanent" magnitudes regarding the "longer term price movements" and they are not quick in revising their judgment. Here again, it is noticeable that there is no explicit mention in Friedman's treatment of expectations to Savage's notion of subjective probability.

The policy implications of Friedman's theoretical findings are developed in his *Program for Monetary Stability* (1959b). In that book, Friedman provides some preliminary results of his first works carried on with Anna Schwartz. There, the main matter of concern is how to prevent monetary authorities to worsen the kind of disequilibria that a monetary economy inevitably undergoes. As an acknowledgement of the debates that occurred during the 1930s in the context of the Great Depression, Friedman (1959b) argues for a monetary rule in terms of a constant rate of growth in the total supply of money, plus a 100 per cent reserve for deposit liabilities.¹⁵ One can perceive here a significant alteration in Friedman's account of macroeconomic disequilibria, in that uncertainty is now considered much more explicitly:

The major gains would be, first, effective insurance against major monetary disturbances; second, a *notable reduction in short-term monetary uncertainty*, and instability; third, a wider scope for private initiative and enterprise in the allocation of capital. (Friedman 1959b, p. 99; emphasis added)

¹⁴ This statement is made again in "The Demand for Money" [1961] 1968b, p. 201).

¹⁵ As shown by Demeulemeester (2018), the 100% money proposal had been extensively discussed previously. It was "supported by different authors, in various versions. One was embodied in the so-called "Chicago Plan" for banking reform, exposed in a series of memoranda co-authored by a group of Chicago economists in 1933² and subsequently, in the writings of Henry Simons (from 1934). Other versions were designed, at that time, by Lauchlin Currie (from 1934), Irving Fisher (from 1935), or James Angell (1935), while several bills calling for a 100% money reform were introduced in the US Congress in the 1930s and 1940s" (Demeulemeester 2018, pp. 357-58). For an investigation of the contrasting monetary and banking policies implied by these different versions of the 100% money proposal, see Demeulemeester's PhD thesis (2019).

To sum up, from the late 1940s to the late 1950s Friedman develops a series of argument explaining the non-neutrality of money in terms of nominal rigidities. The kinds of rigidity he put forward are two-fold. First there is the issue of sticky prices as well as of costs and wages, and in particular the idea that the latter are stickier than the former. Second, there is the issue of rigidities (or lags) in the formation of price expectations held by private actors: individuals are assumed to hold ‘myopic’ expectations in the sense that they expect some long-term norm to prevail in the future; they make their decisions according to this norm and are not prepared to revise their opinion in a timely way.

The theory at work: Friedman on the Great Depression

As noted above, the modern quantity theory of money as restated by Friedman (1956) corresponds to a theory of a demand for money that is stable in the long run.

In the short run, changes in the money stock would produce changes in real output; in the long run, changes in the money stock would be fully reflected in changes in the price level. In modern terms, monetary changes temporarily impact real output, *reflecting nominal rigidities*, but, ultimately, the growth of real output is independent of monetary forces and monetary neutrality prevails.

(Bordo 2016, p. 144; emphasis added)

This non-neutrality of money, based on stickiness and lags, is the background of Friedman and Schwartz’s narrative of the Great Depression in their *Monetary History of the United-States* (1963), yet this theoretical background remains implicit. One should not forget that this book resulted from almost an entire decade of historical research. In fact the two research perspectives - the theoretical proposals regarding the functioning of a monetary economy already discussed above, and empirical inquiry - developed concurrently. *Monetary History* exemplified what would be later called the ‘narrative approach’, a methodology that many considered “the most enduring legacy” (Bordo 2016, p. 147) of that book.¹⁶

¹⁶“Friedman outlined this methodology in “The Methodology of Positive Economics” (1953). Identification of unique historical and institutional circumstances, he argued, provides the closest thing to a controlled experiment in which the direction of influence from money to income can be isolated. Friedman explains this methodology in terms of understanding the causes of inflation. [...] Thus Friedman (1953) anticipated the main mission of [*A Monetary History of the US*]: To show that in a long series of examples, stretching across very monetary regimes, the relationships between money, prices and output, suggested by the

At the empirical level, Temin (1976) showed that the identification problem is at the core of the debate regarding Friedman and Schwartz's account of what was called the "Great Contraction". He concludes that Friedman and Schwartz's 'money hypothesis' does not perform very well by comparison with the 'spending hypothesis'. He also argues that Friedman and Schwartz's account of the Great Depression fails to elaborate explicitly the theoretical elaboration that would justify their standpoint.¹⁷ Yet there was in *The Monetary History* (1963) an implicit theoretical framework sustaining the thesis of a transitory non-neutrality of money, namely nominal rigidities, of lags as well as static expectations. At the theoretical level it also appears that Friedman and Schwartz's purely monetary explanation for the Great Depression rests on several strong assumptions, all of which having been heavily disputed and criticised (Hammond 1996, Rivot 2013b). As shown by Hammond (1996), causality is the basic issue underpinning the whole debate between Friedman and his challengers. This can explain why in the 1960s Friedman changed the way he addressed the issue of causality between monetary disturbances and real disequilibria.

