Criticisms of Aggregate Demand and Aggregate Supply: Mankiw's Presentation

by Fred Moseley
Mount Holyoke College
fmoseley@mtholyoke.edu

The Aggregate Demand – Aggregate Supply framework has dominated intermediate macroeconomics textbooks since the 1980s. However, there have been significant criticisms of the ADAS framework, beginning in the 1990s (Barro 1991; Bhaduri, Laski, and Riese 1995; Colander 1995; Colander and Sephton 1998; Grieve 1996 and 1998; Fields and Hart 1990; Nevile and Rao 1996; Rao 1998a, 1998b and 2007). In spite of these criticisms, the ADAS framework had continued to dominate the textbooks, with little or no response to these criticisms.

This paper reviews the main criticisms of the ADAS framework, and then focuses on Gregory Mankiw's presentation of ADAS in his best-selling *Macroeconomics* textbook. Two main criticisms will be discussed: logically inconsistent and empirically unrealistic.

The paper is concerned primarily with the short run and the upward-sloping short run AS curve, because that is the curve that is logically inconsistent with the AD curve. So when I say "the AS curve" without qualification in the pages that follow, the implied meaning is the upward-sloping short run AS curve.

1. Criticisms of ADAS

1.1 Logically Inconsistent

The logical inconsistency between the AD curve and the short run AS curve depends on the specific nature of the AS curve. The derivations of the AD curve are all essentially the same. There have been three main versions of the AS curve that I classify as: labor market, cost plus, and sticky price. These different versions of the AS curve, and their specific inconsistency with the AD curve, will be discussed in turn.

1.1.1 Labor market AS

The labor market version of AS was the original version of AS since the beginnings of the ADAS model in the 1970s. The key to understanding the logical inconsistency between the AD curve and the labor market AS curve is to realize that these two curves are based on **two entirely different and mutually inconsistent theories of output**. The "AD" curve is based on the Keynesian ISLM theory of output; the labor market "AS" curve is based on a labor market theory of output. These two theories are "synthesized" in order determine the general equilibrium output and the price level. However, this "synthesis" is logically contradictory, because these two theories of output are fundamentally different and lead to different conclusions about the quantity of output to be produced any time the economy is out of equilibrium.

In the ISLM theory, the main variable determined is the equilibrium quantity of output. According to ISLM theory: (1) the equilibrium quantity of output is determined by aggregate expenditures; (2) an adjustment to equilibrium is assumed to take place by means of changes in the quantity of output produced in the output market, and changes in

the rate of interest in the money market, with the price level constant;[1] and (3) an autonomous change of aggregate expenditures has a "multiplier effect" on equilibrium output, because the initial change (e.g. increase) of expenditures causes output to increase, which in turn increases income and (consumer) expenditure further, etc. All these key characteristics of the ISLM theory clearly indicate that it is a theory of **equilibrium output**, including both the **demand** for output (aggregate expenditure) and the **supply** of output (real GDP). Indeed, the very notion of equilibrium includes supply; equilibrium is when supply = demand. One cannot have a theory of equilibrium output without a theory of the supply of output.

The "AD" curve is then derived from the ISLM theory by analyzing the effect of a change in the price level on the equilibrium quantity of output, as determined by the ISLM theory. There are three different ways in which a change in the price level is supposed to have an inverse effect on the ISLM equilibrium output (i.e. a decline in the price level is supposed to increase the ISLM equilibrium output): the Pigou effect on real consumer spending, the Keynes effect on real investment spending, and the international effect on real net exports. For example, the Pigou effect: a decline in the price level results in an increase of real wealth, which increases real consumer spending, which in turn increases the ISLM equilibrium output, including the "multiplier effect".

Thus we can see that the "AD" curve is not just about the **demand** for output, but is instead about the **equilibrium** quantity of output, which includes both the demand and the **supply** of output, as determined by ISLM theory. Since it represents a theory of output produced by firms, the "AD" curve is really more like a supply curve than a demand curve. But it is more than just a supply curve; it is an equilibrium output curve,

including both supply and demand. Colander (1995) has suggested, with similar logic, that the "AD" curve should be renamed the "Aggregate Equilibrium Curve". I think a better name would be "Aggregate Equilibrium **Output** Curve", in order to emphasize more clearly that the equilibrium quantity being represented is the equilibrium quantity of output, as determined by ISLM theory.

This "AD" curve, derived from the ISLM theory of output, is then combined with an AS curve which is derived from an entirely different theory of output based in one way or another on the labor market.[2] According to this labor market theory, the quantity of output produced by firms is determined by the quantity of labor employed, via an aggregate production function, with labor as the only variable factor of production (without even a mention of the devastating criticisms of the aggregate production function in the capital controversy of the 1960s-70s). The quantity of labor employed is either the demand for labor or the equilibrium quantity of labor. The AS curve is then derived by analyzing the effect of a change of the price level on the quantity of labor employed as determined in the labor market, and then on the quantity of output produced by firms, via the aggregate production function. Thus, this labor market theory of output, which underlies the AS curve, is fundamentally different from the ISLM theory of output, which underlies the AD curve. These two theories are based on opposing behavior rules for firms with respect to the quantity of output they chose to produce (Bhaduri et. al. 1995). The ISLM theory assumes that firms produce in order to satisfy demand, and the labor market theory of output assumes that firms produce in order to maximize profit, as determined by wages and prices.

