On the Cyclical Behaviour of Prices

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Abstract
This paper puts forward the proposition that, contrary to the prevailing conventional wisdom, there is no stylised fact about the cyclical behaviour of prices. It is argued that the empirical evidence on the issue is mixed and that the cyclical behaviour of prices is ambiguous because of the randomness of the occurrence of shocks. It is also argued that both supply and demand shocks can cause prices to be either procyclical or countercyclical depending on the policy response. Finally, it is shown that the issue is complicated further by the problem of temporal aggregation bias.

1. Introduction

Business cycle research has inspired a large number of papers investigating the cyclical behaviour of prices. For a long time, the conventional wisdom was that prices vary procyclically, a proposition that was accepted as a stylised fact. This proposition can be traced back to Burns and Mitchell (1946) and can also be found in the work of Lucas (1977) and Mankiw (1989). Lucas (1977, p.9) puts forward the explicit proposition that 'prices are generally procyclical', while Mankiw (1989, p.88) criticises real business cycles theory because 'it cannot explain the procyclical behaviour of prices'.

Recent econometric work, however, has led to the general conclusion that while prices were procyclical in the pre-war period they became countercyclical in the post-war period,

particularly since 1973. Kydland and Prescott (1990) found a strong negative correlation between U.S. output (GNP) and prices (GNP deflator and CPI) over the period 1954-89. Wolf (1990) concluded that the general price level has not been consistently procyclical in the post-war period and that since 1973 it has become countercyclical, a conclusion that is shared by King and Watson (1996). Cooley and Ohanian (1991, p.26) examined the price-output relationship over the period 1822-1987 and concluded that U.S. prices were countercyclical in the post-World War 2 period. Smith (1992) also found broadly similar results for ten countries over extended sample periods. Likewise, Backus and Kehoe (1992, p.882) found similar evidence for ten countries, concluding that 'price fluctuations have changed from procyclical to countercyclical'.

Backus and Kehoe did not venture into finding an explanation for the change in the cyclical behaviour of prices which they described as 'an international phenomenon' (p.883). However, they mentioned in general terms (as explanatory factors) the effect of changes in the economic environment (the impulses) and changes in the economic structure (the propagation mechanism). The evidence for countercyclicality found in these studies is explained, within the framework of the standard aggregate demand and supply (AD-AS) model, in terms of the dominance of supply shocks and/or the ineffectiveness of demand shocks in the most recent period (post-war or post-1973).[2] The general

argument is that if supply shocks are dominant and/or if demand shocks are ineffective then prices will behave in a countercyclical fashion, while if (effective) demand shocks dominate then prices will be procyclical. The countercyclicality of prices in the post-war period and particularly since 1973 is therefore attributed to the dominance of supply shocks such as the rise in oil prices, tax changes and the shift towards supply-side policies in general. Boone and Hall (1996, p.16), for example, put forward this point of view by stating that 'technological shocks shift the aggregate supply of output up and down a relatively stable downward slope of aggregate demand'.

It seems, however, that this line of reasoning is questionable for a number of reasons. First, the empirical evidence for the U.S. and other countries does not provide a clear-cut case for the change in the cyclical behaviour of prices as the evidence on this issue is best described as being 'mixed'. Second, it is not entirely clear whether the post-war period was dominated by demand or supply shocks. While the conventional wisdom points to the dominance of supply shocks, studies aiming at identifying supply and demand shocks have also produced mixed evidence on this issue. Moreover, the available evidence indicates that both supply and demand shocks have been effective. Finally, it has recently been demonstrated that even if demand shocks are dominant, we could still get countercyclical prices. Spencer (1996, p.97) concludes that even in an economy in which fluctuations are driven solely by aggregate demand shocks, the sign of the historical correlation between time series for the price level and output is ambiguous. Furthermore, Spencer writes

The AD/AS model does not make an unambiguous prediction about the cyclical behavior of the price level since the correlation between the price level and output depends not only on the dominant source of shocks but also on the nature of the dynamic responses. (Spencer, 1996, p.97).

This paper examines several issues pertaining to the cyclical behaviour of prices. The starting point is to demonstrate that the available evidence on the cyclical behaviour of prices and the type of shocks is mixed, in which case there is no established stylised fact supporting the notion of either procyclical or countercyclical prices. While the inconsistent or random behaviour of prices can be attributed to the random occurrence and type of shocks, it can also be demonstrated that this behaviour is consistent with the prediction of the AD-AS model. Spencer's argument boils down to saying:

the conventional AD/AS model predicts that prices and output will tend to move together sometimes and in opposite directions at other times even if the economy is driven strictly by demand shocks. (Spencer, 1996, p.104).

We will elaborate on Spencer's sound argument and show that both demand and supply shocks can produce either procyclical or countercyclical prices.[3]

Another point that will be discussed in this paper relates to the distinction between the cyclical behaviour of prices and the inflation rate. Some economists (e.g. Chadha and Prasad, 1994) argue that while the price level is countercyclical, the inflation rate is procyclical. It will be demonstrated by using the dynamic AD-AS model that the behaviour of inflation can also be procyclical or countercyclical and that the policy response is a crucial determinant of this behaviour.

This paper also puts forward the view that there is mixed evidence on the cyclical behaviour of prices because it is impossible to identify from observed data (i) the beginning and the end of a shock, (ii) the beginning and the end of the adjustment process, (iii) the beginning and the end of government intervention and its nature, and (iv) the long and the short run. This issue is relevant partly due to the problem of temporal aggregation resulting from the fact that the decision-making intervals of economic agents do not coincide with data-sampling intervals.