To conclude consideration of this critical period for the shaping of Friedman's thinking, the end of the 1960s represents a turning point. As we will see below, when he does eventually concede the need to provide an explicit theoretical framework for his account of monetary disturbances, involving an account of the adjustment process following an external shock such as a discretionary policy intervention, Friedman's attention shifts from nominal rigidities and static expectations to the issue of the formation of private expectations.

quantity theory of money, continue to hold." (Bordo 2016, p. 147) A serious problem faced by Friedman's overall claim has been the collapse of the stability of estimated money demand functions in the face of financial innovation in the 1980s. As is well known, in Friedman and Schwartz (1963) there is the idea that the stock of money is determined by the monetary base. This assumes a stable money multiplier, the existence of which Goodhart's law put into question. For, as stated by Goodhart (1975) "any observed statistical regularity will tend to collapse once pressure is placed upon it for control" (Goodhart 1975, p. 116). In the same vein, while focusing on the UK case Hendry and Ericsson (1983) claim, in their critique of Friedman and Schwartz's *Monetary Trends* (1982), to have established the non-exogeneity of money.

¹⁷ "What evidence do Friedman and Schwartz muster to support these propositions? Their narrative is long and complex, but it offers far less support for these assertions that appears at first. In fact, it assumes the conclusion and describes the Depression in terms of it; it does not test it or prove it at all." (Temin 1976, pp. 15-16).

3. Friedman's critique of the Phillips curve: adjustment process and adaptive expectations (1966-1972)

Let us now examine how Friedman's account of macroeconomic disequilibria develops after the publication of his *Monetary History* (1963). Friedman's critique of the Phillips curve is of major importance in the development of his monetary macroeconomic dynamics. Yet as it has been argued by Forder (2010), it is highly probable that "by the time of the contributions by Phelps and Friedman, the 'expectations critique was so routine as to be the banal" (Forder 2010, p. 502). And so here we will only focus on the role played by expectations in the development of Friedman's thinking – we will discuss neither the historical lineage of this critique, nor the relevance of the point Friedman tried to make against Keynesians.¹⁸ As we will show, Friedman's rejection of cost-push inflation and his critique of the Phillips curve trade-off are related to a growing concern for inflationary expectations, their formation as well as their influence on macroeconomic dynamics.

It is in his paper "What Price Guideposts?" (1966), included in the Shultz and Aliber conference volume dedicated to *Guidelines, Informal Controls and the Market Place*, that Friedman famously claims that "inflation is always and everywhere a monetary phenomenon" (Friedman [1966a] 1968, p. 98).¹⁹ This paper was Friedman's contribution to a conference at the University of Chicago in April 1966 that sought to critically review wage and price guidelines in force at the time. As Schwarzer has written, "Friedman's rejection of cost-push inflation is one of the pillars of his criticism of the Phillips curve trade-off" (Schwarzer 2018, p. 196).

Besides sluggish adjustment due to the existence of contracts, the temporary nominal rigidity that Friedman now considered mainly applies to lags in the formation of expectations held by private actors.²⁰ Accordingly the attention shifts from static expectations towards adaptive expectations. Let us quote Friedman at length on this:

The typical life history of an inflation is that the quantity of money per unit of output initially increases more rapidly than prices. During this period, the public does not *anticipate* price rises, interprets any price rise that occurs as *temporary*,

¹⁸For an extensive discussion of both points, see Forder (2014).

¹⁹ As mentioned by Nelson (2003, p. 1033), this statement appears originally in Friedman (1963, p. 17).—

²⁰ For a more detailed discussion of this paper "What Price Guideposts?" (1966) as well as the paper "Comments" (1966b) included in the same volume, see Rivot (2018).

and hence is willing to hold money balances of increased 'real' value (i.e., corresponding to a larger volume of goods and services) in the *belief* that prices will be lower in the future. If the quantity of money continues to increase faster than output, however, prices will continue to rise, and *sooner or later* the public will come to *anticipate* further price rises. It then wishes to reduce its money balances not only to their former real value but to an even smaller value. Cash has now become a costly way to hold assets, since its purchasing power is decreasing. People therefore try to reduce their cash balances. They cannot, as a whole, do so in nominal terms (i.e., in terms of dollars) because someone or other must hold the amount in existence. But *the attempt to do so* bids up prices, wages, and nominal income. The result is to reduce 'real' balances. During that stage, therefore, prices rise more rapidly than the quantity of money, and sometimes much more rapidly. If the rate of rise of the quantity of money stabilizes, no matter at how high a level, the rate of price rise will ultimately settle down also.