These two different theories of output are mutually inconsistent outside of equilibrium, because they predict **two different quantities of output to be produced at the same given price level**. This logical inconsistency outside of equilibrium between the two quantities of output predicted by the ISLM AD theory and the labor market AS theory can be clearly seen from the familiar ADAS graph – see Figure 1 at the end of this paper. For example, assume that $P = P_1 > P^*$, as in Figure 1. At this higher than equilibrium P_1, the AD theory concludes that firms will produce a **lower than equilibrium output (Y_{AD})** and the AS theory concludes that firms will produce a **higher than equilibrium output (Y_{AS})**. These two theories of output cannot both be true at the same price level. Firms cannot produce both lower than equilibrium output and higher than equilibrium output at the same price level. (Bhaduri, et. al. 1995, Dutt 1997, and Grieve 1998 have made a similar point.) Therefore, at any price level other than the equilibrium price level, these two theories of output are mutually contradictory. Hence, this ADAS model, which combines these two mutually inconsistent theories of output, is itself logically contradictory.

Colander (1995) was one of the first to point out this logical inconsistency:

> Given that the Keynesian model includes assumptions about supply, one cannot logically add another supply analysis to the model unless that other supply analysis is consistent with the Keynesian model assumption about supply. *The AS curve used in the standard AS / AD model is not; thus the model is logically inconsistent*. It has **two inconsistent supply analyses**; one implicitly built into the slope of the AD curve, the other explicitly behind the AS curve. (p. 176; bolded emphasis added)

Furthermore, because of this logical inconsistency, the ADAS theory is not able to provide a coherent explanation of the process of adjustment from a state of disequilibrium to the equilibrium P and Y. In the situation just described of $P_1 > P^*$, a return to equilibrium requires a reduction of P. However, the AD theory concludes that a P reduction would cause output to increase, but the AS theory concludes that a P reduction would cause output to decline. Output cannot both increase and decrease as a result of the same price decline.

1.1.2 "Cost plus" AS

Since the late 1970s, Dornbusch and Fischer have presented an interpretation of the SR AS curve that is fundamentally different from the labor market SR AS curve discussed above (Blanchard and Colander-Gambel have since presented similar interpretations). In this version, AS is not defined as a quantity of output, as in the labor market theories, but is instead defined as a **price** (the aggregate price level), which is a function of output. Instead of output as a function of price (Y = f(P)), price is a function of output (P = f(Y)). Thus, it is very misleading to call this price curve a "supply" curve, which commonly connotes a quantity of output. We saw above that "AD" is a misleading misnomer; in this cost plus version of AS, "AS" is also a misleading misnomer because it sounds like a quantity of output, but is really a price. (Another source of confusion is that although the short run AS curve is defined as a price, the long run AS curve is defined as a quantity of output (the "natural" output)).

The "cost plus" version of AS does not start with the labor market and a production function, but instead starts with a given quantity of output. This given

quantity of output determines employment and unemployment (inverse production function), which in turn determines the level of wages (Phillips curve type relation), which (along with the expected price level and the "natural" level of output) determines the price level (cost plus mark-up pricing).

Therefore, this "cost plus" version of AS at least avoids the logical problem of two contradictory theories of output. However, this version of AS is also inconsistent with the ISLM AD theory of output in a similar way: outside of equilibrium, these two theories conclude or assume different combinations of output and price. This logical inconsistency can be seen again from Figure 1, with the "cost plus" interpretation of AS. For example, assume again that $P = P_1 > P^*$. At this higher than equilibrium P_1, AD concludes that firms will produce a **lower than equilibrium Y_{AD}**, and AS implies that the higher P is the result of a **higher than equilibrium Y_{AS}**. Again, output cannot be both lower and higher than the equilibrium output at the same P.

Similar to the labor market version of AS, because of this logical inconsistency, this "cost plus" version of AS also cannot provide a coherent explanation of the adjustment process from disequilibrium to equilibrium. In the situation just described, with $P = P_1 > P^*$, a return to equilibrium requires a reduction of P. But why would P fall? Not because AS > AD because AS is price and AD is a quantity, and thus "AS >AD" has no meaning and cannot cause prices to fall. According to this "cost plus" AS, P would fall only if Y falls. However, according to AD, Y would fall only if P increases. Because of these logical inconsistencies, the adjustment process cannot be explained. Therefore, the "cost plus" version of AS is as logically inconsistent with the ISLM-AD theory as the labor market versions of AS.

