THE AGGREGATE-SUPPLY/ AGGREGATE-DEMAND MODEL

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In recent years, many macroeconomic textbooks at the principles and intermediate levels have adopted the aggregate-supply/aggregate-demand (AS-AD) framework [Baumol and Blinder, 1988, Ch. 11; Gordon, 1987, Ch. 6; Lipsey, Steiner, and Purvis, 1984, Ch. 30; Mankiw, 1992, Ch. 11]. The objective was to allow for supply shocks in a Keynesian framework and to generate more satisfactory predictions about the behavior of the price level. The main point of this paper is that the AS-AD model is unsatisfactory and should be abandoned as a teaching tool.

In one version of the aggregate-supply curve, the components of the AS-AD model as usually used are contradictory.[1] An interpretation of the model to eliminate the logical inconsistencies makes it a special case of rational-expectations macro models. In this mode, the model has no Keynesian characteristics and delivers the policy prescriptions that are familiar from the rational-expectations literature.

An alternative version of the aggregate-supply curve leads to what used to be called the complete Keynesian model: the goods market clears but the labor market has chronic excess supply. This model was rejected long ago for good reasons and should not be resurrected now.

The AS-AD Model

The aggregate-demand (AD) curve can be derived from the IS/LM representation of the Keynesian model. Figure 1 shows the standard framework, where r is the interest rate (real and nominal) and Y is the level of output. The IS curve corresponds to the equation of aggregate demand to output, $Y^d=Y$, and the LM curve to the equation of nominal money demand to the quantity of money, $M^d=M$. For a given price level, P, Y and r are determined at the intersection of the IS and LM curves.

Barro and Grossman [1971; 1976, Ch.2] showed that the IS/LM model is a useful representation when nominal prices and wages are sticky at excessive levels and, hence, that excess supply prevails in the markets for goods and labor.[2] I neglect the labor market here, only for convenience, and think about the price level, P, as exceeding its market-clearing value, P^*. The quantity of goods supplied (that is, offered for sale), Y^s, then exceeds the value $Y=Y^d$ determined in Figure 1.

If the price level, P, declines, then the LM curve shifts rightward as indicated by the dashed lines in Figure 2. A decline in P to the market-clearing value P^* shown in Figure 2 eliminates the excess supply of goods. At this point, $Y^s=Y^d=Y=Y^*$, the