(Friedman [1966a] 1968b, p. 107; emphasis added)

The mechanism at work here that explains the transitory effects of monetary expansion on output is delays in the formation of price expectations. Private agents assume that a certain norm prevails in the future regarding prices; that is the reason why they hold "the *belief* that prices will be lower in the future" (Friedman [1966a] 1968b, p. 107; emphasis added). And adjustment during the learning mechanism is a time-consuming process. Once expectations regarding the relevant prices prevailing in the future have adapted, people adjust the real balances they wish to hold and raise their demand for goods accordingly. The mechanism of transmission of monetary expansion relies on the Quantitative Theory of Money, according to which money is a temporary location for purchasing power. So Friedman has shifted his concern from static expectations towards learning processes and adaptation. Economic agents are still viewed as backward-looking, in the sense that they make systematic forecasting errors. These forecasting errors are auto-correlated across time because of sluggishness in adaptation of the information set. Here Friedman relies on adaptive expectations as central to expectations formation.

Besides, in this paper Friedman put forward for the first time the idea of the phenomenon of 'over-shooting' during the adjustment process. Friedman is not explicit

about the precise mechanism at work here. But the idea is this: because of adaptive expectations the perceived cost of holding money is not fully adjusted, and current balances exceed their long-term desired level. Once the rise in the money supply is perceived to be permanent, expectations are revised. Desired cash balances fall because of the increased demand for goods. Hence the overshooting phenomenon, which is stated here in terms of the rate of inflation.²¹

Let us now turn to Friedman's 1967 Presidential Address to the American Economic Association, "The Role of Monetary Policy", published in the *American Economic Review* in 1968. Several basic defects of this paper have already been noted (De Vroey 2001, 2016, Forder 2018a, Rivot 2018).²² What interests us here is that Friedman's argument confuses two kinds of very different dynamic that are potentially at work in a monetary economy. The first thread of analysis, highly Keynesian in its spirit, views price fluctuations as a disequilibrium reaction on the part of economic agents who possess some market power in setting their price. According to the second thread of analysis, the Phillips curve corresponds to an aggregate supply function. In the second case there is perfect competition, but imperfect information about the true relative price level upon which agents take their decisions. Friedman argues that "it takes time for people to adjust to a new state of demand" (Friedman [1968a] 1969, p. 103) when there has been an unanticipated rise in nominal demand. That people hold adaptive expectations reappears here: it is only the lags in the adjustment process that allow the output level to deviate from its natural level.²³ If movements in relative prices were immediately disentangled from variations in the general price level, the Phillips curve would then be vertical in the short run too. There might be a short-run trade-off between unemployment and inflation, but it would disappear once expectations have eventually adapted to the new monetary regime. As in his previous works, the point is that people make systematic forecasting errors because their information set adapts slowly; they do not learn from the past errors of their expectations of inflation.

²¹ In his "Comments" (1966b) Friedman puts forward for the first time the idea that "there is no long-run, stable trade-off between inflation and unemployment" (Friedman [1966b] 1968b, p. 60).

²² Nelson (2018) would not agree with some of the defects pointed out in these contributions.

²³ We focus here on the issue of 'expectations', while Forder (2018b) also considers the issue of 'anticipations', understood as a change of 'habit' instead of a change in 'understanding'. This consideration of changes in institutions and behaviour explain why in Friedman's (1968a) paper indicates why the full adjustment process considered by Friedman might easily take several decades.

In his 1968 paper, Friedman specifies what monetary policy can do for improving the stability of an economy. Friedman's main concern is to help "employers and employees [to] proceed with full confidence that the average level of prices will behave in a known way in the future – preferably that it will be stable" (Friedman [1968a] 1969, p. 106). This implies the avoidance of "sharp swings in policy" (Friedman [1968a] 1969, p. 109), i.e. the implementation of a rule targeting a constant rate of growth in the supply of money, whatever the aggregate considered and whatever the rate of growth implemented. This is consistent with Friedman's appraisal of the expectations formation process: the more stable the information set on which expectations are based, the less systematic are forecasting errors.

