

Monetarist Business Cycle Theories: a Critique

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Introduction

Monetarism, as defined by its advocates, is the doctrine that the quantity of money and changes in it, dominate movements in the price level and cyclic changes in production and employment (see notably Friedman, 1970, p. 22-26). So defined however, there is little distinction between this doctrine and the monetary theory of the Austrian school, while the two are generally considered to be two very distinct approaches within modern day (macro)economic thought. Therefore, we will here define monetarism as those *neoclassical* theories attempting to establish a causal relationship between the quantity of money on the one hand, and prices, output and employment on the other hand.

Here we will not be concerned with all differences between monetarism as a neoclassical approach and the Austrian perspective on economics, but focus instead on their differences in business cycle theory. A relevant and distinctive characteristic of monetarism in that field is that it tries to establish direct causal relationships between the above mentioned macroeconomic aggregates. In practice this means that monetarism differs from the Austrian theory in at least two respects:

First, monetarism stresses almost exclusively the general price level, rather than relative prices, as the mechanism through which changes in the quantity of money affect output and employment. In this way, it simply neglects possible effects of monetary changes not related to the general price level, as was noted by Hayek (1990, p.80) in his verdict on monetarism:

Its chief defects in any situation seems to me to be that by its stress on the effects of changes in the quantity of money on the general level of prices it (...) disregards the (...) harmful effects of the injections and withdrawals of amounts of money from circulation on the structure of relative prices and the consequent misallocation of resources and particularly the misdirection of investments which it causes.

The Austrian Business Cycle Theory (ABCT), by contrast, recognises that monetary injections alter relative prices as they typically enter the capital market first before spreading to the rest of the economy. By lowering the interest rate and bidding up prices for capital goods relative to those of consumer goods, the additional money in the capital market will change the allocation of resources in favour of capital-constructing investments, which will have to be liquidated when the policy of monetary injections is ended.

Second, compared to the Austrian approach monetarism is characterised by a relative neglect of capital theory. This is related to its neglect of relative prices, as it is the latter that give rise to the changed investment pattern in favour of capital-constructing investments, thus moving the capital structure away from that consistent with the actual (time) preferences of consumers and savers.

The role of capital (and its relation to the distortion of relative prices) in ABCT has been an important theme of Austrian macroeconomist Roger Garrison. In his book *Time and Money: The Macroeconomics of Capital Structure* he refers to ABCT as 'capital based

macroeconomics' and makes in the following words a general case for the use of capital in business cycle theory:

Simply put, capital gives money time to cause trouble. In a barter economy, there is no money to cause any trouble; in a pure exchange economy, there is not much trouble money can cause. But in a modern capital-intensive economy (...) the fact that production takes time suggests that, for business cycle theory, capital and money should get equal billing. (...) Macroeconomic theorizing, so conceived, is a story about how things go wrong--how the economy's production process that transforms resources into consumable output can get derailed. (...) Thus, the troubles that characterize modern capital-intensive economies, particularly the episodes of boom and bust, may best be analyzed with the aid of capital-based macroeconomics.

Garrison, 2001, p.8

In light of this argument, we might ask ourselves, as Garrison (1989, p.14) did in an earlier article: '[W]hat sort of a macroeconomic construction remains when capital theory is subtracted from business cycle theory?'

In that same article Garrison answered that question in particular for Keynesianism and the Friedman-Lucas version of monetarism. In this paper we will expand on Garrison's analysis by considering, in addition to the Friedman-Lucas model, Lucas' overinvestment theory, which is an amendment to the Friedman-Lucas model, and furthermore Monetary Disequilibrium Theory and the Debt Deflation Theory. Our discussion of Monetary Disequilibrium Theory will differ from Garrison's later analysis of it in his book, in that it will not be as sympathetic to it as was his.

As noted, instead of using relative prices and capital, these alternative macroeconomic constructions will be seen to rely mainly on the general level of prices and wages as a transmission mechanism between money and the real economy. We will discuss these constructions in the order mentioned above, that is: 1. The Friedman-Lucas Model, 2. Monetary Disequilibrium Theory, and 3. The Debt-Deflation Theory. This order is ultimately quite arbitrary, as the sections do not build on each other, but in any case it works its way down from the theory that gets most attention in the literature to the one that receives least. In each section we will, after presenting the particular theory at hand, confront it with a number of problems. In the final section we will generalise our findings about these monetarist business cycle theories and evaluate the significance of relative prices and capital for business cycle theory.

1. The Friedman-Lucas Model

The influence of Milton Friedman and Robert Lucas on modern macroeconomics may be judged from the fact that they are both Nobel laureates and both founders of a leading school in economic thought: respectively the Chicago and the new-classical schools. Another similarity is that both of them attempt to explain the business cycle through labour supply effects caused by (unexpected) changes in the money supply.

The Basic Friedman-Lucas Model

According to Friedman (1968, p.10 and 1976, p.221-227), an unexpected growth of the money supply and the *ceteris paribus* higher nominal prices and wages that go with it make producers and wage earners overestimate the real prices and wages for their products and services. These overestimated prices and wages induce an increase in both production and the necessary labour supply, thereby creating an economic boom. In Friedman's words:

Workers will initially interpret [an unexpected rise of prices and wages] as a rise in their real wage—because they still anticipate constant prices—and so will be willing to offer more labor (move up [on] their supply curve), i.e. employment grows and unemployment falls. Employers may have the same anticipations as workers about the general price level, but they are more directly concerned about the price of the products they are producing and far better informed about that. 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 wage rate they must pay measured in terms of their own product. They will therefore be willing to hire more labor (move down [on] their demand curve).

Friedman, 1976, p.223

In the reverse situation, when monetary growth unexpectedly declines, the process too is reverse: real prices and wages are underestimated because of the *ceteris paribus* lower prices, and production and labour supply will be down. In this case there is a slump in economic activity.

This simple theory by Friedman was amended by Lucas. Lucas ({1977} 1981, p.224-228) notes that the effects on production and labour supply will be especially large if the perceived changes in real prices and wages are regarded as temporary, as this will give rise to an *intertemporal substitution of labour supply*: in order to maximize leisure and income, producers and labourers will work more when prices and wages are perceived to be temporarily high and work less when they are perceived to be temporarily low:

[I]magine what the producer thinks this price movement *means*. (...) What if (...) the price movement is transitory (as would be the case if each period's price were an independent drawing from a fixed distribution)? The answer in this case amounts to knowing the rate at which the producer is willing to substitute labor today for labor tomorrow. If "leisure" is highly substitutable over time, he will work longer on high price days and close early on low price days. Less is known about actual labor supply responses to transitory price movements than about the "long run" response [to more permanent price movements], and what we do know indicates that leisure in one period is an excellent substitute for leisure in other, nearby periods.

Lucas, {1977} 1981, p.224-225, italics are from original.

Problems in the basic Friedman-Lucas Model

A major problem in the basic Friedman-Lucas Model is its lack of a propagation mechanism. In macroeconomic terminology, a propagation mechanism is a device that makes an initial effect on economic growth last for a while, thus explaining a prolonged *period* of above or below average growth.

In the Friedman-Lucas Model, there will only be prolonged *periods* of above and below average growth under the unrealistic assumption that people err systematically—

continuously overestimating prices in the boom and continuously underestimating them in the bust (Garrison, 1989, p.18). Under the far more realistic assumption that workers and producers will try to take inflation into account--let alone the new classical assumption of "rational" (i.e. model consistent) expectations--there will be no periods of booms and recessions but only random deviations from trend growth. In sum, fooling people into supplying more of their products and services does not generate cycles.

Another problem is the lack of realism. In itself the labour supply effect described by Friedman is very plausible, yet he asks it to bear too much weight. Since changes in the inflation rate are usually quite moderate (at least in terms of the perceived change in the wage rate: at most a few percent), it is not very realistic to consider them to be the cause of major short time fluctuations in labour supply. And in relation to Lucas' intertemporal substitution effect, which explicitly tries to explain major fluctuations, it should be noted that for labourers possibilities for adjustment of working hours are severely limited in the short run.¹ Moreover, both theories do not square with the fact that depressions are occasioned predominantly by mass involuntary lay-offs and by severely restricted employment opportunities for newcomers on the labour market rather than by a significant increase of voluntary resignations and part-time working. Especially in the case of more severe depressions, or in the extreme case of the Great Depression, it would not be very credible to explain low employment figures this way.