2. An evaluation of the available empirical evidence

The consensus view that emerged in the aftermath of the findings of Kydland and Prescott (1990) is that prices have been countercyclical in the post-war period. Backus and Kehoe, for example, reach the conclusion that

> Patterns of price-level fluctuations, however, have changed markedly. Before World War II, prices were predominantly procyclical; since then, they have been consistently countercyclical. (Backus and Kehoe, 1992, p.864).

Similarly, O'Donovan (1994, p.175) concludes that prices have been 'consistently and significantly countercyclical in the post WWII period'. Although Wolf (1990) is less enthusiastic about the proposition of countercyclicality in the post-war period, he asserts that countercyclicality is a post-1973 phenomenon. Cooley and Ohanian (1991, p.26) conclude that 'for the post-World War II U.S. economy prices are countercyclical'. Similar statements are made in more recent studies utilising different trending methods by

King and Watson (1996) and Boone and Hall (1996).[4]

But is this really what the empirical evidence indicates? It only takes some scrutinising to answer this question: if anything, the evidence does not show any systematic change in the cyclical behaviour of prices. Three recent studies seem to support this proposition. In a study of ten countries, using the Backus and Kehoe (1992) data, Serletis (1996) found a 'mixed bag', concluding with the following statement:

> In particular, prices are acyclical for Canada, Germany, Italy, Norway, the United Kingdom and the United States, weakly countercyclical for Denmark and Sweden and weakly procyclical only for Australia. (Serletis, 1996, p.211).

Andersen and Hansen (1996, p.383) examine the price behaviour in fifteen OECD countries using post-war data and conclude that 'there is no clear-cut stylised fact concerning the behaviour of prices over the cycle'. They also suggest that 'the cyclical properties differ more over time than across countries' (p.383). A similar conclusion is reached by Spencer by examining quarterly U.S. data over the period 1954:1-1994:2 using three price measures and three output measures. Although his results indicate weaker countercyclicality in the pre-1973 period, he concludes that 'the price level has certainly not been consistently procyclical but neither has it been consistently countercyclical' (Spencer, 1996, p.99).

Ironically, it can be demonstrated that these findings are not incompatible with the results obtained by Smith (1992), which are normally taken to provide a verification of the Kydland-Prescott (1990) contention. Table 1 summarises Smith's correlation results for ten

Table 1: A summary of Smith's (1992) results (HP filter)

Period*	Negative	Positive	Insignificant
1850-1909	1	3	6
1910-1929[a]	1	1	7
1930-1945	3	3	4
1946-1986	6	0	4

* The first period starts in 1869 for the U.S., 1870 for the U.K., Canada and Denmark, 1861 for Australia, Sweden and Italy, 1865 for Norway, 1885 for Japan and 1850 for Germany. There are other variations for other periods. [a] There is no second period for Germany.

countries over four periods extending between 1850 or so and 1986 or so. The correlation coefficients are classified as significantly negative, significantly positive or insignificant according to the 5 per cent critical values reported in Smith's table 1 (p.424).

The contention that prices have been countercyclical since World War 2 is verified by these results only to the extent that in no case is there any significantly positive correlation and that in six out of ten cases the correlation is significantly negative. However, the contention that prices were procyclical in the pre-war period is not very well supported. There are cases of significantly negative correlations: three in the period 1930-1945, one in 1910-1929 and one in 1850-1909. In most cases prices were acyclical as indicated by insignificant correlations. The evidence, therefore, is mixed. Moreover, even for the post-war period the cyclical behaviour of prices changed over time as indicated by the rolling correlation coefficients. Thus, Smith concludes:

Prices generally are procyclical prior to World War II, with the exception of a brief period of countercyclical prices during the subperiod from about 1910 to the onset of the Depression, and prices are countercyclical for the post-Depression period, with the possible exception of a period of procyclical prices in the 1950s and 1960s. (Smith, 1992, p.416).

Smith's conclusion may indicate that countercyclicality of prices in the post-war period is confined to the post-1973 period, but again this is not necessarily the case. The study by Andersen and Hansen (1996), which employs quarterly data extending to the end of 1990, provides evidence for procyclicality in the most recent years as shown by the recursive correlations (see Andersen and Hansen's figure 2, p.382). The evidence is indeed mixed, and the cyclical behaviour of prices is not consistent but rather changing.

3. The sources of shocks

The empirical results, thus, do not unambiguously support the contention that prices were procyclical before the war and countercyclical after the war or since 1973. One explanation for this finding is that, contrary to the conventional wisdom, the post-war and the post-1973 periods were not necessarily dominated by supply shocks. Moreover, demand shocks do cause economic

fluctuations, unlike the proposition put forward by the real business cycle economists.

Let us start with the second point first, that demand shocks are also effective. Spencer (1996) isolated demand and supply shocks in his sample data using the method proposed by Blanchard and Quah (1989). This method, which is based on a structural VAR specification, utilises the notion that while demand shocks have no long-run effect on output, supply shocks have a long-run effect on both output and prices. The evidence he found does not support the claim that demand shocks do not cause business fluctuations. This conclusion was also supported by the forecast error variance decomposition. Spencer writes:

> These FEV decomposition results indicate that aggregate demand and aggregate supply shocks both contribute importantly to fluctuations in the price level.[5] (Spencer, 1996, p.102).