Friedman's restatement of the Quantity Theory of Money has been met with several critiques regarding his own understanding of the 'old' Quantity Theory of Money, and also of his appraisal of the Keynesian framework. Friedman responded with his "Theoretical Framework for Monetary Analysis" published in the *Journal of Political Economy* in 1970, and as the first chapter of a volume edited by Gordon in 1974. Correcting the confusing argument stated in "The Role of Monetary Policy" (1968a), the adjustment process now properly relies on two compatible arguments: "the anticipations about the behaviour of prices – this is the inertia factor stressed by Keynes and the current level of output or employment compared with the full-employment (permanent) level of output or employment- this is the supply-demand response stressed by quantity theorists" (Friedman [1970] in Gordon (ed) 1974, p. 49).

Friedman there deals at length with the dynamics at work in a monetary economy. In his 'third model', which is presented as a synthesis between Fisher and Keynes, Friedman explicitly relies on a constant value (or a "permanent" value) for both the anticipated real rate of interest and the anticipated rate of growth: "the differences between anticipated and actual magnitudes are the motive force behind the short-run fluctuations" (Friedman [1970] in Gordon (ed) 1974, p. 45).²⁴ Friedman also follows up on the issue of the 'overshooting' phenomenon that follows a change in the quantity of money - an overshoot that now applies to nominal income instead of the price level.²⁵

²⁴"These anticipation equations....close the system." (Friedman [1970] in Gordon (ed) 1974, p. 55)

²⁵"In order to produce the shift in the equilibrium path of nominal income [...] nominal income and prices must rise over some period at a faster rate than the final equilibrium rate. [...] There must, that is, be a

The paper entitled “Monetary Policy” (1972) brings together several analytical threads and closes our discussion of that period.²⁶ Friedman argues here that “only unanticipated inflation is favourable to a reduction in unemployment” (Friedman 1972, p. 194). At the policy level Friedman consistently argues that the best thing that public authorities can do is to avoid further exacerbation of economic fluctuations by their well-intentioned actions: “[...] the private-enterprise market system is inherently stable, provided only that there is a stable monetary framework, and that past instability has been produced primarily by erratic and unwise government intervention rather than by any inherent instability in the system itself” (Friedman 1972, p. 194). These statements are consistent either with static expectations, adaptive expectations or rational expectations. Regardless of the manner in which they are estimated empirically, the fact is that for Friedman expectations play a crucial role in economic behaviour. Besides, Friedman acknowledges that nominal rigidities due to market power in the labour market or to minimum wage legislation could alter the value of the natural rate of unemployment. Price expectations also play a role: “the higher the rate of inflation expected, the higher must be the actual rate of inflation in order to reduce unemployment” (Friedman 1972, p. 194). Such an argument opens the door for a treatment of expectations based on forward-looking behaviour, for it can hardly be argued that systematic forecasting errors are sustainable in the case of inflation acceleration.

4. Friedman on the expectations formation process and macroeconomic disturbances (1975-82)

Friedman’s appraisal of macro-economic disequilibria changed significantly in the mid-1970s. Here we will discuss three major contributions by Friedman from the mid-1970s to the early 1980s, closing our discussion of the expectations issue in Friedman’s writings: his essay *Unemployment versus Inflation? An Evaluation of the Phillips Curve* from 1975, his ‘Nobel prize’ lecture of 1977, and his *Monetary Trends* (1982) co-authored with Schwartz. We will first show how the issue of expectations formation is

cyclical reaction, an overshooting, in the rate of change in nominal income and prices, though not necessarily in their levels”. (Friedman [1970] in Gordon (ed) 1974, p. 58)

²⁶ Nelson (2013) discussed the money *versus* credit issue addressed by Friedman in that paper. For a detailed discussion of Friedman (1972), see Forder (2018a).

henceforth explicitly addressed in the explanation of macroeconomic disturbances. We then focus on the rational expectations issue. We will argue that, even if Friedman proves very sympathetic to rational expectations in its early stages, he ends up having a rather critical and distanced view of this approach.