A third problem with the model is that it predicts a counter-cyclical movement of profits (or at least a tendency for this), while profits are actually strongly pro-cyclical.² The reason for the predicted counter-cyclical pattern is that the overestimation of real prices in the boom implies an overestimation of real profits, while in the bust an underestimation of real prices implies an underestimation of real profits. As expected real profits will, other things being equal, be roughly constant, actual real profits will tend to move counter to the over- and underestimation of those profits. In the boom producers think they make normal profits but actually make less, while in the bust producers think they make normal profits but they actually make more.³

Lucas' Over-Investment Amendment

The problems in the Friedman-Lucas model appear to be solved by another amendment to Friedman' theory by Lucas: his introduction of an over-investment during the over-estimation of real prices.

According to Lucas ({1977} 1981, p.231-232), misinterpreted price signals caused by unexpected inflation not only change the volume of production and of the labour supply but also the volume of investments:

Initially (...) traders (...) perceive a relative price movement, possibly permanent, in their favor. As a result, employment and investment both increase. Through time, as price information diffuses through the

¹ Also, Mankiw (1990, p. 1653) reports that many empirical studies find that the intertemporal elasticity of substitution of the labour supply is small.

² See the appendix.

³ We are here talking about a broad concept of profits, not the Austrian one which excludes all interest income and the managerial income of entrepreneurs (see Rothbard, {1962} 1993, p.463-467, p.537-540).

economy, these traders will see they have been mistaken. In the meantime, however, the added capacity *retards* price increases generally, postponing the recognition of the initial shock. In this way, unsystematic or short-term shocks to prices can lead to much longer swings in prices.

Lucas, {1977} 1981, p. 231, italics are from original.

Thus, the over-investment will propagate the above-average output level for a while, by suppressing the general inflation that would notify producers of their mistaken perception of real prices. Lucas then continues by explaining how this boom will result in a downturn:

[T]here is a downturn automatically built in to this expansion of capacity. When recognition of general inflation does occur, investment will have to become less than normal for a time while capacity adjusts downward. There is no reason to expect this readjustment to come rapidly, or to be describable as a “crash,” or “bust.”

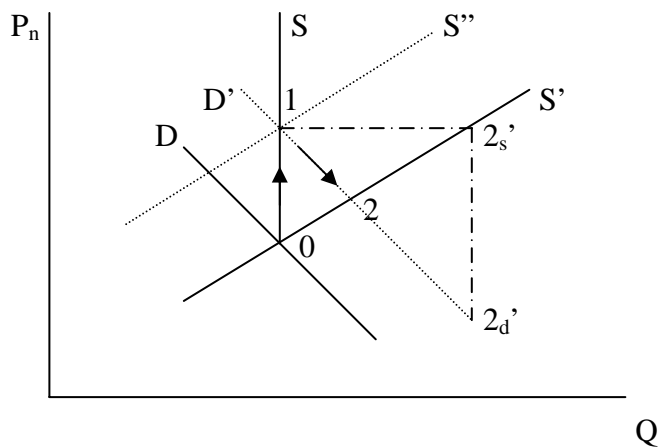
Lucas, {1977} 1981, p. 231

This downward adjustment of capacity in response to the recognition that the investments were mistaken, would circumvent the unrealistic scenario of voluntary resignations during a depression. Presumably (this is not explicitly stated by Lucas), the downward adjustment would mean involuntary lay-offs of workers. It would also imply a lowered profit level during depressions as this would presumably be the mechanism, which will induce businesses to produce less. Again this is not explicitly discussed by Lucas but we may as well give him a favourable reading.

Problems in Lucas’ Over-Investment Amendment

Although Lucas’ over-investment theory would solve the problems associated with the basic Friedman-Lucas model, it has three even more serious difficulties of its own.

The first concerns the alleged propagation of the boom. Lucas relies on the suppression of the price level caused by the over-investment to temporarily prevent the general inflation from being detected. However, it will be shown below that this cannot be the case, and that therefore producers would discover very soon that their over-investment was based on an over-estimation of prices. The matter can best be explained by use of the following supply and demand schedule (explained below):



Starting from a situation in which there is no overestimation of prices (point 0), a monetary expansion ($D \rightarrow D'$) raises nominal prices, as a given supply S will be sold by a larger amount of money (point 1). As producers increase their capacity in order to accommodate the increased demand, thinking that their real prices are higher, they will supply more, moving up along their long-run supply curve S' (point 2). As can be seen, their increased supply suppresses the price level from the level it otherwise would have been, i.e. prices are lower in point 2 than in point 1.

Now, at this point, we should try to prevent a possible misunderstanding of the issue at hand, as Lucas' exposition is not very clear or comprehensive (the above quote is basically all there is on this point). It should be noted that in Lucas' scheme the producers do not expect final prices to be in point 1 (as might be thought) but more-or-less correctly estimate the final nominal prices after their investments to be at the level at point 2. Not only is such anticipatory foresight more realistic than a robotic stimulus-response to higher prices (as for example in the cobweb model), the latter response is clearly not what Lucas could have had in mind since such an 'over-over-investment' (point $2_s'$: producers move even higher along their supply curve) would be terminated shortly rather than be propagated, as prices would soon fall drastically (to point $2_d'$) due to the increased supply.

With this possible misunderstanding out of the way, it should be clear that if producers estimated their final prices to be in point 2, then both the individual prices producers expected, and the general price level, will be situated in point 2 at the same time. As the general price level and the individual prices move together, there is no reason for producers to take later notice of the general inflation than they usually do. There is therefore no sense in Lucas' argument that the suppression of the price level from point 1 to 2 somehow postpones the recognition of the general inflation. The recognition of the inflation may be later than the discovery that individual prices have risen, but not more so than usual.

The recognition of the general inflation will make producers see that they were fooled into believing that the real reward for their products had risen, and will make them return to their previous levels of production. In the graph this is reflected in a rise of their supply curve (S''), resulting in a return of output and prices to point 1. The expansion of capacity turns out to be mistaken and the boom will end without the alleged propagation.

It could, however, be argued that now that some additional capital has been constructed, this may propagate above average output. However, here the second problem with Lucas' theory kicks in.

This second problem with Lucas over-investment theory is that he treats capital as a homogenous blob and completely ignores two qualitative aspects of capital, namely:

- capital is build up over time and has a time structure (i.e. is composed of stages)
- capital is specific and complementary to labour

As capital is not a homogenous blob but consists of specific capital goods (tools, machinery, factories, and the like) to assist workers in production, they have to be constructed to be brought into existence. In addition, while all capital goods ultimately contribute to the production of consumer goods, those specific capital goods that directly produce consumer goods are usually constructed themselves with the use of other specific capital goods, which themselves are constructed using still other specific capital goods, etc. The construction of the capital goods producing consumer goods, therefore, not only takes time (how much time depends on what existing capital goods can be used), it also has to be fitted into the stages of an overall production and capital structure.

The construction of additional capital goods directly producing consumer goods is not likely to be completed during the very temporary Lucasian over-investment. Therefore, as workers and producers discover that they were mistaken in their price perceptions, these unfinished projects will be abandoned. Since the capital goods in these projects were aimed at specific purposes, and moreover complementary to the labour assigned to them, they are no longer usable in another line of production. For one thing, there are simply not enough hands to put on them. Thus, there will not be much left of the additional capital to propagate an above average level of output.

While there is then not much of a boom in Lucas' theory, it is still worthwhile to look at the bust it is supposed to give rise to, as here a third problem can be found: Why is there, in light of the homogenous nature of capital in Lucas' theory, a downward adjustment in capacity in response to the alleged over-investment? If capital was truly as homogenous as assumed in Lucas' theory, then there is no reason not to use it after it has been brought into existence. The additional capital, although created by fooling producers and workers, is simply a boon to production once it is there. Neither will people temporarily stop investing as a consequence of the previous over-investment. People still want to further improve their (future) lives, and will make investments to do so. (In fact, to deny that they would, would bring us to the age-old doctrine of insufficient demand for increases in capacity. However, a discussion of this fallacy falls beyond the scope of this paper, and can moreover be found in Rothbard (1963) 2000, p.55-58).