The same methodology was used by Keating and Nye (1996) to study the dynamic effects of demand and supply shocks in the G7 countries. One important finding of this study is that output is more responsive to demand shocks in the post-World War 2 period than in the pre-World War 1 period. They provide two explanations for this finding: (i) the monetarist critique of stabilisation policy (e.g. Friedman, 1959),[6] and (ii) price rigidity in the post-war period.

Mocan and Baytas (1991) used a different method to identify supply and demand shocks. This method is based on VAR specification and analysis of the response to demand shocks as represented by changes in the nominal money supply and supply shocks as represented by changes in the relative price of oil and productivity. On the basis of quarterly U.S. data over the period 1948:1-1985:4 the impulse response analysis shows that both supply and demand shocks cause fluctuations in output and employment.

The second point, that the recent period has been dominated by supply shocks, is not supported by the available empirical evidence either. Mocan and Topyan (1993) utilised the structural time series model of Harvey (1989) to pinpoint the periods dominated by demand shocks and supply shocks. They applied Harvey's model to output (GNP) and prices (CPI) using U.S. data over the period 1947:1-1990:1 and calculated the prediction error (the empirical residuals of the estimated equations) as a percentage of the actual value for each quarter. According to this approach, supply and demand shocks are identified by whether the output and price prediction errors have the same or opposite signs: a similar sign indicates a demand shock while opposite signs indicate a supply shock.[7] On the basis of this methodology, they found results in direct contrast with the conventional wisdom. For example, they found the period 1971:2-1990:1 to be dominated by demand shocks and the period 1951:2-1971:1 to be dominated by supply shocks. The period 1948:4-1951:1 was found to be dominated by demand shocks. If we accept these results at face value, how can we reconcile them with those obtained by Smith (1992)? The indication here is that prices were countercyclical in the period dominated by demand shocks (post-73) and procyclical in the period dominated by supply shocks (the 1950s and 1960s). We can explain this contradiction in terms of the argument put forward by Spencer (1996). In the following section we elaborate on and extend Spencer's argument.

4. Supply and demand shocks in the AD-AS model

From a theoretical perspective, the cyclical behaviour of prices can be deduced from simple partial models that may tell us different stories. Basic macroeconomics textbooks (e.g. Gordon, 1993, pp.7-8) tell us that prices or inflation will rise if output is above its natural level and vice versa, implying procyclicality of prices. But this is certainly not the case if, for example, the decline in output is caused by an adverse supply shock such as the rise in oil prices.

A partial model that predicts countercyclicality is the P-Star model.[8] One version of this model may be written as

$$y-y^* = \beta(p-p^*), \quad \beta < 0 \tag{1}$$

where y is the logarithm of real output, p is the logarithm of the price level and an asterisk denotes the potential level of the respective variable such that $y-y^*$ is the output gap and $p-p^*$ is the price gap. This model can be re-written as

$$p = (\frac{1}{\beta})y - (\frac{1}{\beta})(y^* + \beta p^*) \tag{2}$$

The standard AD-AS model consists of a downward sloping AD curve, an upward sloping short-run AS curve and a vertical long-run LAS curve cutting the horizontal axis at the full employment (or natural) level of output. The implication of the positive slope, which is due to some frictions in the economy, is that changes in aggregate demand will influence not only prices but also output in the short run. There are several versions of the AD-AS model, including the 'conventional' model that does not distinguish between anticipated and unanticipated policy changes, the New Classical model that

assumes rational expectations as well as perfect wage and price flexibility, and the New Keynesian model that assumes price and wage rigidity or stickiness. The exposition that follows is based on the standard textbook model which is accepted by mainstream economists. However, it can be demonstrated that the choice of the model does not make much difference for the issue under consideration here. For example, the three models predict that unanticipated expansionary policy leads to rising output and prices in the short run. If policy is anticipated, then the conventional model and the New Keynesian model predict rising output and prices but the New Classical model predicts no change in output, a scenario that will be discarded in the present analysis. The models do, however, differ with respect to the extent of changes in prices and output and the speed of adjustment.[9]

We start with a (positive) demand shock without government intervention as illustrated in figure 1. The economy is initially at point A, representing both short-run and long-run equilibrium. The shock shifts the AD curve from AD_0 to AD_1 and the economy moves to point B as both output and prices go up. Obviously, the behaviour of prices at this stage is procyclical. Because output is now above the natural level, labour negotiates and obtains a higher nominal wage, leading to a leftward shift in the SAS curve, and this shift continues until it moves from SAS_0 to SAS_1. At point C the economy is in long-run equilibrium. The movement of the economy from B to C is achieved by a decline in output and a rise in the price level. Hence, prices are countercyclical between points B and C. Thus, this demand shock is associated with both procyclical and countercyclical prices. This is basically Spencer's (1996) argument.

Let us now imagine that the government

reacts to the shock by pursuing a contractionary fiscal policy. If this is the case, then the economy will move from point B back to A as the AD curve shifts back to its original position (AD_0) and there is no discernible movement in the AS curve. In this case, prices are countercyclical all the way. So, the behaviour of prices depends not only on the source of the shock, but also on whether or not the government reacts to the shock.