1.1.3 "Sticky price" AS

A "new Keynesian" theory of AS has emerged since the early 1990s known as the "sticky price" model of AS. This theory is similar to the "cost plus" theory in that AS is defined as a **price** (rather than a quantity of output), but it is based on a completely different theory of price. There are two main versions of this "sticky price" model: "staggered price setting" and "menu costs". These different models will not be reviewed here (see below for a discussion of Mankiw's "menu costs" version). The main point for our purposes is that AS is defined as a price and derived as a function of output, as in the "cost plus" version of AS. For example, if output increases, then the price level increases, although at a slower rate (for various reasons) than if prices were perfectly flexible.

This "sticky price" model of AS is also logically inconsistent with the ISLM model of AD, in the same way as the "cost plus" model of AS. Outside of equilibrium, AS and AD are logically inconsistent because they conclude or assume different combinations of Y and P, and this theory also cannot provide a coherent explanation of the adjustment process from disequilibrium to equilibrium. Figure 1 above also applies to the "sticky price" model of AS.

Thus we can see that there has a shift in the interpretation of AS in recent years – a shift away from the labor market "output" theory of AS and toward these two "price" theories of AS, but this shift has solved not the main logical problem – the logical inconsistency between the AS curve and the ISLM AD curve outside of equilibrium – and has failed to provide an explanation of the adjustment process from disequilibrium to equilibrium.

1.2 Empirically Unrealistic – Deflation

Even if these fundamental logical problems could somehow be resolved, another important criticism of the ADAS theory is that it is empirically unrealistic. The main unrealistic feature of ADAS is that it assumes that **prices fall**, if either one of the following two conditions are satisfied: (1) in a situation of SR disequilibrium, AS is greater than AD; or (2) in a situation of SR equilibrium, the SR equilibrium output is less than the full employment "natural" level of output. In what follows, I will focus on case (2), since that case has received the most attention in the textbooks and has the more important implications (and (2) has nested (1) within it; an adjustment from a SR equilibrium to the LR equilibrium includes an adjustment to a new SR equilibrium). Futhermore, and more importantly, the ADAS theory also assumes that this decline of the price level will **increase AD** (a downward movement along the negatively sloped AD curve) and the economy will return to the full employment equilibrium price level and quantity of output, with only minor difficulties. All the theories of ADAS discussed above make these same assumptions.

There are two main problems with these assumptions of ADAS theory. In the first place, **prices don't fall** anymore; the last time prices fell in the US was in 1955, and then only a tiny bit. The last significant decline of prices was in the 1930s. And yet the level of output has been less than the full employment natural output for most of the post World War II period! Therefore, a theory that assumes that {Y < full employment Y} causes prices to fall has a serious disconnect with contemporary economic reality. Keynesian economists assume that prices are "sticky" in the short run, but even they

agree that, in the long run, {Y < full employment Y} will eventually cause the price level to fall.

Even more importantly, even if prices were to fall, this would **not increase AD** and would not provide an unproblematic return to full employment output, but would instead be a **disaster** for a heavily indebted economy, such as the US economy. Falling prices would **increase the real debt burden** of borrowers, which would increase delinquencies and bankruptcies, which in turn would cause a financial crisis and a significant reduction of AD (both C and I). Thank goodness that prices don't fall as ADAS theory predicts! If prices did fall, we would really be in trouble. A theory that concludes that falling prices will provide an unproblematic return to full employment equilibrium has an even more serious disconnect with reality than the assumption of falling prices itself.[3]

These criticisms apply to all versions of AS discussed above, because they all assume a full employment "natural" level of output and an automatic adjustment to this natural output by means of falling prices (if output is less than natural output).

"Deflation" is the greatest fear of most macroeconomists today. And yet macroeconomists still continue to teach the ADAS model, with the same old conclusions about the positive effects of deflation. A striking example is Ben Bernanke. Bernanke is doing everything he can possibly think of as Chairman of the Fed to avoid deflation in the current real world economic crisis (and has been applauded by economists for doing so); but the latest edition of his macroeconomics textbook (2009, co-authored with Andrew Abel and Dean Croushore) still presents the standard ADAS theory, in which deflation is

a solution to {Y < full employment Y}, and the only problem with deflation is that it is too slow. Surely this will have to change in the next edition! [4]

Graphically, this "bankruptcy effect" of deflation would reduce AD (both C and I) and make the **AD curve positively sloped**, rather than negatively sloped. The negative slope of the conventional AD curve is due to the Keynes effect (lower real rate of interest → higher investment spending) and (perhaps) to the Pigou effect (higher real balances → higher consumer spending). However, these two effects are likely to be small (especially the Pigou effect)[5] and overwhelmed by the "bankruptcy effect" of deflation on both investment spending and consumer spending.