As compared with the 1968 lecture, there are significant alterations and improvements in Friedman's essay *Unemployment versus Inflation? An Evaluation of the Phillips Curve* (1975).²⁷ First, the definition of structural unemployment is properly stated. Second, Friedman clearly disentangles the two possible understandings of a non-vertical Phillips curve: on the one hand the understanding of the relationships between output and inflation taken from Fisher (1926), and on the other hand the symmetric understanding of the relationship as stated by the Keynesians. In Friedman's eyes, Fisher had it right in treating the rate of change in prices as the independent variable and the rate of change in employment and output as the dependent variable; Phillips (1958) had it wrong in putting the causality the other way round. One would today state this as an alternative between a market equilibrium approach versus a disequilibrium approach to market dynamics, i.e. a case for imperfect information versus a case for imperfect competition. Third, contrary to the 1968 paper, which assumes a slow adjustment in expectations for workers while employers are able to revise their prices more quickly (but as in the 1966 papers), the expectational process now applies symmetrically to workers and to employers. For both of them the reference real wage is necessarily a magnitude that has to be anticipated.²⁸ The issue of the expectations formation process is now explicitly addressed:

If we suppose that anticipations about the price level are slow to change, while the nominal wage can change rapidly and is known with little time-lag, we can, for *short* periods, revert essentially to Phillips' original formulation, except that the equilibrium position is no longer a constant nominal wage, but a nominal wage changing at the same rate as the anticipated rate of change in prices (plus, for a growing economy, the anticipated rate of change in productivity).

²⁷ See Rivot (2018).

²⁸ "Because both potential employers and potential employees envisage an implicit or explicit employment contract covering a fairly long period, both must guess in advance what real wage will correspond to a given nominal wage. Both therefore must form anticipations about the future price level." (Friedman 1975, p. 19)

(Friedman 1975, p. 19)

The point at stake in approaching expectations of the real wage upon which workers and employers must base their respective supply of and demand for labour is quite subtle. On the one hand, at the time wage negotiations take place the nominal wage can be treated as relatively flexible. It is of course known with certainty for the whole period of the wage agreement. On the other hand, “anticipations about the price level are slow to change” (Friedman 1975, p. 19). So the non-neutrality of money now relies on delays in the correction of price expectations instead of nominal rigidities due to labour market imperfections (as the Keynesians would argue). When prices and wages rise because of monetary expansion, workers temporarily offer more labour because they “will initially interpret this as a rise in their real wage – because they still anticipate constant prices” (Friedman 1975, p. 21). As for employers, they temporarily confuse the increase in the general price level with a local rise: “they will initially interpret a rise in the demand for and price of their product as a rise in its relative price and as implying a fall in the real rate they must pay measured in terms of their productivity” (Friedman 1975, p. 21). Of course, both workers and employers eventually correct their price expectations so that the unemployment-inflation tradeoff vanishes in the long run. The remainder of the 1975 essay is dedicated to the specific issue of the expectations formation process. As we will see, it is in that 1975 essay that Friedman’s crudest appraisal of adaptive expectations can be found, together with his most sympathetic review of the rational expectations approach.

How can lags in the correction of price perceptions be explained? Adaptive expectations are presented as implying that “the anticipated rate of inflation is an exponentially weighted average of past rates of inflation, the weights declining as one goes back in time” (Friedman 1975, p. 25). Unsurprisingly, this way of framing private expectations does not appear satisfactory to Friedman, mainly because it portrays economic agents as myopic and strictly backward-looking in their forecasting and planning efforts: “people who are forming their anticipations are not fools – or at least some of them are not. They are not going to persist in being wrong. And more generally they are not going to base their anticipations solely on the past history of prices” (Friedman 1975, p. 27). So viewed this way adaptive expectations do not prove a significant improvement on static expectations. Friedman then shifts his attention to the

rational expectations approach to the Phillips curve, which he describes fairly logically and positively if one recalls his mechanistic presentation of adaptive expectations.

Therefore, said Muth, we should assume that people form their anticipations on the basis of a correct economic theory: not that they are right in *each individual* case but that over any long period they will *on the average* be right. Sometimes this will lead to the formation of anticipations on the basis of adaptive expectations, but by no means always. (Friedman 1975, pp. 27-8)²⁹

From the perspective of policy-making too Friedman is here quite sympathetic to the rational expectations approach. The only way to obtain a – temporary – decrease in the unemployment rate is “*unanticipated* inflation” (Friedman 1975, p. 29). In a probable reference to the Lucas critique (Lucas 1976), Friedman goes on to argue: “If the government follows any rule whatsoever, so long as the people know it, they will be able to take it into account” (Friedman 1975, p. 29).³⁰ Accordingly, economic policy turns to be a strategic game between the government and private actors:

This analysis provides a different sort of intellectual background for a view that some of us have held for a long time: that it is a better approach to policy to say that you are going to co-operate with the people and to inform them of what you are doing, so giving them a basis for their judgements, rather than trying to fool them. What the Sargent argument and analysis really suggests is that you are fooling yourself if you think you think that you can fool them.