FIGURE 1
IS/LM Model

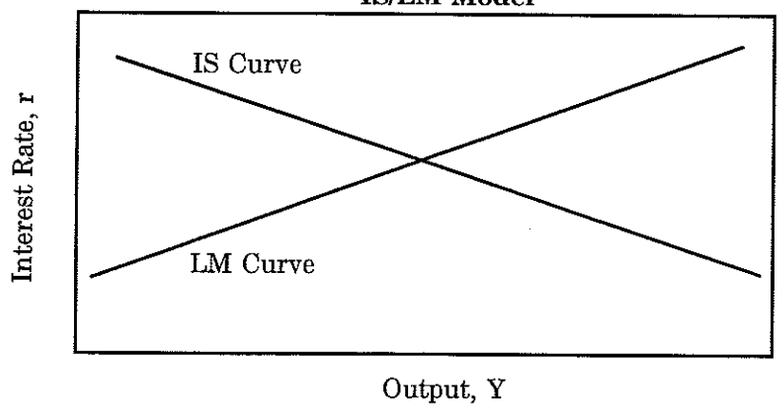


FIGURE 2
Shifts in LM Curve

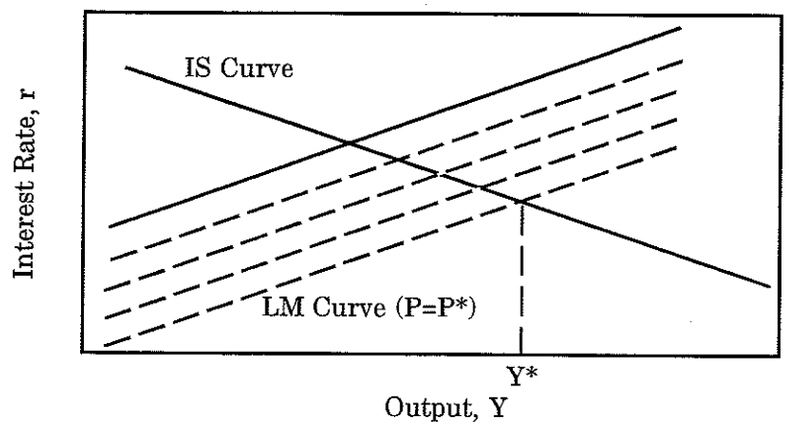
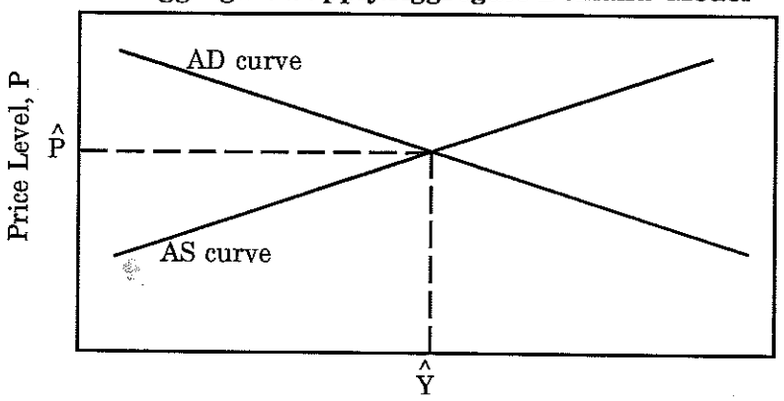


FIGURE 3
Aggregate-Supply/Aggregate-Demand Model



market-clearing level of output.[3] If the quantity of goods supplied, Y^s, is fixed, then Y^* is the constant, full-employment level of output. More generally, Y^s depends on the real interest rate, tax rates, the position of the production function, and other variables.

The downward-sloping AD curve, shown in Figure 3, shows the combinations of P and Y that are consistent with the IS/LM conditions.[4] Figure 2 shows why a lower P corresponds to a higher Y. The AD curve applies when goods are in excess supply (see notes 2 and 3).

The aggregate-supply (AS) curve in Figure 3 shows a positive effect of P on the quantity supplied, Y^s. One motivation for this effect follows from the arguments of Friedman [1968], Phelps [1970], and Lucas [1972], among others. If suppliers of goods and services have a given expectation of prices, P^e, then they offer to sell more goods (and labor services) when the observed price, P, rises relative to expectations.

In the AS-AD framework, P is assumed to be determined at the value $\hat{P}$ where the AS and AD curves intersect. The corresponding quantity, $\hat{Y}$, equals the amount demanded, Y^d, determined along the AD curve, and also the quantity supplied, Y^s, determined along the AS curve. The usual assumption is that the economy begins with expectations $P^e > \hat{P}$ and that P^e declines gradually toward $\hat{P}$. The fall in P^e causes the AS curve to shift rightward, so that $\hat{Y}$ rises and $\hat{P}$ falls.

The attractive feature of the AS-AD model is that output responds to shifts in supply or demand. Shocks to aggregate demand, represented by rightward shifts of the AD curve, lead to increases in $\hat{Y}$ and $\hat{P}$. These shocks could reflect increases in the demand for goods (IS shifts) or increases in the quantity of money (LM shifts). An increase in aggregate supply, corresponding to a rightward shift of the AS curve, causes an increase in $\hat{Y}$ and a decrease in $\hat{P}$.

The changes induced by shifts to the AD or AS curves refer to short-run situations in which the expectations, P^e, can be held fixed. In the long run, the adjustment of P^e moves the economy back to its "natural" level of output.

The main problem with this version of the AS-AD model is that the components are contradictory. The AD curve reflects the underlying IS/LM model, and the key to this model is the presence of excess supply of goods and services. The excess supply reflects, in turn, the assumed stickiness of the price level at an excessive level. In contrast, in the AS-AD model described in Figure 3, the adjustment of the price level to the value $\hat{P}$ eliminates the excess supply of goods. The key features of the IS/LM model — such as the Keynesian consumption function, the investment accelerator (or Keynesian investment function), and the multiplier — do not apply in this situation. Firms are, in particular, always able to sell whatever they wish at the going price level: they are not constrained by aggregate demand.

It is possible to interpret the AD curve as applying to the IS/LM model *only* when the price level has adjusted to ensure general market clearing at P^* in Figure 2. The value $\hat{Y}$ in Figure 3 then corresponds to the market-clearing value, Y^*, from Figure 2. We cannot, however, interpret Y^* as a constant in this case, because shifts in $P - P^e$ affect Y^s and therefore Y^*. In this case, the AS-AD model is internally consistent but is in no sense a Keynesian model. It is equivalent to market-clearing

models that assume incomplete information about the general price level, that is, the models worked out by Lucas [1972], et al.[5]

The policy implications of this consistent version of the AS-AD model are the same as those pointed out by Sargent and Wallace [1975] for familiar rational-expectations models. For example, if P^e is a rational expectation of the current general price level based on incomplete current information and if supply, Y^s, depends only on the contemporaneous value of $P-P^e$, then systematic monetary policies do not matter for real variables.