2. Monetary Disequilibrium Theory

The major monetarist alternative to the Friedman-Lucas Model is Monetary Disequilibrium theory, put forward by Warburton (1950) 1966 and more recently by Yeager (1986) 1997). The theory holds that due to the stickiness of prices and wages, changes in the money supply or in the monetary growth rate will initially result in quantity adjustments on markets rather than price adjustments. The new-Keynesians hold a similar position although in their theory the disturbance, which necessitates price and wage adjustment, may also be non-monetary.

The boom phase is quite similar to that of the Friedman-Lucas model. An increased money supply will lure producers and workers into supplying more of their products and

services. Contrary to the Friedman-Lucas model, however, producers and workers are willing to do this without being fooled to believe that real prices and wages have become higher:

We now describe how, starting from general equilibrium, an increase in the money supply can cause a temporary increase in output and employment, and *without* necessarily fooling the workers (...)

When the money supply and spending increase, businessmen experience an increase in the real demand for their goods. Quite generally, each businessman, or the average businessman, is willing to meet an increase in demand with increased sales, and at substantially unchanged prices, as long as he can get the necessary capital goods, materials, labor and so forth at unchanged costs. Whether he can get them depends largely on *other* people's willingness to run down their inventories, work their factories more nearly at maximum capacity, work overtime, take less of a semi-vacation between jobs, enter the labor force, postpone retirement, etc. To a considerable extent other people *are* willing to behave that way.

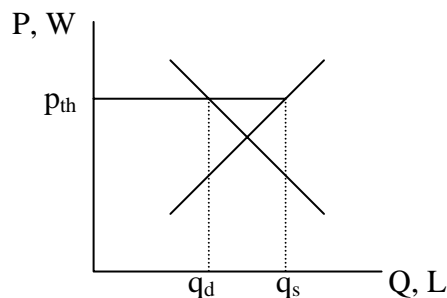
Birch, Rabin, and Yeager, 1982, p.216. Italics are from original.

Most expositions of MDT do not discuss a boom phase but focus instead exclusively on the bust phase. This phase was explained by Yeager as follows:

A discrepancy between supply and demand is likely to develop (...) when growth of the money supply falls short of the long-run trend. Actual shrinkage poses the simplest case. People and organizations try to conserve or replenish their shrunken money holdings by restraint in buying and greater efforts to sell goods and services and securities. (...) Transactions and production fall off, unless prices and wages promptly absorb the whole impact of the monetary disturbance.

Yeager, {1986} 1997, p. 218

In other words, when the money supply is less than anticipated (“falls short of its long run trend”) the price and wage level tends to be too high relative to the money supply. As prices and wages will be based on the anticipated money supply, the actually available money supply is not sufficient to buy all goods and services offered for sale at these prices. Yeager’s statement that more people will want to sell than to buy, is just another way of saying this, as is shown below in a simple supply-and-demand schedule. There it is seen that if prices or wages are too high, the supply for goods or services (the demand for money) is higher than the demand for goods (the supply of money offered in exchange). In the figure: at price p_{th} the quantity supplied (q_s) is larger than the quantity demanded (q_d).



Markets will move from a disequilibrium position to a new equilibrium position by means of price adjustment. However, MDT holds that prices and wages may fail to adjust for a significant amount of time due to price and wage stickiness. As Warburton explains:

[S]ome prices are greatly influenced by custom or contract and move less readily than other prices; specifically wages and contractual elements in business costs tend to be sluggish relative to price of output.
Warburton, {1950} 1966, p.28

By implication, one market that will be affected in particular is the labour market. In contrast to the Friedman-Lucas theory therefore, involuntary lay-offs are a distinct characteristic of MDT. In addition, the divergent movements of output prices and contractual elements in business costs, such as wages, will ‘...have significant effects upon business profits and prospects and hence upon business plans, especially with respect to investment decisions....’(Warburton, {1950} 1966, p.28). Contrary to the Friedman-Lucas Model, then, also the lowered profits during depressions are accounted for by MDT.

Discussion of Monetary Disequilibrium Theory

We will discuss the boom and bust phase in MDT separately:

1) The Boom Phase in MDT

The distinctive characteristic of the boom phase in MDT, is that “starting from general equilibrium” producers and workers are prepared to supply more of their products and services without price inducement--that is without being fooled that real prices and wages are higher than before.⁴ But this is a very distinctive characteristic indeed; one which runs counter to basic economic principles. For if producers and workers are not fooled into believing that real prices and wages have changed, why did they not supply more before? As this would have increased production, it would have led to the same real outcome as the case described by Birch et al. In short, if people are not fooled about prices, real outcomes will not change.

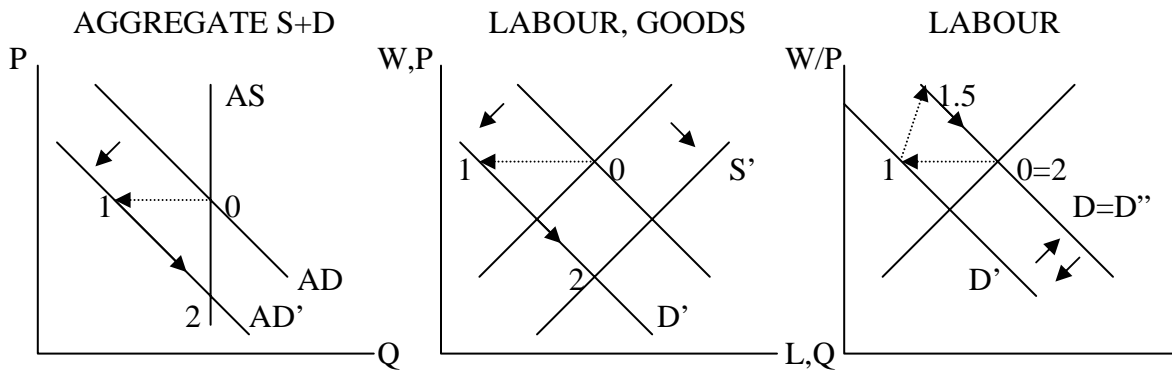
2) The Bust Phase in MDT

To assist our discussion of the bust phase in MDT, it is illustrated in the series of figures below. The schedule on the left shows the decline of the money supply, which is indicated by the downward shift in aggregate demand. Starting from point 0 and assuming sluggish price adjustment, the change initially leads to lower output (point 1) but ultimately, when prices have adjusted downwards, output fully recovers (point 2). The effect on individual markets, either for goods or labour services, is shown in the graph in the middle. After the demand shock, prices and nominal wages initially do not adjust (point 1) but when they ultimately do, output and employment return to their original levels (point 2). The shift in the supply curve seen in that figure implies a lower supply curve in terms of nominal prices and wages but an unaltered supply curve in terms of real prices and wages.

The graph on the right shows that unaltered supply curve-in terms of the real wage rate on the labour market. The monetary change leaves the real wage rate initially unaffected as both nominal wages and prices do not adjust (point 1). Under the assumption that wages fall more sluggish than prices (a reasonable assumption, as wages are more often

⁴ MDT does not assume idle resources. This idea belongs to the realm of (traditional) Keynesian economics and will not be discussed here.

subjects to contract extending over a considerable period of time), the next phase is for *real wage rates to rise* (point 1.5). The upward shift in the demand curve for labour is due to the adjustment of prices, which increases the quantity of products sold and therefore of labour demanded. Only later, when nominal wages also adjust, will the real wage rate return to its original level (point 2). Although the adjustment of prices and wages is an interdependent process as they have to adjust to each other, for expository purposes (i.e. to show the net effect on the real wage) price adjustments as a whole are illustrated to take place before wage adjustment.