(Friedman 1975, p. 29)

It should be emphasised that is already Friedman not adhering unreservedly to the rational expectations approach: “the evidence is by no means all in” (Friedman 1975, p. 29). Either at the theoretical level or at the policy level, “we certainly cannot regard the matter as settled” (Friedman 1975, p. 29). Strict adherence to the rational expectations approach to the Phillips curve implies a non-vertical Phillips curve only in the case of ‘surprise’, and the restatement of the Phillips curve as an aggregate ‘surprise’

²⁹See Muth (1960, 1961).

³⁰Nelson mentioned that Friedman made essentially the same point in his February 7, 1972 Newsweek column: “[Friedman] stressed that a policy of steady monetary growth announced in advance and then delivered would be more stabilizing than would a discretionary (that is, judgment driven) policy even if the latter policy delivered, ex post, the same pattern of monetary growth as the rule” (Nelson 2018, p. 434).

supply function (as in Lucas 1972) would severely undermine Friedman's appraisal of the Great Depression, as well as his pleas for a monetary rule stated as a constant rate of growth in money supply (Rivot 2018).

This potential weakening of Friedman's macroeconomic achievements at both the theoretical and the policy levels explains quite well why he would later appear much more critical about the rational expectations 'revolution'.

The essential parts of the argument developed in the essay dated 1975 are taken up in Friedman's 'Nobel' lecture (Friedman 1977). The argument for a non-vertical Phillips curve in the short run still relies on unanticipated changes in aggregate nominal demand: "only surprises matter" (Friedman 1977 in Leube 1987 p. 352). While Friedman still endorses the rational expectations approach to macroeconomic disequilibria, he remains as cautious as he was previously. From the statement that "we can expect rapid progress in these issues" (Friedman 1977 in Leube 1987 p. 355), one can undoubtedly infer that in Friedman's eyes the issue is far from settled. Besides, an entire section of Friedman's lecture is dedicated to a point that was only sketched out in the 1975 essay, namely the possibility for a positively-sloped Phillips curve, at least as a transitory phenomenon. The argument is this: higher inflation rates are associated with higher volatility in inflation rates. The price system is less efficient in coordinating economic plans, mainly because individuals face much more noise in their signal extraction problem.³¹ Hence a general loss of efficiency: higher inflation becomes associated with higher unemployment, at least temporarily. To sum up:

[...] *increasing* volatility and *increasing* government intervention with the price system are the major factors that seem likely to raise unemployment, not *high* volatility or a *high* level of intervention.

(Friedman 1977 in Leube 1987 pp. 364-65)

Noticeably, neither in the essay dated 1975 nor in his 'Nobel' lecture does Friedman address the policy issue of how to stabilise a monetary economy as he did in

³¹ "If the price level is on the average stable or changing at a steady state, it is relatively easy to extract the signal about relative prices from the observed absolute prices. The more volatile the rate of general inflation, the harder it becomes to extract the signal about relative prices from the absolute prices." (Friedman 1977 in Leube 1987 p. 363)

previous writings. Undoubtedly, the rational expectations approach to market fluctuations held by the New Classicals undermines Friedman's account of the short-run non-neutrality of money. Temporary effects of monetary disturbances were easily understood in case of static or adaptive expectations: when people take time to revise their inflationary expectations, a change in the growth rate of money supply does have an effect on output and employment – even in the case where this change in monetary policy regime was announced. But as is well-known, in case of rational expectations only 'surprises' matter. In that case, there is no need to care about the best policy scheme able to cope with these monetary disturbances: *any* kind of rule is integrated into the private sector's information set, and expectations develop accordingly. In our view, this explains very well why later on Friedman shifts from this sympathetic yet cautious appraisal of the rational expectations approach to a much more critical assessment.

Finally, *Monetary Trends* (1982) was co-authored with Schwartz and states Friedman's final views on the expectations issue. One can find in the book a clear presentation of the terms of the debate regarding the way of framing expectations in a manner consistent with Friedman's appraisal of macroeconomic disequilibria triggered by monetary disturbances. Two issues are distinguished. There is first the conceptual and analytical issue: how do individuals shape their expectations in the short period? And how do they adapt to a new information set? Second, there is the statistical and practical issue: how should expectations be framed in order to provide us with 'good' predictions?

In Chapter 2 of *Monetary Trends* (1982) the argument already established in Friedman's article "A Theoretical Framework for Monetary Analysis" (1970b) is restated virtually word for word:

The transition between the short-run adjustment process and long-run equilibrium is produced by a *revision* of anticipated values in response to measured values in such a way that, for a stable system, a single disturbance sets up discrepancies that are in the course of time eliminated.