An important implication of an upward-sloping AD curve is that there is **no automatic adjustment to full employment "natural" output**, even in the long run. According to ADAS theory, the SR equilibrium output can be less than the natural output only if the actual price level is lower than expected price level. In this case, the expected price level is supposed to decrease and adjust to the new actual price level, which shifts the AS curve to the right. The rightward shift of the AS curve creates an excess supply at the original SR equilibrium price level, which is supposed to cause the price level to fall. The fall in the price level in turn is supposed to increase AD (C and I), which is supposed to generate a downward movement along a negatively sloped AD curve, until the economy returns to LR equilibrium at the full employment natural output. However, if the AD curve is positively sloped, then a rightward shift of the AS curve results in a **reduction** of the short run equilibrium output, rather than an increase, and the economy moves further away from the full employment output, rather than moving closer toward

it.[6] This adverse effect of deflation on equilibrium output is shown in Figure 2 at the end of this paper.

A handful of authors have been making this point over the years (Caskey and Fazzari 1986 and 1987; Greenwald and Stiglitz 1993; Fazzari, Ferri, and Greenberg 1998), but these articles have been ignored in the scholarly literature and in the textbooks. Perhaps the current crisis will make macroeconomists and textbook authors pay more attention to the dangers of deflation and the necessity to abandon the ADAS framework because of its unrealistic assumptions about the existence of deflation and the positive effects of deflation.

With these general criticisms of the ADAS theory in mind, we turn our attention now to an examination of Gregory Mankiw's presentation of this theory in his *Macroeconomics* textbook, in order to see how Mankiw deals with these critical points in the ADAS theory.

2. Mankiw's presentation of ADAS

Mankiw's presentation of ADAS theory is in Part IV of his textbook, entitled "Business Cycle Theory: The Economy in the Short Run". This part begins with Chapter 9 entitled "Introduction to Economic Fluctuations". In this introductory chapter, the AD curve is derived from the quantity theory of money, and the AS curve is assumed to be horizontal in the short run and vertical in the long run (derived from classical theory). This simple model is used to analyze the effects of demand and supply shocks.

2.1 Keynesian ISLM theory of equilibrium output

Chapter 10 ("Aggregate Demand I: Building the IS-LM Model") presents a conventional ISLM model. The main variable is the **equilibrium quantity of output** produced in the economy as a whole. However, Mankiw obscures this crucial point somewhat by almost always referring to this key variable as **income,** rather than **output**. The horizontal axis of the graphs of the goods market and of ISLM graphs is usually labeled "income, output", but the text almost always refers to Y as income. Of course, income and output are identically equal, but the use of income obscures the crucial fact that ISLM is a theory of equilibrium output, which includes a theory of the supply of output.

Mankiw's ISLM model has the following standard features: the equilibrium quantity of output is determined by aggregate expenditures; adjustment to the equilibrium takes place by means of changes in the quantity of output produced in the goods market and changes in the interest rate in the money market (with the price level constant); and an autonomous change of aggregate expenditures has a "multiplier effect" on equilibrium

output. All these key characteristics of the ISLM theory clearly indicate that this theory is a theory of equilibrium output, which includes a theory of the supply of output.

Mankiw describes the adjustment process in the goods market to the equilibrium output as follows:

> **How does the economy get to equilibrium?** In this model, **inventories** play an important role in the adjustment process. Whenever an economy is not in equilibrium, firms experience unplanned changes in inventories, and this induces them to **change production levels**. Changes in production in turn influence total income and expenditure, moving the economy toward equilibrium. (291; emphasis added)

This adjustment to equilibrium output by means of changing output levels is illustrated and explained again in similar terms in Figure 10-4 ("Adjustment to Equilibrium in the Keynesian Cross") (292).

Mankiw explains the **multiplier effect** of fiscal policy as follows:

> When an increase in government purchases raises income, it also raises consumption, with further raises income, which further raises consumption, and so on. (293)

What is missing in this explanation is an explicit mention of the increases in **output** that result from the increases of expenditures, and that cause income to increase. An increase of government spending increases income only if firms increase output. Even though Mankiw avoids the term "output", it is clear from his presentation that the ISLM theory is a theory of equilibrium output, which includes both the demand for output and the supply of output

Similarly, Mankiw describes the adjustment process in the money market to the equilibrium rate of interest as follows:

> How does the interst rate get to this equilibrium of money supply and money demand? The adjustment occurs because whenever the money market is not

> in equilibrium, people try to adjust their portfolios of assets and, in the process, alter the interest rate. (302)

And Mankiw describes the adjustment to simultaneous equilibrium in the goods market and the money market in the full ISLM model as follows:

> To understand fully what's happening in Figure 11-1, it helps to keep in mind the **building blocks for the IS-LM model** from the preceding chapter – the Keynesian cross and the theory of liquidity preference. Here is the story. When the government increases its purchases of goods and services, the economy's planned expenditure rises. The increase in planned expenditure stimulates the production of goods and services, which causes total income Y to rise. These effects should be familiar from the Keynesian cross.
>
> Now consider the money market, as described by the theory of liquidity preference… higher money demand causes the equilibrium interest rate to rise.
>
> The higher interest rate arising in the money market, in turn, has ramifications back in the goods market… (313; emphasis added)

These adjustment processes from disequilibrium to equilibrium in the goods and money markets are an essential part of ISLM theory. They explain how the equilibrium values in ISLM theory are related to the real world – that there are tendencies for real world output and interest rates to move toward these equilibrium values. When the AD curve is derived from ISLM, the AD curve implicitly incorporates these adjustment processes to equilibrium as well.