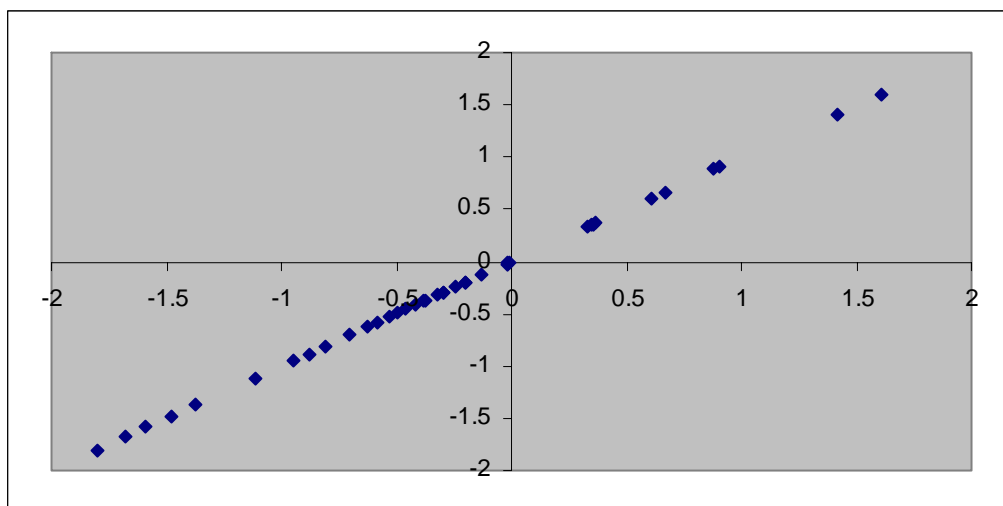
For MDT to predict real wages to fall rather than rise during depressions, wages would have to fall faster than prices. In that case, we would first move from point 1 downwards along the demand curve to the intersection with the supply curve, and then from there move upwards again along the supply curve to the original equilibrium, point 0. We will return to this alternative scenario later and for the moment continue with the original MDT scenario in which real wage rates rise.

Rising Real Wages

Apart from interest payments on debt-contracts (to be discussed in the next section on the Debt-Deflation Theory), labour costs are generally by far the most important contractually fixed costs in businesses. However, empirically, they do not rise during most depressions.

In the diagram below, the quarterly percentage changes in the real wage rate for quarters with negative-GDP-growth are presented for the US since 1948.⁵ Negative numerical values (located in the south-west quarter) show falling real wages, positive numerical values (located in the north-east quarter) show rising real wages. Clearly, the anti-cyclical movement of real wages predicted by MDT is not there: in fact, 28 of the 38 observations are inconsistent with the MDT.

⁵ The data are presented in the appendix, and are based on the Federal Reserve Economic Database 2.



Furthermore, of those 10 real wage observations that do not immediately contradict MDT, 6 were followed by economic recovery (that is, a quarter of positive GDP-growth), despite the fact that there was continued real wage growth—of which 4 cases even experienced a real wage growth that was above the average real wage growth during positive GDP-growth quarters.⁶ This further contradicts the view that those recessions were caused by unduly high real wages in the first place.

A possible way-out of this empirical analysis would be to say that real wages may be too high prior to the depression rather than during the depression. Prices could drop to accommodate the lowered money supply, thus preventing the otherwise immediate and inevitable fall in production but resulting instead in a fall of the profit mark-up causing the depression to occur in the next period. Yet this possible alteration would still not save MDT: only 10 observations of 24 observations are consistent (see the appendix).

What then is wrong with MDT? One possible reason that the effect stressed by MDT is not as relevant as might be expected is that wage rates, despite their being fixed by contracts, can regain some flexibility in the short run in two indirect ways:

First, at various times during a non-depression year, an employee may receive a non-contractual wage-increase; by simply cancelling these, a certain amount of downward wage flexibility will be achieved.

Second, employers may require workers to do more work at the given wage. Knowing that money wages are too high, employers will realise that their additional pressure on workers will not risk their resignations, for no other employer will offer a better deal. While an alternative mix of money wage and effort would be preferable to employees, most employers are confronted with the same problem, preventing competition in the ‘wage/work effort’-mix from that direction. Furthermore, the probability that newcomers will be a major threat as competing employers is very limited within the period in which wages are contractually fixed.

⁶ See for the data the appendix.

Yet the question of how flexible wages are in the short run does not touch upon the heart of the matter. The main weakness of MDT, in particular as compared to ABCT, is that the temporarily higher wages do not change the relative profitability of different investment projects. As wages are fixed for a limited period of time (for example one year), they will only temporarily lower profits as output prices fall. Although one year of low profits will lower asset values, the future profitability of investment projects will not be in danger, neither will other, different, investment projects now become relatively more profitable than the existing ones. No structural adjustment in the economy will therefore be required, and thus no reallocation of resources.

It may be objected that despite unchanged *relative* profitability of investment projects, production on the existing projects will be temporarily stopped during the period of higher real wages because of the lowered *absolute* profitability. Production will be resumed only after it will have become profitable again, that is when wages have returned to equilibrium levels. However, it will be seen that the option of stopping production is very costly:

- Businesses will have to continue paying interest on their loans.
- Capital goods require costs for location or storage (e.g. rent).
- For employers to avoid continuing wage payments, workers will have to be fired and after some time re-hired. This implies administrative costs and search costs.

Only if the unanticipated increase of the real wage is higher than all these costs together, will a business make less losses when stopping producing than when continuing. With a numerical example it can be shown that this is not very likely: If the de(in)flation and consequently the unanticipated real wage increase are 3% and wages take up 90% of all costs, then the above mentioned costs need to be less than $(90 \cdot 3\%) = 2.7\%$ of the total production costs in the period under consideration.

Filing for bankruptcy to avoid any costs when not producing, is often not a realistic option, and will moreover lead either to the loss of the future profits that would have been reaped when staying in business, or to the future costs of setting the business up all over again. In sum, not using large amounts of resources is very costly and will confront businesses with a bigger loss of income than the option of just writing off the temporary real wage increase as a one-time loss and continuing producing as before. This means that although asset values will be lowered, there will be no significant effect on production, investments and employment.⁷

Falling Real Wages

To predict falling rather than rising real wages during a MDT-depression, wages need to adjust faster than output prices. This in itself is not very plausible but it has nevertheless

⁷ A third option would be to rent out non-specific capital goods while temporarily not producing. While this would not avoid all of the mentioned costs, this would at least allow the non-producer to recapture some of its costs of capital without having to pay high real wages. However, the fact that we do not see this option massively applied in depressions suggests that the first option (simply continuing production) is the optimal one. One reason may be that the capital rented out will be less productive than in its original use because the temporary use is second best (the original use is first best), and specific capital goods cannot be used.

been defended by New-Keynesian economists. Their defence starts with the assumption that good markets are characterised by ‘monopolistic competition’—that is by producers who have some monopoly power over prices due to the imperfect substitutability of their product with other’s products (Ball et al., 1988, p.6-9, 13).

This situation of monopolistic competition is contrasted with the theoretical ideal type of ‘perfect competition’ in which producers have no control over their prices at all but are simply ‘pricetakers.’ In the latter case producers have no choice but to lower prices in response to a lower than expected money supply, but if producers do have some control over their prices then they might choose not to lower them. The following reasons are mentioned for not lowering prices: menu costs, near-rationality, and an unwillingness to move first:

-Menu costs are the costs expended in changing prices, e.g. printing new menus. If these are higher than the expected higher revenues from the changed prices (during the period in which these changed prices would be applied), producers will choose not to change prices.

-Near-rationality means that when producers will loose very little when not adjusting prices, they may opt for the latter option and thus act sub-optimally. (Actually, they still act optimally and rationally, because in fact they either choose not to be informed because of the fact that the costs of being informed are higher than the expected benefits, or they are informed but are too lazy to undertake action—in which case the disutility of labour is higher than the expected benefits of changing prices. Seen in this way, near-rationality resolves into a particular instance of menu costs.)