The same analysis can be extended to the case of an aggregate supply shock. Let us consider the effect of a (negative) supply shock resulting from the rise of raw materials prices without government intervention. This case is illustrated in figure 2. The shock shifts the SAS curve leftwards to SAS_2, and so the economy moves from A to B with prices being countercyclical. At point B output is below the natural level and so the nominal wage rate declines (since unemployment is above the natural level). This will result in a rightward shift in the SAS curve until it reaches its original position again, and the economy settles back at point A. Prices are again countercyclical in this case. If the government responds to the shock via an expansionary monetary or fiscal policy, prices will be countercyclical initially and procyclical subsequently. Government intervention causes a shift in the AD curve from AD_0 to AD_1, and the economy settles at point C. The movement from B to C is associated with procyclical prices. But if the governments intervention takes the form of supply-side policies then prices will be countercyclical all the way, since the effect of such policies is to shift the SAS curve to the right, reinforcing the effect of the fall in nominal wages. The effect of supply-side policies is therefore to increase the speed of adjustment back to the natural level of output.

We will now consider the case of a supply shock that also shifts the LAS curve without government intervention. This case is illustrated in figure 3 which shows that the supply shock causes a shift in the SAS curve and LAS curve to and respectively. The economy moves from A to B, representing a decline in output and a rise in prices. Thus, prices are countercyclical as the economy moves from A to B. If the government does nothing, the fall in nominal wages and the rise in prices will bring down real wages, and so the SAS curve shifts to SAS_2 such that long-run equilibrium is established at C. Between A and C, therefore, prices are also countercyclical.

When the government intervenes we get the situation described by figure 4. If the government adopts an accommodating (demand side) policy, the AD curve shifts to AD_2, taking the economy to point C. Between B and C, prices are procyclical. If the policy is over-accommodating, the economy will end up at point D. Again, the behaviour of prices between B and D is procyclical.

In order to derive some sort of a conclusion, let us summarise the results in a tabular form. Table 2 shows that demand shocks do not necessarily produce procyclical prices and that supply shocks do not necessarily produce countercyclical prices. A demand shock will produce procyclical prices all the way through only if the government responds with an offsetting demand-side policy. A supply shock will produce countercyclical prices all the way through only if the government does not intervene or if intervention takes the form of a supply-side policy. Both procyclical and countercyclical behaviour will be exhibited if the government does not respond to a demand shock or if it responds to a supply shock with a demand-side policy. This discussion seems to

Table 2: The effect of shocks on the behaviour of prices in the AD-AS model

Shock*	Intervention	Initial behaviour	Subsequent behaviour
Demand(1)	None	Pro (A→B)	Counter (B→C)
Demand (1)	Demand side	Pro (A→B)	Pro (B→A)
Supply (2)	None	Counter (A→B)	Counter (B→A)
Supply (2)	Demand side	Counter (A→B)	Pro (B→C)
Supply (2)	Supply side	Counter (A→B)	Counter (A→B)
Supply (3)	None	Counter (A→B)	Counter (A→B)
Supply (4)	Demand side (accommodating)	Counter (A→B)	Pro (B→C)
Supply (4)	Demand side (over accommodating)	Counter (A→B)	Pro (B→D)

* Numbers in parentheses refer to the corresponding figures.

provide a theoretical rationale for an observed empirical irregularity.

5. The problem of timing and temporal aggregation

The analysis of the previous section shows that the behaviour of prices could be anything at any time, depending on the configuration of the shock and the government response as shown in table 2. However, even if this configuration is known, reconciling observed data on output and prices with the predictions of the AD-AS model is problematical because the timing of action is not readily observable. Economists cannot in general define or specify the short run or the long run. There is no way to know how long it takes the economy to move from A to B and back to A or to C. In figure 1, for example, the movement from B to C can be slow or fast, depending on the speed of adjustment of nominal and real wages. If the government

intervenes in response to a supply shock, as shown in figure 2, the movement from B to C (in which prices are procyclical) is determined by the policy lags (data, recognition, action, transmission and effectiveness). Indeed, the change of the behaviour of prices from countercyclical to procyclical depends on the first four lags. Obviously, one cannot align these theoretical movements against actual data and decide, for example, that the movement from B to C with respect to a particular shock occurred between certain dates, and therefore, corresponds to a certain subsample of the overall sample. This problem is accentuated further if there are overlapping shocks.

This point is relevant to the temporal aggregation problem which arises because the frequency at which economic time series are collected does not coincide with the frequency at which economic agents make decisions. This problem results in distortion to parameter

estimates and hypothesis tests, what Christiano and Eichenbaum (1987) call 'temporal aggregation bias' which, they argue, is quantitatively important. The conclusion they reach is that it is not possible to determine the decision making interval on the basis of aggregate time series alone. Obviously, this problem is highly relevant to studies of the price-output relationship.[10]

6. Price level or inflation rate?

Chadha and Prasad (1994) and Serletis (1996) distinguish between the cyclical behaviour of the price level and that of inflation. Chadha and Prasad present results, based on post-war data for the G7 countries, showing that while the (HP-filtered) price level is countercyclical, the inflation rate is procyclical. They even claim that this distinction is their papers contribution to the literature.