Chapter 11 ("Aggregate Demand II: Applying the IS-LM Model"), Section 1 ("Explaining Fluctuations with the ISLM Model"), uses the ISLM theory to analyze the effects of fiscal policy, of monetary policy, and of other shocks to the economy (change of animal spirits, of consumer confidence, and of credit card regulations). And the ISLM model is applied to the real US economy, in two "case studies": the US recession of 2001, and the large macroeconomic computer models (e.g. the DRI model). It is noteworthy that these macroeconomic computer models, that are used to analyze the real

US economy (and other economies) are based on the ISLM theory (augmented with the Phillips Curve) and are not based on ADAS theory.

2.2 Derivation of the AD curve from ISLM equilibrium output

Section 2 of Chapter 11 ("IS-LM as a Theory of Aggregate Demand") is an important section, in which the AD curve is derived from the ISLM model. The AD curve is derived in the standard way, by allowing the price level to change, and analyzing the effects of a price change on equilibrium output, as determined in the ISLM model. Mankiw's specific derivation of the inverse relation between P and the ISLM equilibrium output is based on the "Keynes' effect" on real investment spending. For example, an increase of P reduces the real supply of money (shifts the LM curve to the left), which increases the interest rate, which reduces real investment spending, and finally which reduces equilibrium output by a multiplied amount; hence the inverse relation between P and the ISLM equilibrium output.

Mankiw expresses this conclusion in terms of "equilibrium income", rather than equilibrium output, but the meaning is the same, as derived from the ISLM model.

> The aggregate demand curve … plots this negative relationship between national income and the price level. In other words, the aggregate demand curve shows the set of equilibrium points that arise in the IS-LM model as we vary the price level and see what happens to income. (322)

Thus we can see again, as discussed in the first section of this paper, that the "AD" curve is not really a demand curve at all; i.e. it is not just about the **demand** for output, but is instead about the **equilibrium** output, which includes both the **demand** for output and the **supply** of output. The derivation of the "AD" curve is not simply that an increase of prices reduces the demand for output; rather the derivation of the "AD" curve

concludes further that the increase in the demand for output will in turn increase the supply of output. The ISLM theory assumes that firms respond to an increase in the demand for output by increasing the supply of output by that amount, which in turn increases income and consumer spending, and leads to the multiplier effect.

Mankiw is ambiguous and inconsistent in his definition of "aggregate demand". He first defines "aggregate demand" in Chapter 9 (before the presentation of ISLM) as:

> … the relationship between the quantity of **output demanded** and the aggregate price level. In other words, the aggregate demand curve tells us the quantity of goods and services **people want to buy** at any given level of prices. (269; emphasis added)

This sounds like a regular demand curve, at the aggregate level.

However, in Chapter 11 Mankiw refers back to this earlier definition in Chapter 9, but he actually presents a different definition of "aggregate demand". The difference is subtle, but important. Instead of "aggregate demand" defined in terms of "**output demanded**" (what "people want to buy"), it is instead defined in terms of "**income**" (with "demanded" missing):

> Recall from Chapter 9 that the aggregate demand curve describes a relationship between the price level and the level of national **income**. (321; emphasis added)

One can substitute output (the equilibrium output as determined in the ISLM model) for income in this definition, but what is noteworthy is that the qualifier "demanded" is missing at this crucial point in the derivation of the "aggregate demand" curve (and also on the next page at the conclusion of the derivation, p. 322, quoted above). This omission might be considered a "slip of the pen", but in fact the qualifier "demanded" **would not make any sense** at this point in the derivation. The "AD" curve is clearly derived as the relation between P and equilibrium output in ISLM theory (including both

demand and supply of output), not as the relation between P and "output demanded" (only). Ironically, Mankiw's definition of "aggregate demand" is more accurate when he leaves off the qualifier "demanded". But he (and others) should not use the misleading term "aggregate demand" to describe the relation between P and ISLM equilibrium output.

Section 3 of Chapter 11 ("The Great Depression") applies the ISLM model (not the ASAD model) to analyze the causes of the Great Depression. The various explanations of the Great Depression are classified (as is common) into "the spending hypothesis" (shocks to the IS curve) and "the money hypothesis" (shocks to the LM curve). The final subsection on " … Effects of Falling Prices" is also discussed in terms of ISLM. I will discuss below this interesting and important subsection, in the context of a general discussion of "deflation".