Another interpretation of the aggregate-supply curve that appears in some textbooks is that it represents the effects of an increase in P for a given nominal wage rate, w. The reduction in the real wage rate, w/P, then leads to a greater quantity of goods supplied. The intersection of the AS and AD curves corresponds to the clearing of the goods market, but the labor market would still be in excess supply if the fixed nominal wage rate were too high.

This model with a fixed nominal wage and a flexible price level is the so-called complete Keynesian model. The model features involuntary unemployment, corresponding to the chronic excess supply of labor, but this excess supply hinges on the excessive real (and nominal) wage rate. Firms' sales are never constrained by aggregate demand because the adjustment of the price level clears the goods market. Hence, some of the main Keynesian ideas, such as the investment accelerator, would not apply.

A boost to aggregate demand raises employment and lowers unemployment, but only because it leads to a higher price level, and hence, a lower real wage rate. The model therefore has the well-known flaw that shocks to aggregate demand imply a strongly countercyclical pattern for the real wage rate, in contrast with the procyclical pattern that appears in the U.S. data at least since World War II (see, for example, Kydland and Prescott [1990]).

CONCLUDING OBSERVATIONS

We have available, at this time, two types of internally-consistent models that allow for cyclical interactions between monetary and real variables. The conventional IS/LM model achieves this interaction by assuming that the price level and nominal wage rate are typically too high and adjust only gradually toward their market-clearing values. The market-clearing models with incomplete information get this interaction by assuming that people have imperfect knowledge about the general price level.

It may be that neither of these models is compelling in the sense of isolating important reasons for monetary nonneutrality: neither sticky prices nor incomplete information about nominal variables is likely to be very important. Some of the predictions of these models seem also to conflict with observation. The IS/LM model implies, for example, that the price level would be procyclical and that labor productivity would countercyclical, whereas the price level appears to be countercyclical and labor productivity procyclical in the post-World War II U.S. data

[Kydland and Prescott, 1990; Barro, 1993, Ch.1]. The market-clearing model, driven by monetary shocks, implies counterfactually that the price level would be procyclical and the real interest rate countercyclical. This model also has difficulty in explaining how labor input and consumption can both be procyclical [Grossman, 1973; Barro and King, 1984]. These problems with the market-clearing model do not apply, however, if one introduces the kinds of shocks to the production function that appear in real-business-cycle models.

The main point is that, contrary to the usual textbook treatments, the AS-AD model does not offer a satisfactory combination of the IS/LM and market-clearing models. The AS-AD model is logically flawed as usually presented because its assumption that the price level clears the goods market is inconsistent with the Keynesian underpinnings for the aggregate-demand curve.

NOTES

1. Fields and Hart [1990] and Colander [1993] also argue that the AS-AD model has problems with logical consistency.
2. The IS/LM apparatus can, of course, still be used when the price level adjusts to ensure "full employment," as pointed out, for example, by Abel and Bernanke [1992, Ch. 4]. The apparatus is, however, unnecessarily cumbersome in this situation, and the market-clearing representation used in Barro [1993] is more straightforward. The notion that the distinguishing features of the IS/LM model involve excess supply of goods and labor in the context of sticky prices and wages was well understood in the 1970s, but is now often forgotten. This is a clear example of technological regress.
3. If P falls below P^*, then excess demand for goods results. Barro and Grossman [1974, 1976, Ch. 2] showed that Y falls below Y^* in this case. (Workers respond to the rationing of goods by reducing their willingness to work.) Output is maximized in this model not by making P as low as possible, but rather by equating it to the market-clearing value, P^*.
4. The notation, aggregate-demand curve, is unfortunate because the AD curve is not a demand curve in the usual sense. The curve shows the combinations of P and Y that are consistent with the conditions $Y=Y^d$ and $M=M^d$. The level of Y shown along the AD curve therefore equals the quantity demanded, but only because the actual quantity produced has already been equated to this demand.
5. This version of the incomplete-information model is restrictive, however, in that price surprises matter only for goods supplied. More general specifications allow $P-P^e$ to have a negative effect on goods demanded and allow prospective future values of $P-P^e$ to have a positive effect on investment demand [Barro, 1993, Ch. 19].

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