-The unwillingness to move first is not just found in the New-Keynesian literature but also in Yeager’s writings, and is explained (by both) by the fact that the producer who changes first, changes not just the nominal price of its product but also its relative price:

By promptly cutting the price of his own product or service, [the producer] would be cutting its relative price, unless other people cut their prices and wages in at least the same proportion. How could he count on deep enough cuts in the prices of his inputs to spare him losses or increased losses at a reduced price of his own product?

Yeager, {1986} 1997, p.225⁸

To begin our comments with the last of these three rigidities, it should be obvious that even given the costs of their inputs per product, producers in a disequilibrium position (as in the first figure in this section) will often want to decrease prices because this may lower losses or increase profits due to the increased revenues ($P*Q$). Yeager focuses exclusively on the price and the profit mark-up per product, and forgets the contribution of Q to revenues and profits. Furthermore, part of the increase in Q that induces the individual producer to move to the new equilibrium, consists of customers that the first movers attract at the costs of other producers (of the nearest substitutes)—that is those

⁸ See alternatively, Ball et al., 1988, p.11.

laggards who lower prices later. Thus, even if in the aggregate producers would lose from lowering prices, they are stuck in a prisoner dilemma forcing them to cut prices.

The latter observation is also relevant for the cases of menu costs and near-rationality. Given the fact that the first mover does not only keep his existing customers but also wins customers at the expense of the other producers, there is a strong incentive to adjust prices to changing nominal demand. And within this general picture we should also consider potential competition from newcomers drawn to the industry by the prospect of taking customers away from high-pricing producers.⁹ These will be particularly eager to make use of the easy opportunity to get some market share.

Another criticism of the scenario in which wages fall faster than prices is that it does not confirm to the timing of unemployment resulting from depressions. The scenario implies that the labour market clears faster than the rest of the economy and therefore that (involuntary) unemployment would be ended before ‘underproduction’ would. Yet typically, unemployment remains high for some time while output has recovered.¹⁰

3. The Debt-Deflation Theory

Our third and final monetarist explanation of depressions is the so-called debt-deflation theory. Originally, this theory was put forward by Irving Fisher (1933), albeit in an unsophisticated and not necessarily monetarist form. The theory can also be found in a more modern form in a short article by Anna J. Schwartz (1995).

In the original form, the theory stated that high levels of indebtedness...

...will tend to lead to liquidation, through the alarm either of debtors or creditors or both. Then we may deduce the following chain of consequences (...): *Debt deflation* leads to distress selling and to *Contraction of deposit currency*, as bank loans are paid off (...). This (...) causes *A fall in the level of prices*, in other words a swelling of the dollar. Assuming (...) that this fall of prices is not interfered with by reflation or otherwise, there must be *A still greater fall in the net worth of business*, precipitating bankruptcies and *A like fall in profits*, which in a “capitalistic” that is, a private-profit society, leads the concerns which are running at a loss to make *A reduction in output, in trade and in employment* of labor.

Fisher, 1933, p. 341-342, italics are from original.

The problem of high levels of debt is for Fisher predominantly caused by irresponsible commercial borrowing:

The over-indebtedness hitherto presupposed must have had its starters. It may be started by many causes, of which the most common appears to be *new opportunities to invest at a big prospective profit* (...) such as

⁹ It may be argued that the existing producers will hold on to their excess capacity to threaten potential newcomers with “cutt throat competition” if they enter. There is no need here to counter this particular argument, as it can simply be pointed out that this scenario would not fit the new-Keynesian explanation of business cycles: it would imply that producers would hold on to their employees and therefore low levels of production would not coincide with unemployment.

¹⁰ See the appendix.

through new inventions, new industries, development of new resources, opening of new lands or new markets.

Fisher, 1933, p.348, italics are from original.

Although Fisher also mentions ‘easy money’ as well as ‘the low-interest policy adopted to help England get back on the Gold Standard in 1925’ (p. 348), nowhere the central bank is given ultimate (or for that matter *any*) responsibility for causing over-indebtedness.

However, this stress on commercial errors and relative neglect of policy factors is contrary to modern economic theory, which concludes that it is precisely policy shifts that cannot be anticipated and are therefore able to disturb the whole market. With non-interfered market transactions, by contrast, errors will be limited to individual entrepreneurial misjudgements and tend to be minimized: good judgements are rewarded by profits, bad judgment are penalized by losses, inducing good entrepreneurs to continue doing business while bad entrepreneurs either have to adjust or are forced off the market.¹¹

Likewise, Fisher fails to mention that it is not deflation as such that is a problem, but only *unanticipated* deflation since only this will upset people’s plans. It is in Schwartz (1995, p.24), that we find a more modern debt-deflation theory:

Both [lenders and borrowers] evaluate the prospects of projects borrowers want to undertake by extrapolating the prevailing price level or inflation rate. Borrowers default on loans (...) because, subsequent to the initiation of the project, authorities have altered monetary policy in a contractionary direction. The original price level and inflation rate assumptions are no longer valid. The change in monetary policy makes rate-of-return calculations on the yield of projects, based on the initial price assumptions of both lenders and borrowers, unrealisable. Borrowers lose the sums they have invested. Lenders have to contend with losses on loans.

Thus, the lower than expected prices cause previous estimates of sales revenues to be no longer realistic since these were mistakenly based on an extrapolation of previous price developments. Debtors make losses on their undertaking and are not, or only partly, able to repay their creditors.

Discussion of the Debt-Deflation Theory

As we have already indicated some of the problems with Fisher’s version of the debt-deflation theory, we will here start with Schwartz version of the theory, and look in more detail at the possible effects of increased real debt stemming from an unexpected deflation or unexpected de-inflation.

The first thing to note about unexpected de(in)flation is that the lower than expected prices only lower nominal revenues and not real revenues (since virtually all prices go down). The effect is therefore only a single redistribution of funds from debtors to

¹¹ The argument can be found in Rothbard ({1963} 2000, p.76), while it is implicitly assumed in neoclassical equilibrium models.

creditors, whose contracts were based on a wrongly predicted inflation rate. This was noted by Rothbard (1963) 2000, p.51, n.16):

It has often been maintained that a falling price level injures business firms because it aggravates the burden of fixed monetary debts. However, the creditors of the firm are just as much its owners as are the equity shareholders. The equity shareholders have less equity in the business to the extent of its debts. Bond-holders (long-term creditors) are just different types of owners, very much as preferred and common stock holders exercise their ownership rights differently. Creditors save money and invest it in an enterprise, just as do shareholders. Therefore, no change in price level by itself helps or hampers a business; creditors-owners and debtor-owners may simply divide their gains or (losses) in different proportions. These are mere intra-owner controversies.

As the lower-than-expected-revenues are a one-time loss on the projects of the debtor-owners, they do not change the relative profitability of different investment projects.¹² Herein lays an important difference with the interest rate effect in ABCT, which does change the relative profitability of investments. In the ABCT, a higher interest rate necessitates a liquidation of certain projects because these can no longer be continued profitably.

In the debt-deflation theory, the one-time loss for debtors may at worst lead to a number of bankruptcies among them. But since relative profitability is unchanged, the projects of these debtors can be continued by others and an economy-wide re-allocation of production factors comparable to that caused by the Austrian interest rate effect is unnecessary. Furthermore, as in the aggregate the real value of financial assets does not decrease—in fact, it increases somewhat as real cash balances rise due to the de(in)flation—there is no reason to assume that the investment projects and the capital goods incorporated in them, cannot be taken over by others. In sum, as future and relative profits remain unchanged, the temporary fall in profits will—contrary to the first quote from Fisher—not lead to cutbacks in output and employment.

Another fear of the adherents of the debt-deflation theory is that increased real debt will lead to a (further) contraction of the money supply through its effects on the banking system. Confronted with debtors unable to pay off their loans, banks will experience a negative effect on their balance sheet, which may cause them either to increase their reserves to secure their creditors of their liquidity or to experience a bank run when creditors remain unconvinced.