Chapter 12 presents the Mundell-Fleming model, which is essentially the ISLM model extended to an open economy, and will be passed over here, since it is not central to the main concern of this paper, which is the relation between the ISLM model and the ADAS model.

2.3 Theories of short run AS

Chapter 13 ("Aggregate Supply and the Short Run Tradeoff between Inflation and Unemployment"), Section 1 ("The Basic Theory of Aggregate Supply") presents two different theories of AS and then very briefly puts together AS and AD at the end of the section. Mankiw's presentation of SR AS has evolved over the successive editions of his textbook. In the first three editions (starting in 1992), four different theories of an

upward sloping SR AS curve were presented (in this order): the "sticky wage" model, the "worker-misperception" model (both of these are based on the labor market, as discussed above), the "imperfect information" model, and the "sticky price" model.[7] In the 4th edition (2000), the "worker-misperception" model was dropped, and the "sticky price" model was presented first and emphasized more. And in the most recent 7th edition (2009), the "sticky wage" model has also been dropped. So the two classical labor market theories of AS have been dropped altogether, and Chapter 13 now presents only the "sticky price" model (emphasized the most) and the "imperfect information" model.

Mankiw presents the "menu costs" version of the "sticky price" model (he was one of the originators of this version) (381-82). This model divides the economy into competitive firms ("flexible price" firms), which set prices based on **current** output (which determines the demand for the firms' products), and monopoly firms ("sticky price" firms), which set prices based on **expected** output (which determines the firms' expected demand and expected marginal cost). Monopolistic "sticky price" firms are reluctant to increase prices because changing prices cost money ("menu costs") and they may antagonize customers.[8] Thus an unexpected increase of output causes "flexible price" firms to increase prices faster than "sticky price" firms, and the overall effect on the general price level depends on the relative proportions of "flexible price" firms and "sticky price" firms in the economy (the more "fixed price" firms, the less the overall P level will increase and the flatter the slope of the AS curve).

Mankiw concludes that the "sticky price" model of AS can be expressed by the following equation:

$$P = EP + [(1\text{-}s)a/s](Y - Y^*)$$

where *EP* is the expected price level, *s* is the fraction of sticky price firms, a is the responsiveness of prices to changes in output, and *Y** is natural output. Mankiw then argues that this equation can be rearranged (by transferring Y and P to opposite sides of the equation) to be essentially the same as the output equation for AS:

$$Y = Y^* + \alpha(P - EP)$$

where $\alpha = s[(1\text{-}s)a]$. Therefore, Mankiw argues, the "sticky price" model assumes essentially the same relation between Y and P as the "output" models of AS.

However, this algebraic rearrangement does not change the basic assumptions of the two theories, which are fundamentally different. In the output models of AS, a change of price causes a change of output; but in the "sticky price" model, the direction of causation is the opposite: a change of output causes a change of price. This opposite assumption has significant implications for the adjustment process to equilibrium, as we shall see below.

As discussed above, this "sticky price" model of AS is logically inconsistent with the ISLM model of AD, in the same way as the "cost plus" model of AS. Outside of equilibrium, AD and the "sticky price" AS are logically inconsistent because they conclude or imply different combinations of Y and P, and because they cannot provide a coherent explanation of the adjustment process from disequilibrium to equilibrium.

The other theory of SR AS presented by Mankiw is Lucas' "imperfect information" model (383-85) (this model is not presented in any other intermediate macroeconomics textbook that I have surveyed). In this model, AS is defined as a quantity of **output**, but it is not based on the labor market; instead, it is based on a

different theory of output. This theory assumes that, when there is an unexpected increase of the general price level, firms think that only the price of their good has increased (or that the price of their good has increased relative to the prices of all other goods), which leads them to increase their output (temporarily, until they realize that the prices of all goods have increased as much as the price of their good). Hence the positive relation between the price level and the quantity of output produced and the upward sloping AS curve.

Given the extensive coverage of inflation in the business press, it is hard to imagine that savvy firms are not aware of the general rate of inflation, and that they misperceive a general increase of prices as an increase of the relative price of their good alone, and especially that they would make this mistake over and over again (the example presented by Mankiw is an asparagus farmer).

In any case, this "imperfect information" model of AS is based on a theory of output (i.e. how firms decide the quantity of output to produce) that is completely different from and contradictory to the ISLM theory of output, which is the basis of the AD curve. Outside of equilibrium, these two different theories predict two different quantities of output to be produced at the same price level, so these two theories cannot both be true at the same time, similar to the labor market models of AS discussed above.

2.4 "Putting together" AD and SR AS

After these two theories of the SR AS curve are presented, there is a short two-page summary subsection at the end of Section 13-1 (386-87) which "**puts AS and AD back together** again". This section is important, because it finally combines AD and an

upward sloping AS curve, but it is disappointing because it is so short and is not emphasized (the title of the subsection is "Implications"). This rejoining of AD and AS is illustrated by Figure 13-2 (387).