Two points arise from the work of Chadha and Prasad (1994). First, while they make the distinction between prices and inflation explicit, they are certainly not the pioneers in testing the cyclical behaviour of the inflation rate. Economists who have previously examined the cyclical behaviour of prices by applying the first difference filter to the (logarithm of) price level did exactly that (e.g. Smith, 1992; O'Donovan, 1994). This is because when the first difference filter is used, the filtered series is by definition the inflation rate. Therefore, Chadha and Prasad (1994) cannot claim to be the pioneers in this respect. Second, the finding of procyclical inflation is not supported by those economists who found that the behaviour of filtered prices was similar (at least qualitatively) irrespective of the choice of the filter.[11] Moreover, Serletis (1996), who makes the distinction between prices and inflation explicit, comes up with results which are inconsistent with those of Chadha and Prasad

(1994) as he finds similar results for the behaviour of prices and inflation.[12] Serletis concludes that his results 'provide strong confirmation for the countercyclical price behaviour' and that they 'clearly support the Kydland and Prescott (1990) claim that the perceived fact of procyclical prices is but a myth'. As far as the work of Chadha and Prasad is concerned he writes:

> The results reported in table 4 indicate that inflation is anything but procyclical. This is inconsistent with the evidence reported by Chadha and Prasad (1994), who basically argue .... that although prices are countercyclical, inflation is procyclical. (Serletis, 1996, p.211).

If, however, we take the Chadha-Prasad (1994) results at face value, then this is another indication that countercyclicality of prices in the post-war period is not a stylised fact. Hence, the evidence on the cyclical behaviour of prices is indeed mixed.

While Chadha and Prasad (1994) did not present a theoretical rationalisation for their results, it is possible to explain the cyclical behaviour of inflation on the basis of the dynamic AD-AS model which relates inflation to output. But again we will show that this model does not have a unique prediction about the cyclical behaviour of inflation. We will consider two cases.

The first case, which is illustrated in figure 5, is when there is a supply shock and the government reacts with an expansionary monetary policy. The supply shock causes a leftward shift in the dynamic aggregate supply curve from $DSAS_0$ to $DSAS_1$, leading to lower output and higher inflation rate (y_1 and π_1 respectively). Government intervention causes a continuous rightward shift in the dynamic aggregate demand curve, until it

reaches the position of DAD_1. At point C the economy is in a long-run equilibrium. So, between points A and B inflation is countercyclical, while between points B and C it is procyclical.

The second case is illustrated in figure 6, showing a supply shock with short-run inflation extinguishing policy. As a result of the shock, the economy moves from point A to point B. If the government is more concerned about inflation than about unemployment, a demand-side inflation extinguishing policy may be adopted, shifting the dynamic aggregate demand curve to DAD_1, in which case the economy moves to point C. Inflation will, thus, fall to π_1 while output falls further to y_1. In the long run the dynamic aggregate supply curve will shift to the right until long-run equilibrium is re-established at point D. Thus, the inflation rate is countercyclical between A and B, procyclical between B and C, and countercyclical between C and D.

It is obvious, therefore, that the cyclical behaviour of inflation can be anything, just as the case with prices. Moreover, it seems that the behaviour of the inflation rate as indicated by the dynamic AD-AS model is theoretically similar to the behaviour of prices as indicated by the AD-AS model.

7. Conclusions

This paper has examined the alleged stylised facts about the cyclical behaviour of prices. The discussion suggests the following conclusions:

- The available empirical evidence is not compatible with the proposition that prices were procyclical before and countercyclical after the war. Indeed, prices behave in an inconsistent manner over the business cycle. A similar conclusion can be made for the inflation rate.

- There is no evidence to support the claim that the pre-war period was dominated by demand shocks and that the post-war (or post-1973) period has been dominated by supply shocks. The available empirical evidence also refutes the proposition that demand shocks have been ineffective in the post-war period.

- The proposition that demand shocks cause prices to be procyclical and that supply shocks cause them to be countercyclical is not valid. The AD-AS model predicts that both kinds of shock can produce either procyclical or countercyclical prices, depending on whether or not the government responds to the shock and also on the nature of this response (supply-side or demand-side policies).

- Even if the configuration of the shock and the government response are known, reconciling observed data on output and prices and the predictions of the AD-AS model is problematical because the timing of agents' actions is not readily observable. Temporal aggregation bias also makes it difficult to infer anything about the cyclical behaviour on the basis of observed data.

If there is a stylised fact at all, then it must be that the cyclical behaviour of prices is random and inconsistent. To understand this behaviour in a better way, economists need to use different methods of econometric investigation. Continuous time modelling could alleviate the temporal aggregation bias while event studies could prove useful in tackling the timing problem. Most importantly, perhaps, is that economists should refrain from attempting to derive inference on the cyclical behaviour of prices only by examining time series data without studying the institutional and policy changes occurring during the period under study.