The further contraction of the money supply brought about in this way would cause more deflation, which would further increase real debt, causing more bank failures and higher liquidity ratio's, which in turn would lower the money supply, etc. Irving Fisher expressed this downward spiral most vividly:

Unless some counteracting cause comes along to prevent the fall in the price level, such a depression (...) tends to continue, going deeper, in a vicious spiral, for many years. There is then no tendency of the boat to stop tipping until it has capsized. Ultimately, of course, but only after almost universal bankruptcy, the indebtedness must cease to grow greater and begin to grow less. Then comes recovery and a tendency for a

¹² The one-time loss is a “sunk cost.”

new boom-depression sequence. This is the so-called “natural” way out of a depression, via needless and cruel bankruptcy, unemployment, and starvation.

Fisher, 1933, p.346

In relation to the fear of a further contraction of the money supply and the ensuing downward spiral, two questions arise:

- (1) How likely is this scenario?
- (2) How does it account for cutbacks in production and employment?

(1) To answer the first question, imagine an unexpected de(in)flation of 3%, causing an unexpected rise in real debt of the same percentage. If we assume a contractually fixed interest rate, then interest payments also increase 3%. Thus instead of paying for example \$100, now \$103 will have to be paid (in real constant dollars). Or to translate to interest rate points: instead of for example 5% or 10%, now 5.15% or 10.3% should be effectively paid. Apart from a few bankruptcies of firms that were already on the edge, this can hardly be supposed to cause much trouble, let alone a banking crisis. Instead, the effect is simply a one-time depreciation of the asset values of affected businesses.

Why then do banking crises and efforts by banks to prevent such crises, occur during periods of unexpected de(in)flation? This is, of course, perfectly well explained by the Austrian theory of the business cycle, for as businesses get in financial trouble, the banks they owe may get into trouble as well. Indeed, businesses typically go bankrupt not because of increased real debt (although that may be a symptom), but because of unprofitable investments or low sales. These latter occur, during an Austrian type downturn, first in the investment sectors, and later as a second round effect in other sectors.

(2) Suppose, just for the sake of argument, that due to a debt-deflation, there is a banking crisis or an increase of reserves that substantially lowers the money supply. In that case, we have already established that the subsequent increase in real debt itself is no reason for cutbacks in output and employment since relative and future profitability are unaffected. Therefore ultimately, the debt-deflation theory will have to fall back on other theories linking money to output and unemployment—to which, of course, our earlier criticisms apply.

4. The Significance of Relative Prices and Capital for Business Cycle Theory

Having reviewed in the previous sections the business cycle theories offered to us by monetarism, we are now in a position to judge the significance of their neglect of relative prices and capital. For this purpose, we will first look at a specific version of MDT, namely the idea expressed by prominent New-Keynesian monetarist Christina Romer, that the interest rate policy of a central bank may generate the business cycle. As ABCT also focuses on the interest rate, this will most sharply contrast both approaches to economics, and serve to illustrate Hayek’s concern about monetarism’s disregard of the harmful effects of monetary injections.

Then we will take up Garrison's concern about what macroeconomic constructions remain when capital and relative prices are subtracted from business cycle theory, by evaluating our findings of the monetarist business cycle theories.

The Disregard of the Harmful Effects of Monetary Injections

In an article about the Great Depression, Romer (1993a, p.32) notes:

[R]eal rates were very high in 1931 and 1932. This is what one would expect if the monetary contraction generated substantial deflation and nominal rates were bounded by zero. (...) [The] high real interest rates are no doubt part of the reason that fixed investments plummeted during this phase of the Great Depression.

And in the entry for 'Business Cycles' in *The Concise Encyclopedia of Economics*, she gives a more general formulation:

The Federal Reserve System determines the size and growth rate of the money stock and, thus, the level of interest rates in the economy. Interest rates, in turn, are a crucial determinant of how much firms and consumers want to spend. A firm faced with high interest rates may decide to postpone building a new factory because the cost of borrowing is so high. Conversely, a consumer may be lured into buying a new home if interest rates are low and mortgage payments are, therefore, more affordable. Thus, by raising or lowering interest rates, the Federal Reserve is able to create recessions or booms.

Romer, 1993b, p. 3

While Romer differentiates between consumption and investment spending, from the second quote it should be clear that the relevant factor in her analysis is spending as such, that is total spending. This means that her argument relies on price and wage rigidity, for if prices and wages would adjust to the changed quantity of money spend, real volumes would not change. Romer (1993b, p. 3) herself, recognises this:

Only when prices and expectations are not fully flexible can fluctuations in government spending or the money stock cause large swings in real output.

Despite the fact then that the argument is formulated in terms of the influence of the interest rate on consumption and investment spending, in essence it links total monetary spending via price stickiness to output and employment, and that is why it is a version of MDT. We need therefore not separately criticise Romer's argument, since it was implicitly covered in section 2.

The point to make here, is that Romer's argument clearly shows the loss of relevant information when theorising exclusively or predominantly in aggregates like total spending and the general price level. If Romer had given attention to the re-distributive effects of a change in the money supply, she would have recognised that consumption and investment spending would have been affected differently—thus changing relative prices and resource allocation in the economy. Had she incorporated in her theory the role of the interest rate in evaluating the profitability of different investment projects, she would have concluded that monetary changes do not just change the volume of investment spending but also its qualitative make-up—thus changing the capital structure in the economy. Finally, had she considered the specific nature of capital goods tied up in

particular investment projects, she would have realised that policy induced re-allocations of resources move the economy away from the capital structure wanted by consumers—thus setting the stage for an economic bust.

In these ways, Romer overlooks the harmful effects of monetary injections in a manner that is typical for monetarism. Romer's neglect of the qualitative make-up and specific nature of capital was, for example, also encountered in Lucas' over-investment theory. Typically, monetarism treats capital like a homogenous blob, which does not allow it to cause much trouble.

Neither is there much need to talk about interest rates if the dis-aggregated effects of monetary injections on capital and relative prices are neglected. Indeed with the notable exception of Romer, interest rate effects do not play any role in monetarist explanations of business cycles.

The Alternative Constructions of Monetarism

Related to the loss of relevant information resulting from the neglect of relative prices and capital, is the failure of the macroeconomic constructions that remain—those focusing on the general price level—to provide a satisfactory account of the business cycle. Below we will shortly reiterate our earlier findings:

The Friedman-Lucas Model

In the Friedman-Lucas model unexpected general price level movements fool producers and workers in supplying either more (boom) or less (bust) of their products and services. The model fails to account for sustained periods of boom and bust, as it is not reasonable to assume that market suppliers structurally under- or overestimate the general inflation. Nor was the significance attached to voluntary changes in employment by this theory very plausible.

Lucas' overinvestment amendment could not save the Friedman-Lucas Model for a number of reasons, most importantly it incorrectly viewed individual prices and the general price level to move opposite to one another during a boom.

Monetary Disequilibrium Theory

In its explanation of the boom phase, MDT implausibly assumes that producers and workers will supply more during an inflation, despite the fact that they will realise that real values have not changed. In the explanation of the bust phase, the real wage rise ascribed to de(in)flation, seems at first glance to be a very plausible cause of depression--yet when considering the decision facing the businessman about the best use of his capital, the rise cannot be expected to affect output and employment very much as it does not substantially change the businessman's investment plans.

In the new-Keynesian version of MDT, real prices rather than real wages rise in case of a de(in)flation. However, the alleged price rigidities held responsible for this would crumble under producers' competition for customers.

The Debt-Deflation Theory

With a numerical example it could be shown that the effect of de(in)flation on real interest payments is typically not that big at all. In addition, the debt-deflation effect does not change the relative profitability of different investment projects, making an economy wide re-allocation of resources unnecessary.

In sum, a few aspects of monetarist explanations of the business cycle are contradictory to economic theory, while the remaining part stresses effects that cannot be expected to have much impact on the overall economy. We may explain the latter by the fact that the changes in the price and wage level used in these monetarist constructions do not require a change in the production structure and the corresponding economy-wide reallocation of resources.

The significance of relative prices and capital for business cycle theory is precisely that they do allow us to explain the economy-wide distortion in the production structure and the subsequent reallocation of resources. Changes in relative prices caused by a monetary injection, first induce production factors to shift to investment projects that do not reflect the preferences of consumers, and then later, when the monetary injections stop, reveal that these investment projects cannot be completed. In short, relative prices bring about a change which later needs to be undone, and capital causes this undoing to be painful. Together then, these considerations of relative prices and capital help us explain why monetary distortions have big repercussions.