Mankiw uses this ADAS framework to analyze how the economy responds to an unexpected increase in aggregate demand, as follows:

> In the short run, the equilibrium moves from point A to point B. The **increase of aggregate demand raises the actual price level** from P_1 to P_2. Because people did not expect this increase in the price level, the expected price level remains at EP_2, and output rises from Y_1 to Y_2, which is above the natural level $\hat{Y}$. (387; emphasis added)

We can see that Mankiw assumes that the economy moves from one short run equilibrium to a second short run equilibrium because the increase of aggregate demand **causes the price level to increase**, which in turn causes the SR AS quantity of output to increase (i.e. an upward movement along the SR AS curve from A to B). Mankiw does not mention it, but the logic of the ADAS theory implies that the higher price level also reduces AD (an upward movement along the AD curve).

However, there are several serious problems with this explanation of the adjustment process from disequilibrium to equilibrium. In the first place, nothing is said about the adjustment process in the goods and money markets, which are assumed in ISLM, and which are therefore assumed in the derivation of the AD curve. Readers are left to wonder – what is the relation between the ADAS adjustment by means of ΔP and the ISLM adjustments by means of ΔY and Δr? These different adjustment mechanisms appear to be mutually contradictory (ISLM adjustment assumes constant prices and ADAS adjustment assumes changing prices), so an explanation is needed.

Secondly, this adjustment process to equilibrium **does not apply to the "sticky price" model of SR AS**, Mankiw's main theory of AS. Mankiw's adjustment process to the new SR equilibrium assumes that AS is a quantity of output, which is a positive function of price, and thus that an increase of price causes the AS output to increase. However, the "sticky price" model assumes the **opposite** relation between price and output – that AS is a price level, which is a function of output. Therefore, the adjustment to SR equilibrium in the "sticky P" model cannot work by means of a price increase causing an increase of AS output, as described by Mankiw.

One could perhaps assume that the upward movement along the short run AS curve from A to B is caused by the opposite direction of causation: a change of output causes a change in the price level. But then this SR AS curve would not be logically consistent with the AD curve, which assumes the opposite - that a change of the price level causes a change of AD output. If the AD curve shifts to the right and the P level increases (as in Mankiw's example), then the AD theory of output concludes that the increase of P would cause the AD output to fall. But the AS theory assumes that P is a positive function of Y, and thus that P cannot increase without a prior increase of Y. Therefore, the "sticky P" model of AS does not provide a coherent explanation of the economy out of equilibrium nor of the adjustment process to equilibrium.

Finally, this "putting together" of the AD curve and the upward sloping AS curve also does not work for Mankiw's other model of AS (Lucas' "incomplete information" model) in which AS is defined as output which is a function of price. For this model, the AS and AD curves in Figure 13-2 represent two different and logically inconsistent

theories of output, at any price level other than the equilibrium price (similar to the labor market theories of AS discussed above).

If the AD curve shifts to the right and the P level increases (as in Mankiw's example), then the "imperfect information" AS theory (which assumes that Y is a positive function of P) concludes that output will increase; but the AD theory (which assumes that Y is a negative function of P) concludes that output will decrease. Therefore, the "incomplete information" model of AS also does not provide a coherent explanation of the economy out of equilibrium nor of the adjustment process to equilibrium.

After this brief "putting together" of the AD curve and the upward sloping SR AS curve, this framework is not applied to any empirical real world situation, not in this chapter nor in the rest of the book. The ISLM model is applied in previous chapters to a number of important real world examples (including the Great Depression, the Kennedy and Bush tax cuts, Volcker's tight monetary policy, the recession of 2001, Japan's slump in the 1990s, and the large scale macroeconomic computer models), but the ADAS framework is not applied at all to real world examples.

2.5 Rest of the book

The rest of Chapter 13 derives the Phillips curve from the upward-sloping short run AS curve, but does not mention the AD curve, nor the combined ADAS framework (indeed the ISLM AD curve cannot be combined with the Phillips curve because this AD curve is in terms of the price level and the Phillips curve is in terms of the rate of

inflation). The Phillips curve is then used to explain the inflation and unemployment in the US in recent decades.