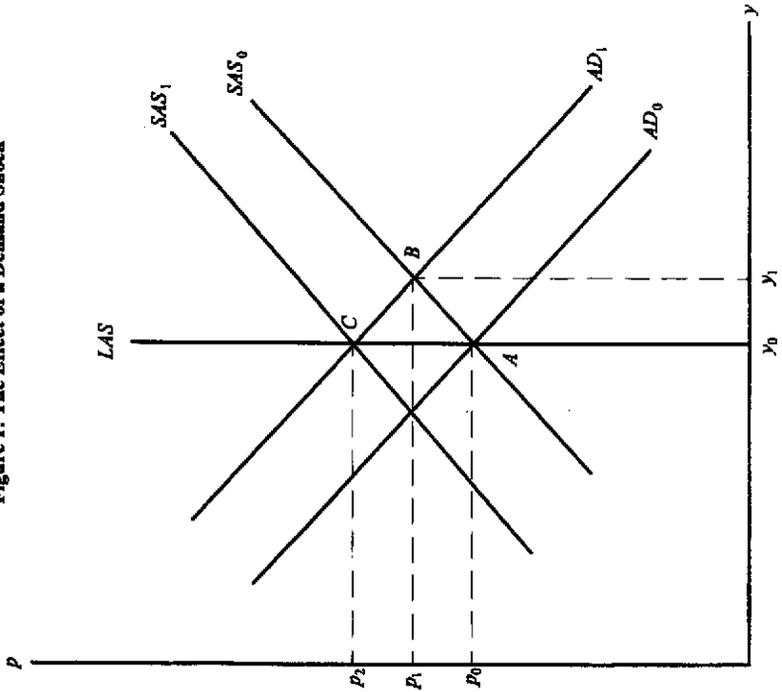Figure 1: The Effect of a Demand Shock
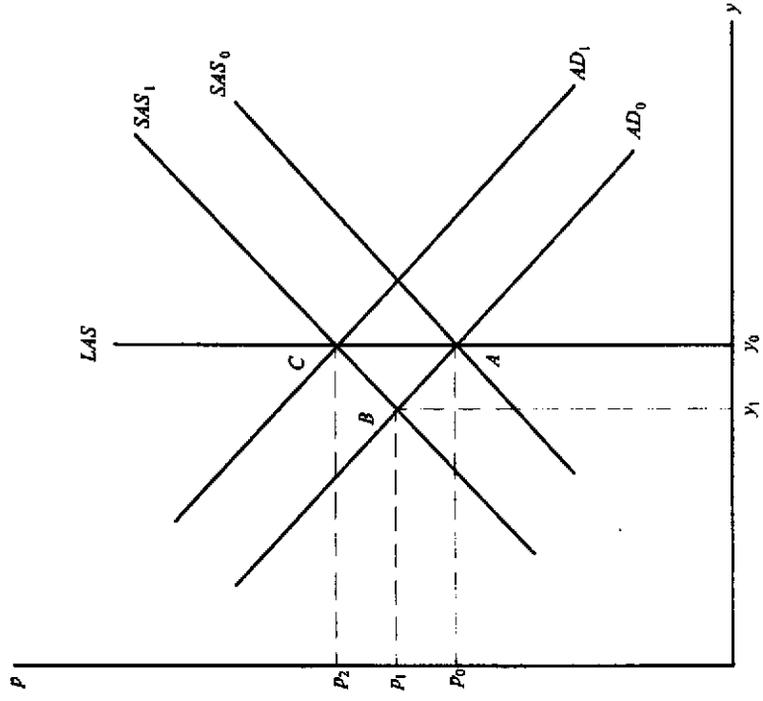