(Friedman and Schwartz 1982, p. 64; emphasis added)

Noticeably, the word "revision" is used in *Monetary Trends*, while Friedman spoke of "adjustment" in his 1970 article (Friedman [1970] in Gordon (ed) 1974, p. 54).

Monetary Trends incorporates adaptive expectations at both analytical and empirical levels, even though Friedman and Schwartz are well aware of the basic defect of adaptive expectations: they are backward looking in the sense that “they require that anticipations be determined entirely by the history of the particular variable in question, not by other history or other currently observed phenomena” (Friedman and Schwartz 1982, p. 65). Yet, it is precisely the delays in the revision of expectations that explain the dynamics of the adjustment process.

Monetary Trends (1982) proves much more critical towards the rational expectations approach to macroeconomic dynamics, which has its own defects. The reason is that the rational expectations approach assumes that “economic agents should be treated as if their anticipations fully incorporate both currently available information about the state of the world and a correct theory of the interrelationships among the variables” (Friedman and Schwartz 1982, p. 65). This is quite unlikely to provide good predictions.³² A crucial issue applies to the time unit considered, “the implicit assumption [...] that the same time unit, relatively brief, is relevant to anticipations for all variables” (Friedman and Schwartz 1982, fn 9 p. 415). Some alternative formalisations of expectations are positively acknowledged, especially the perspective adopted by Brunner, Cukierman and Meltzer (1980) who “have combined the distinction between anticipated and unanticipated with the distinction between permanent and transitory shocks” (Friedman and Schwartz 1982, fn 9 p. 415), and who have shown that in some cases (depending on the stochastic structure of the model) adaptive expectations can be ‘rational’. As stated by Hoover (1984, p. 61): “It is clear from this latest work that he sees rational expectations as a potentially useful modelling technique, but stops short of embracing the new classical research program”.³³

This point appears clearly in the lesson drawn from the “free silver movement” in the United States during the 1880s and the 1890s, and about which Friedman and Schwartz state that “anticipated inflation in the United States was systematically above

³²“The theory of rational expectation has been extremely fruitful on an analytical level but as yet is in a preliminary stage as a source of empirically testable hypotheses about the formation of expectations” (Friedman and Schwartz 1982, p. 65).

³³ Nelson goes further when he states: “Friedman does not appear to have been opposed to rational expectations in principle. He accepted that it was ‘most unreasonable’ to use adaptive expectations when this involves extrapolating from a different regime (Friedman and Schwartz 1982, p. 569) [...]. He spoke out in favour of rational expectations models with long-term nominal contracts and defended these models against critics of rational expectations (Friedman and Schwartz 1982, p. 415)” (Nelson 2008, p. 104).

the actual before 1896 and perhaps the reverse after” (Friedman and Schwartz 1982, p. 555).³⁴ As summed up by Hoover (1984):

Agents made persistent, serially correlated errors in fore-casting inflation; but whether their expectations coincided with the objective probability distribution is a moot point, because a historical situation cannot be repeated in a controlled experiment in order to ascertain the objective frequency of it falling out one way or the other. (Hoover 1984, p. 71)

This specific episode during the free silver movement is used by Friedman and Schwartz to develop a twofold critique of rational expectations. First, from a Bayesian perspective there is the issue of what is meant by ‘wrong expectations’: “There is a tantalizing intellectual question – What meaning, if any, can be given to the assertion: ‘Mr X’s personal probability about a specified event was correct [or wrong]’ (Friedman and Schwartz 1982, p. 557)?” It is noticeable that, to the best of our knowledge, the term ‘personal probability’ is used here for the first time in Friedman’s macroeconomic writings.³⁵ Next, there is the issue of the time horizon appropriate for considering uncorrelated errors in forecasts, which can be extremely long (the relevant period being about twenty years in this particular episode). Erasing the distinction between short-run and the long-run is acceptable from a Walrasian perspective; for Friedman the Marshallian, this is not acceptable (Hoover 1984).

If the argument put forward in *Monetary Trends* is restated by means of the usual distinction between risk and uncertainty, the point made by Friedman is that one takes time to know, to establish complete knowledge about the structure of the economy within which our expectations are formed. The episode of the ‘free silver movement’ helps Friedman to argue for a gradual transition from an ‘uncertain’ perspective towards

³⁴ “The importance of *anticipations* as opposed to *realisations* is highlighted by one particular instructive episode. That episode is the transition from the fear that the United States would go off the gold standard, produced by the free silver movement before 1896, to confidence in the maintenance of the gold standard following McKinley’s election in 1896.” (Friedman and Schwartz 1982, p. 629)