Conclusion

Monetarism may be defined as the collection of *neoclassical* theories linking money with prices, output and employment. These theories differ from the Austrian theory of the business cycle in their neglect of relative prices and capital and their reliance instead on the general price level as the mechanism through which monetary changes affect real magnitudes.

In this paper, it was shown that without relative prices and capital, the monetarist business cycle theories are unable to account for booms and busts. The main problem is that general price level effects do not have very severe repercussions, whereas relative price effects situated in a modern capital-intensive economy do. We therefore conclude that monetarist theories would do well to include the latter factors in their theories. Until they do, the Austrian theory of the business cycle holds an important advantage over them.

Appendix: US Data 1948-2003

The following table gives for the US for the period 1948-2003 the quarterly percentage changes of real GDP, real wages and real profits; and the unemployment rate. To calculate real GDP, the GDP chain-type price index was used; for real wages and real profits the CPI was used. All used data are from the Federal Reserve Economic Database 2 (<http://research.stlouisfed.org/fred2/>).

We will use the table to comment on some stylised facts, which were used in the paper:

Real Profits: Of the 24 observations of negative GDP-growth since 1959, 22 show a fall in real profits and 2 show a rise. This contradicts the Friedman-Lucas Model, which predicts high profits during below-trend GDP-growth, as argued in section 1.

Real Wages: Of 38 observations of negative GDP-growth, 28 show a fall in real wages, 10 show a rise. Six of those 10 observations were followed by a quarter of both continued real wage growth and positive GDP-growth—of which four cases even experienced a real wage growth that was above the average real wage growth during positive GDP-growth quarters (this average is 0.55%). These findings contradict Yeager’s MDT.

Of the 24 observations of negative GDP-growth since 1959, only 5 are consistent with Yeager’s MDT, and only 5 more can be made consistent by also looking at real profits and real wages directly before the quarter of negative GDP-growth. There are actually 7 observations which show both a fall in real profits and a rise in the real wage directly before the quarter of negative GDP-growth, however two of those were already counted in the original 5. The 7 observations mentioned were considered consistent with MDT because they either had a fall in real profits and a rise in real wages in the quarter before the recession quarter, or in the quarter before that quarter (but not if in the latter case there was a recovery of profits in the quarter laying in between, as this would also contradict Yeager’s MDT).

Unemployment: From the data it can be seen that negative GDP-growth generally leads to a higher level of unemployment for some time after the economy starts growing again and has again reached its pre-depression level of output (which is approximately when the negative percentages of GDP-growth have been compensated by positive percentages). This contradicts the new-Keynesian sticky price version of MDT, for this theory predicts that the labour market would be sooner in equilibrium than the goods market.

Date	Real GDP (%-change q-o-q)	Real Wage (%-change q-o-q)	Real Profits (%-change q-o-q)	Unemployment Rate (percentage)
1948-01-01	1.2	n/a	n/a	3.4
1948-04-01	1.5	0.4	n/a	3.9
1948-07-01	0.7	-0.2	n/a	3.6
1948-10-01	0.5	2.4	n/a	3.7

1949-01-01	-1.6	0.4	n/a	4.3
1949-04-01	-0.8	-0.4	n/a	5.3
1949-07-01	1.4	1.2	n/a	6.7
1949-10-01	-1.0	-0.5	n/a	7.9
1950-01-01	4.2	3.1	n/a	6.5
1950-04-01	3.0	1.6	n/a	5.8
1950-07-01	4.0	3.1	n/a	5.0
1950-10-01	2.1	1.9	n/a	4.2
1951-01-01	1.4	1.4	n/a	3.7
1951-04-01	1.8	0.8	n/a	3.1
1951-07-01	1.7	1.3	n/a	3.1
1951-10-01	0.0	0.6	n/a	3.5
1952-01-01	0.9	0.8	n/a	3.2
1952-04-01	-0.2	1.6	n/a	2.9
1952-07-01	1.0	0.9	n/a	3.2
1952-10-01	3.2	3.7	n/a	3.0
1953-01-01	1.8	-0.1	n/a	2.9
1953-04-01	0.7	1.5	n/a	2.7
1953-07-01	-0.6	-0.2	n/a	2.6
1953-10-01	-1.7	-0.6	n/a	3.1
1954-01-01	-0.6	0.9	n/a	4.9
1954-04-01	0.0	-0.5	n/a	5.9
1954-07-01	1.3	1.2	n/a	5.8
1954-10-01	2.1	1.8	n/a	5.7
1955-01-01	3.0	0.9	n/a	4.9
1955-04-01	1.5	1.7	n/a	4.7
1955-07-01	1.4	0.6	n/a	4.0
1955-10-01	0.9	1.4	n/a	4.3
1956-01-01	-0.5	0.7	n/a	4.0
1956-04-01	0.4	1.8	n/a	4.0
1956-07-01	0.0	-0.5	n/a	4.4
1956-10-01	1.4	1.4	n/a	3.9
1957-01-01	0.9	1.3	n/a	4.2
1957-04-01	-0.3	-0.7	n/a	3.9
1957-07-01	0.8	-0.8	n/a	4.2
1957-10-01	-1.6	-0.2	n/a	4.5
1958-01-01	-2.5	-0.9	n/a	5.8
1958-04-01	0.5	-0.3	n/a	7.4
1958-07-01	2.7	2.2	n/a	7.5
1958-10-01	2.6	1.2	n/a	6.7
1959-01-01	1.7	1.7	n/a	6.0
1959-04-01	2.5	1.2	9.4	5.2
1959-07-01	-0.1	-0.8	-9.7	5.1
1959-10-01	0.4	0.6	-0.3	5.7
1960-01-01	2.4	2.3	6.6	5.2
1960-04-01	-0.6	-0.3	-7.4	5.2
1960-07-01	0.1	0.0	-2.4	5.5
1960-10-01	-1.4	-0.4	-5.2	6.1
1961-01-01	0.7	0.1	-1.8	6.6
1961-04-01	1.9	2.0	8.7	7.0
1961-07-01	1.7	1.0	3.9	7.0
1961-10-01	2.1	1.3	6.6	6.5
1962-01-01	1.8	1.8	4.3	5.8
1962-04-01	1.0	0.8	-1.8	5.6
1962-07-01	0.9	0.7	2.1	5.4
1962-10-01	0.2	-0.6	2.8	5.4
1963-01-01	1.2	1.5	0.0	5.7
1963-04-01	1.4	0.3	4.7	5.7
1963-07-01	1.9	0.4	1.4	5.6
1963-10-01	0.9	0.9	2.0	5.5
1964-01-01	2.2	1.4	5.8	5.6
1964-04-01	1.1	0.2	-0.3	5.3
1964-07-01	1.3	1.9	1.6	4.9
1964-10-01	0.3	1.0	-1.5	5.1
1965-01-01	2.5	0.5	9.6	4.9
1965-04-01	1.3	0.5	2.2	4.8
1965-07-01	2.0	0.3	0.7	4.4
1965-10-01	2.4	2.3	4.2	4.2
1966-01-01	2.5	1.6	2.7	4.0
1966-04-01	0.2	0.9	-2.6	3.8