Figure 2: The Effect of a Supply Shock

Figure 3: A Supply Shock Shifting the LAS Curve without Government
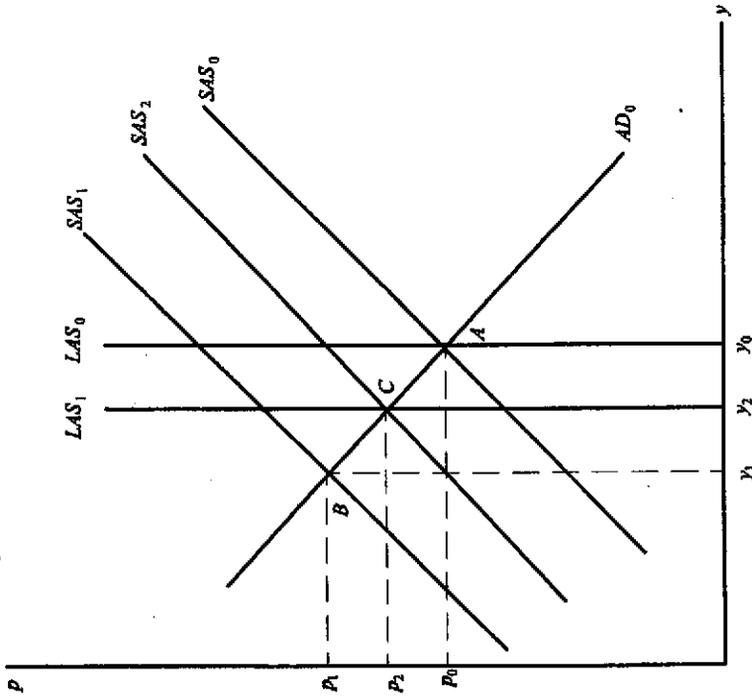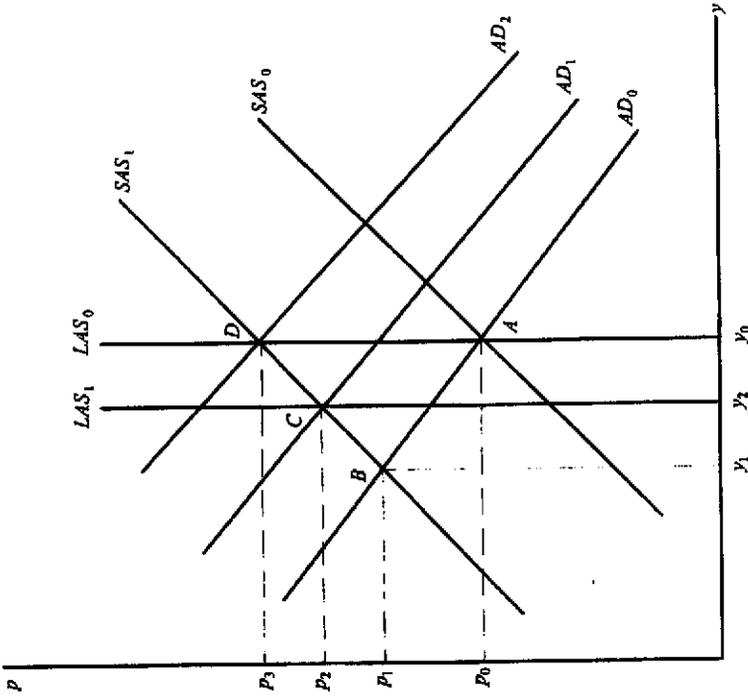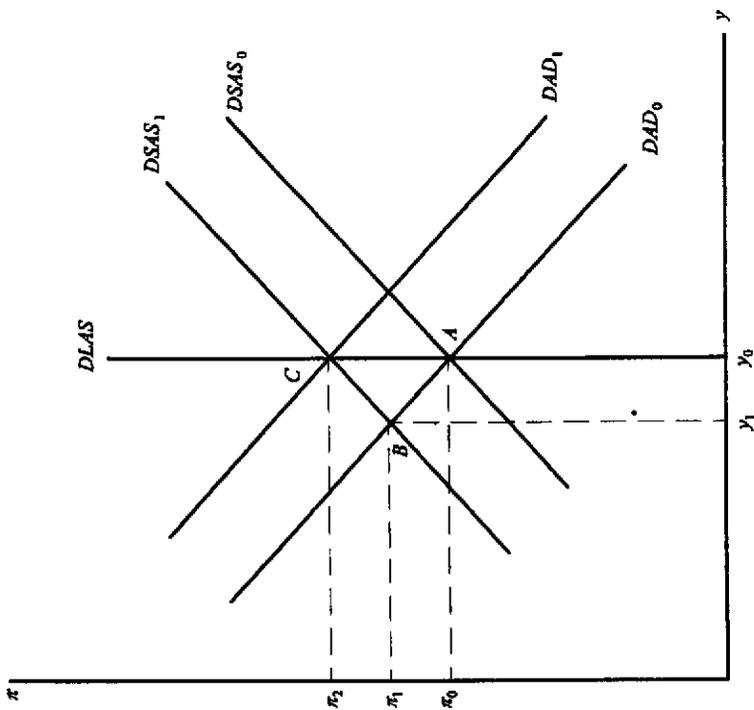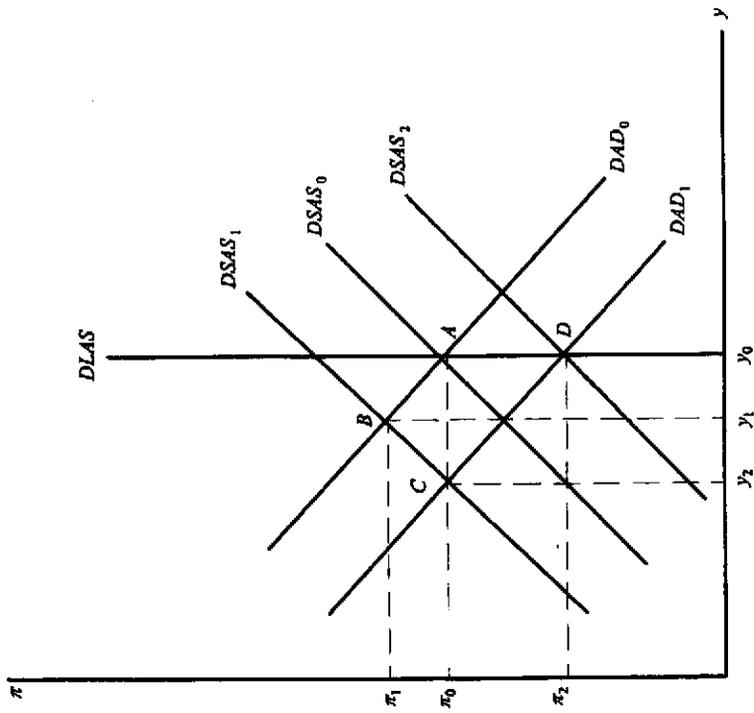Intervention

Figure 4: A Supply Shock Shifting the LAS Curve with Accommodating and
Over-Accommodating Demand Side Policies

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Figure 6: Supply Shock with Supply-Side Inflation
Extinguishing Policy

Figure 5: Supply Shock with Government Intervention
(Expansionary Monetary Policy)

Endnotes

1. La Trobe University, Bundoora, Victoria 3083, Australia. I would like to thank the editor of this journal and two anonymous referees for their comments on an earlier version of this paper. I am also grateful to Afaf Moosa and Liam Lenten for their help with the drawing of the diagrams.

2. For example, one hypothesis, which is implicit in Gordon (1980, 1983), is that the change in the cyclical behaviour of prices within the AD-AS model can be attributed to a greater variability of supply shocks.

3. In his concluding remarks, Spencer (p.104) does not mention the possibility of a supply shock leading to either kind of behaviour. His second conclusion is that 'AD/AS models predict that supply shocks will cause prices and output to move in opposite directions'.