³⁵ But not in his micro-economic writings, for this point was already argued in the version dated 1976 of Friedman’s *Price Theory*: “The personal probability approach bypasses much of the dispute in the literature about ‘objective’ and ‘subjective’ probabilities. One way the personal probability approach can be linked with that distinction is to classify those sets of probabilities as ‘objective’ for which personal probabilities of the group in question agree, and as ‘subjective’ for which they disagree. An example especially relevant for economics is the distinction stressed by Frank Knight between ‘risk’ and ‘uncertainty’, ‘risk’ in essence corresponding to so-called objective probabilities, ‘uncertainty’ to subjective probabilities. This distinction largely loses its force if the personal probability approach is adopted (Friedman 1976, p. 84).

a 'risky' one, in the sense that individuals take time to obtain full knowledge of the structure of a decentralised market economy. In the short period the rational expectations approach might not be so helpful, if only because it assumes continuous market clearing.

5. Conclusion

Friedman's concept of the natural rate of unemployment provides the equilibrium concept upon which his dynamics is based. When the prevailing real wage structure is consistent with all labour market imperfections, a decentralised market economy can be said to be at its equilibrium position. The dynamic at work in a monetary economy is then understood as a temporary, and sometimes cyclical, departure from this equilibrium position. The economic system is assumed to be inherently stable, any departure from an intertemporal equilibrium being only transitory: a market economy eventually converges toward its intertemporal equilibrium position.

Throughout his career Friedman attempted to demonstrate that macroeconomic disequilibria were the result of monetary disturbances. In his explanation of the transmission mechanism behind these disequilibria Friedman evolved the most: what is the adjustment mechanism that explains the transitory real effects of a change in the monetary regime? A few years after his first explicit assaults on the Phillips curve, Friedman argued that nominal rigidities were a "catch-all excuse for all failures to provide a satisfactory explanation of observed phenomena" (Friedman 1976, p. 213) – a simple-minded explanation that he strongly opposed. But this is to forget that in his early writings about macro-economic dynamics Friedman himself relied on sticky prices and wages to explain the non-neutrality of money in the short-run.

In his early writings, a change in the rate of growth of money supply has transitory effects on output precisely because of delays in the adjustment of wage and prices. In this regard, the early Friedman looked very Keynesian. Subsequently, Friedman's appraisal of monetary disturbances relied on static expectations instead of rigid nominal prices. Because they expect long-term values to prevail in the periods ahead and because they make their economic decisions on the basis of these long-term forecasts, economic agents might misperceive the relative price structure upon which they should make their decisions. Departures from the long-term equilibrium position can only occur while economic agents adjust their long-term forecasts regarding the

relative price structure. A third step in the development of Friedman's thinking about macro-economic disequilibria relates to his appraisal of adaptive expectations. The move from static to adaptive expectations was undoubtedly an improvement, for it permitted the competitive adjustment process to be more explicitly connected with the formation of expectations. Yet expectations were still considered to be a mechanical correction of errors, while economic agents were very slow in adjusting their expectations regarding the future state of the world. When the rational expectations approach to macroeconomics started to develop, Friedman appeared rather sympathetic to this approach - at least at the analytical level. He hastily conceded that people must be considered to be forward-looking in the sense that their forecasting errors are not auto-correlated across time: they possess some knowledge about economic structure. And he even endorsed the New Classical claim that only 'surprises' mattered, which represented a significant shift towards the basic idea of continuous market clearing as well as a weakening of Friedman's policy advice regarding monetary stability.

As a matter of fact, it took a long time for Friedman to reconsider the way his early joint work with Savage might help address the issue of macroeconomic disequilibrium. Much later Friedman argued that "[t]he only probability notion I can make sense of is personal probability in the spirit of Savage and others. Keynes's degree of belief is in the same family" (Friedman in Snowdon and Vane 1997, p. 199). This is certainly appropriate, but the reality is more complex. Regarding the statistical treatment of Bayesian probabilities, one might argue that providing an effective alternative to the rational expectations approach was a critical impediment. But the limitations we have identified apply also at the analytical level. Even in his purely theoretical work Friedman took a very long time to consider subjective uncertainty instead of mechanical adaptive expectations. To the best of our knowledge, one cannot find any reference to probability as a personal judgment in Friedman's writings about monetary economics before *Monetary Trends* (1982). Friedman eventually placed subjective uncertainty at the heart of his account of macroeconomic disequilibria.³⁶ But this was the outcome of a very lengthy process.

³⁶ In Friedman's own words, Savage "greatly influenced [his] understanding of the foundation of statistics - particularly the interpretation of the concept of probability" (Friedman and Friedman 1998, p. 199). See Savage (1954).

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