1966-07-01	0.8	1.4	-2.4	3.8
1966-10-01	0.8	-0.2	0.2	3.7
1967-01-01	0.9	1.0	-2.7	3.9
1967-04-01	-0.1	0.3	-1.7	3.8
1967-07-01	0.8	0.3	0.8	3.8
1967-10-01	0.8	0.7	2.7	4.0
1968-01-01	2.1	2.3	0.1	3.7
1968-04-01	1.6	0.5	3.2	3.5
1968-07-01	0.7	0.5	-1.2	3.7
1968-10-01	0.4	1.0	0.0	3.4
1969-01-01	1.6	0.3	-1.4	3.4
1969-04-01	0.2	-0.1	-4.8	3.4
1969-07-01	0.6	1.0	-4.1	3.5
1969-10-01	-0.4	0.0	-6.6	3.7
1970-01-01	-0.1	-0.3	-9.8	3.9
1970-04-01	0.1	-0.8	2.9	4.6
1970-07-01	0.9	0.5	-0.9	5.0
1970-10-01	-1.1	-0.9	-6.9	5.5
1971-01-01	2.8	1.3	15.2	5.9
1971-04-01	0.5	1.2	1.8	5.9
1971-07-01	0.8	-0.1	1.1	6.0
1971-10-01	0.3	0.3	2.6	5.8
1972-01-01	1.7	1.6	4.1	5.8
1972-04-01	2.4	0.5	0.0	5.7
1972-07-01	1.0	0.5	3.9	5.6
1972-10-01	1.8	1.9	5.4	5.6
1973-01-01	2.4	1.8	4.6	4.9
1973-04-01	1.0	-1.6	-4.9	5.0
1973-07-01	-0.5	0.3	-1.0	4.8
1973-10-01	1.2	-1.2	-0.7	4.6
1974-01-01	-1.0	-1.1	-7.9	5.1
1974-04-01	0.4	-0.5	-4.1	5.1
1974-07-01	-1.1	-0.6	-5.6	5.5
1974-10-01	-0.5	-1.8	-6.8	6.0
1975-01-01	-1.2	-0.5	-0.7	8.1
1975-04-01	0.8	0.5	10.0	8.8
1975-07-01	1.7	0.1	15.4	8.6
1975-10-01	1.3	0.9	3.0	8.4
1976-01-01	2.2	0.7	6.5	7.9
1976-04-01	0.7	0.6	-3.7	7.7
1976-07-01	0.5	0.0	-1.2	7.8
1976-10-01	0.8	0.8	-1.7	7.7
1977-01-01	1.2	0.5	3.9	7.5
1977-04-01	1.8	-0.4	10.0	7.2
1977-07-01	1.6	0.5	6.5	6.9
1977-10-01	0.5	0.7	-4.6	6.8
1978-01-01	0.1	-0.3	-5.9	6.4
1978-04-01	3.8	0.8	11.9	6.1
1978-07-01	0.9	-0.4	-0.6	6.2
1978-10-01	1.4	-0.2	2.2	5.8
1979-01-01	0.1	0.2	-6.0	5.9
1979-04-01	0.1	-1.0	-2.5	5.8
1979-07-01	0.8	-1.5	-3.8	5.7
1979-10-01	0.3	-0.6	-4.2	6.0
1980-01-01	0.2	-1.5	-5.3	6.3
1980-04-01	-2.0	-1.6	-17.3	6.9
1980-07-01	-0.2	0.4	1.4	7.8
1980-10-01	1.8	0.7	6.3	7.5
1981-01-01	2.0	-0.5	3.6	7.5
1981-04-01	-0.7	-1.4	-4.3	7.2
1981-07-01	1.1	-0.2	6.2	7.2
1981-10-01	-1.2	-0.2	-8.3	7.9
1982-01-01	-1.7	0.9	-10.9	8.6
1982-04-01	0.5	0.5	5.9	9.3
1982-07-01	-0.3	-1.5	-2.4	9.8
1982-10-01	0.1	0.4	-3.6	10.4
1983-01-01	1.2	1.7	10.8	10.4
1983-04-01	2.2	0.6	12.2	10.2
1983-07-01	2.0	-0.6	5.2	9.4
1983-10-01	2.1	0.8	2.9	8.8

1984-01-01	2.0	0.9	7.6	8.0
1984-04-01	1.7	0.0	2.0	7.7
1984-07-01	1.0	0.2	-3.7	7.5
1984-10-01	0.9	0.6	1.2	7.4
1985-01-01	0.9	0.7	-0.2	7.3
1985-04-01	0.9	-0.3	0.0	7.3
1985-07-01	1.5	1.1	4.4	7.4
1985-10-01	0.8	0.2	-5.0	7.1
1986-01-01	1.0	-0.9	-1.7	6.7
1986-04-01	0.4	1.9	-0.9	7.1
1986-07-01	0.9	-0.1	-2.9	7.0
1986-10-01	0.5	0.9	0.3	7.0
1987-01-01	0.7	0.1	2.5	6.6
1987-04-01	1.1	-0.3	9.6	6.3
1987-07-01	0.9	0.0	5.5	6.1
1987-10-01	1.8	0.7	1.2	6.0
1988-01-01	0.5	0.2	2.1	5.7
1988-04-01	1.2	0.6	3.7	5.4
1988-07-01	0.5	0.2	0.9	5.4
1988-10-01	1.3	0.0	4.0	5.4
1989-01-01	1.1	-0.5	-5.8	5.4
1989-04-01	0.6	-0.9	-3.6	5.2
1989-07-01	0.7	-0.3	-2.8	5.2
1989-10-01	0.3	0.7	-0.9	5.3
1990-01-01	1.1	-0.9	1.5	5.4
1990-04-01	0.3	0.9	4.4	5.4
1990-07-01	0.0	0.0	-7.1	5.5
1990-10-01	-0.8	-1.7	-2.4	5.9
1991-01-01	-0.5	0.0	5.2	6.4
1991-04-01	0.7	0.5	-1.7	6.7
1991-07-01	0.5	0.7	-1.2	6.8
1991-10-01	0.5	0.1	0.1	7.0
1992-01-01	1.0	1.0	8.2	7.3
1992-04-01	1.0	0.2	-0.3	7.4
1992-07-01	1.0	0.2	-14.1	7.7
1992-10-01	1.1	0.3	16.1	7.3
1993-01-01	0.1	-0.1	-0.1	7.3
1993-04-01	0.5	0.1	5.4	7.1
1993-07-01	0.5	-0.2	0.1	6.9
1993-10-01	1.4	-0.1	8.0	6.8
1994-01-01	1.0	0.3	-10.7	6.6
1994-04-01	1.3	0.3	12.7	6.4
1994-07-01	0.6	-0.3	3.9	6.1
1994-10-01	1.2	-0.5	3.6	5.8
1995-01-01	0.3	0.5	0.1	5.6
1995-04-01	0.2	-0.3	3.1	5.8
1995-07-01	0.9	0.6	4.8	5.7
1995-10-01	0.7	-0.1	0.0	5.5
1996-01-01	0.7	0.4	5.1	5.6
1996-04-01	1.7	0.0	0.8	5.6
1996-07-01	0.7	0.0	0.2	5.5
1996-10-01	1.3	-0.2	1.9	5.2
1997-01-01	0.9	0.5	2.5	5.3
1997-04-01	1.3	0.4	2.8	5.1
1997-07-01	1.3	0.8	3.7	4.9
1997-10-01	0.7	1.1	-2.2	4.7
1998-01-01	1.1	1.5	-8.2	4.6
1998-04-01	0.6	1.2	-2.3	4.3
1998-07-01	1.2	1.0	1.0	4.5
1998-10-01	1.6	0.7	-2.1	4.5
1999-01-01	0.9	0.7	5.9	4.3
1999-04-01	0.7	0.4	-0.1	4.3
1999-07-01	1.2	0.6	-1.3	4.3
1999-10-01	1.7	1.0	2.3	4.1
2000-01-01	0.3	0.8	-4.9	4.0
2000-04-01	1.5	-0.9	-0.9	3.8
2000-07-01	-0.1	1.4	-3.6	4.0
2000-10-01	0.5	-0.5	-2.8	3.9
2001-01-01	-0.1	-0.4	-5.8	4.2
2001-04-01	-0.1	-0.1	-1.5	4.4

2001-07-01	-0.3	-0.3	-5.2	4.6
2001-10-01	0.6	0.5	20.9	5.4
2002-01-01	1.0	0.9	1.9	5.6
2002-04-01	0.6	-0.6	1.4	5.9
2002-07-01	0.7	-0.4	-0.6	5.8
2002-10-01	0.3	-0.6	3.3	5.7
2003-01-01	0.5	0.1	-1.4	5.8
2003-04-01	0.8	0.0	9.6	6.0
2003-07-01	2.0	0.8	9.7	6.2
2003-10-01	1.0	0.2	6.6	6.0

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