4. Apart from these two studies, this strand of research has utilised three detrending methods by applying the Hodrick-Prescott (HP) filter, a linear filter and a first difference filter. King and Watson (1996) extracted the power spectrum of the growth rate, applying it to post-war U.S. data. Boone and Hall (1996), on the other hand, extracted the cyclical components from a stochastic trend model, applying it to the Backus and Kehoe (1992) set of data.

5. Spencer finds that at a horizon of one quarter, demand and supply shocks respectively explain 38 and 62 per cent of the FEV of the price level, but as the time horizon lengthens, the relative importance of demand and supply shocks is reversed.

6. The critique is based on the presence of policy lags. If the economy self-corrects before policy has its full effect, stabilisation policy may actually make the economy less stable than it would be if countercyclical policy had not been implemented.

7. A positive (negative) sign indicates a higher (lower) values for the underlying variable for a particular quarter. If the output and price errors have the same sign this means that they have changed unexpectedly in the same direction, implying a demand shock. Opposite signs mean that they have moved unexpectedly in opposite directions and thus imply a supply shock.

8. See, for example, Humphrey (1989).

9. See, for example, Mishkin (1995), Chapter 30.

10. Christiano and Eichenbaum (1987) propose to solve this problem by using continuous time models.

11. See, for example, the results presented in Smith's (1992) Table 2, p.425. These results are not qualitatively different from those presented in Table 1, implying similar behaviour of the HP and first-difference filtered prices. There is a stronger evidence in these results for countercyclical rather than procyclical inflation.

12. This is consistent with the finding of O'Donovan (1994).

References

Andersen T M and Hansen N L (1996) 'Do Prices Move Counter-Cyclically?', *Applied*

Economics Letters, 3, 379-383.

Backus D K and Kehoe P J (1992) 'International Evidence on the Historical Properties of Business Cycles', *American Economic Review*, vol. 82, 864-888.

Blanchard O J and Quah D (1989) 'The Dynamic Effects of Aggregate Demand and Supply Disturbances', *American Economic Review*, vol. 79, 655-673.

Boone L and Hall S G (1996) 'Stylized Facts of the Business Cycle Revisited: A Modelling Approach', Mimeo, London Business School.

Burns A F and Mitchell W C (1946) *Measuring Business Cycles*, New York: National Bureau of Economic Research.

Chadha B and Prasad E (1994) 'Are Prices Countercyclical? Evidence from the G-7', *Journal of Monetary Economics*, vol. 34, 239-257.

Christiano L J and Eichenbaum M (1987) 'Temporal Aggregation and Structural Inference in Macroeconomics', Carnegie-Rochester Conference Series on Public Policy, vol. 26, 63-130.

Cooley T F and Ohanian L E (1991) 'The Cyclical Behaviour of Prices', *Journal of Monetary Economics*, vol. 28, 25-60.

Friedman M (1959) *A Program for Monetary Stability*, New York: Fordham U P.

Gordon R J (1980) 'A Consistent Characterization of a Near-Century of Price Behavior', *American Economic Review* (Papers and Proceedings), 70, 243-9.

Gordon R J (1983) 'A Century of Evidence on Wage and Price Stickiness in the United States, the United Kingdom, and Japan', in J Tobin (ed) *Macroeconomics, Prices and Quantities*, Washinton D C: the Brookings Institution, 85-121.

Gordon R J (1993) *Macroeconomics*, New York: Harper Collins.

Harvey A C (1989) *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge: Cambridge U P.

Humphrey T M (1989) 'Precursors of the P-Star Model', *Federal Reserve Bank of Richmond Economic Review*, July/August, 3-9.

Keating J W and Nye J V (1996) 'The Dynamic Effects of Aggregate Demand and Supply Disturbances in the G7 Countries', Working Paper No 204, Department of Economics, Washington University.

King R G and Watson M W (1996) 'Money, Prices, Interest Rates and the Business Cycle', *Review of Economics and Statistics*, vol. 58, 35-53.

Kydland F E and Prescott E C (1990) 'Business Cycles: Real Facts and a Monetary Myth', *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring, 3-18.

Lucas R E (1977) 'Understanding Business Cycles', *Carnegie-Rochester Conference Series on Public Policy*, 7-29.

Mankiw N G (1989) 'Real Business Cycle: A New Keynesian Perspective', *Journal of Economic Perspectives*, Summer, 79-90.

Mishkin F S (1995) *The Economics of Money,*

Banking and Financial Markets (4e), New York: Harper Collins.

Mocan H N and Baytas A (1991) 'Demand Shocks, Supply Shocks and the Cyclicality of Real Wages', *Applied Economics*, vol. 23, 1213-1220.

Mocan H N and Topyan K (1993) 'Real Wages Over the Business Cycle: Evidence from a Structural Time Series Model', *Oxford Bulletin of Economics and Statistics*, 55, 363-389.

O'Donovan B (1994) 'New Zealand Price-Output Correlations Over the Business Cycle', *New Zealand Economic Papers*, vol. 28, 165-179.

Serletis A (1996) 'International Evidence on the Cyclical Behavior of Inflation', *Economics Letters*, vol. 51, 205-212.

Smith R T (1992) 'The Cyclical Behaviour of Prices', *Journal of Money, Credit and Banking*, vol. 24, 413-430.

Spencer D E (1996) 'Interpreting the Cyclical Behaviour of the Price Level in the U.S.', *Southern Economic Journal*, vol. 63, 95-105.

Wolf H C (1990) 'Procyclical Prices: A Demi-Myth?', *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring, 25-28.