Chapter 14 ("Dynamic Aggregate Supply and Aggregate Demand") is an entirely new chapter in the latest 7th edition. This title suggests that the static ADAS model derived in the previous chapters is made dynamic in some way, and this is not true. Bits and pieces are taken from the static ADAS model, but not the model as a whole. And there are important differences between these two models, especially for the AD curve. The dynamic AD curve is not derived from the ISLM model, but is instead based on a monetary policy rule (the Taylor rule), according to which the Central Bank responds to an unexpected increase of inflation by increasing the nominal interest rate more than the increase of inflation, so that the real interest rate also increases (and vice versa for an unexpected decrease of inflation).[9] This monetary policy rule makes AD output a function of the rate of inflation, rather than the price level. Since the dynamic AD curve depends on the central bank following a specific monetary policy rule, the applicability of the dynamic ADAS model is limited to the analysis of the effects of different monetary policy rules, and thus does not provide a general theory of output and its fluctuations.[10]

In addition, this dynamic ADAS model has the same logical problems as the "price" version of the static ADAS model: it can only explain equilibrium values, it is logically contradictory when the economy is not in equilibrium, and it cannot explain the process of adjustment from disequilibrium to equilibrium (even less so, since a movement along the AD curve toward equilibrium is generated in this model only by an exogenous change in monetary policy).

The ADAS framework (either static or dynamic) is not mentioned again in the final two parts of the book – Part V on "Macroeconomics Policy Debate" and Part VI on "… the Microeconomics Behind the Macroeconomics". The ISLM model is utilized in several places in Part V on policy debates, but the ADAS model is not utilized at all.

2.5 Deflation

As discussed in the first section of this paper, the static ADAS framework is empirically unrealistic, because it assumes that, if output is less than the natural output, then the price level will fall, and that this reduction in the price level will move the economy back to the full employment output in the long run. But prices don't fall any more, and if prices did fall, it would be a disaster for a heavily indebted economy (such as the US economy), mainly because deflation would increase the debt burden of borrowers, which would lead to widespread bankruptcies, financial crisis, etc.

Mankiw discusses deflation in three places in the book. The first discussion is in the introductory Chapter 9, which assumes a horizontal AS curve. It is assumed that the economy in initially in long run equilibrium, and then assumes a reduction of AD (the AD curve shifts to the left). The economy adjusts to a new short run equilibrium with lower output and the same price level, and Mankiw concludes:

> Over time, in response to low demand, **wages and prices fall**. The gradual reduction in the price level **moves the economy downward** along the aggregate demand curve to point C, which is the new long run equilibrium. (269-70; see Figure 9-12)

There is no mention here of possible negative effects of deflation on debtors and AD, etc.

Mankiw's second discussion of deflation is at the end of Section 11-2 (in which the AD curve is derived), in the context of a discussion of the key difference between

Keynesian theory and classical theory (fixed prices vs. flexible prices). The example assumes that the initial short run equilibrium output is below the natural level, and as a result the price level falls. The price decline eventually causes a downward movement along the AD curve (i.e. the ISLM equilibrium output increases) and output returns to its full employment level. Mankiw concludes:

Eventually, the low demand for goods and services causes prices to fall, and the economy moves back toward its natural rate. (316; see Figure 11-7)

Again, there is no mention here of any possible difficulties caused by deflation.

Finally, toward the end of the next section (11-3, on the Great Depression), there is a more extensive and more important discussion of deflation, which acknowledges possible difficulties.

> From 1929 to 1933 the price level fell 25 percent. **Many economists blame this deflation for the severity of the Great Depression**. They argue that the deflation may have turned what is 1931 was a typical economic downturn into an unprecedented period of high unemployment and depressed income. (321; emphasis added)

The statement that many economists blame deflation for the Great Depression must come as a surprise to students, who have been taught in previous chapters that deflation is an effective means for the economy to return to full employment (which is indeed a key premise of the whole ADAS theory).

Mankiw first discusses the usual "stabilizing effects of deflation" – the Keynes effect and the Pigou effect – which increase AD (i.e. moves the economy downward along the AD curve). Then Mankiw goes on to discuss, for the first and only time in the book, the possible "destabilizing effects of deflation". The first destabilizing effect is the "debt-deflation theory", according to which deflation redistributes income from debtors to creditors, which in turn reduces the overall marginal propensity to consume (because

creditors have a higher propensity to consume than debtors).[11] Another destabilizing effect of deflation discussed by Mankiw is that expected deflation increases the real rate of interest, which in turn reduces investment spending.

However, Mankiw does not mention the more serious destabilizing effect of deflation discussed in the first section of this paper – the "bankruptcy effect", according to which deflation increases in the real burden of existing debt, which leads to bankruptcies of debtors and a financial crisis, and thus to lower consumer spending and investment spending.

Mankiw also does not discuss the important question of the likely **net effect** of the stabilizing and destabilizing effects of deflation on AD and the resulting slope of the AD curve. As discussed above, it is likely that the destabilizing effects will be greater than the stabilizing effects, especially if the "bankruptcy effect" is included. If so, then the slope of the AD will be positive, instead of negative, which in turn has the important implication that deflation does **not** provide a return to full employment "natural" output, even in the long run.

Mankiw concludes this section by asking "Could the Great Depression Happen Again?". His answer is "unlikely", and the main reason is that the Fed would not allow a reduction of the money supply, which implies that deflation is not very likely. What are students supposed to think now? The main conclusion of ADAS theory is that deflation is an effective way to return to full employment, but Mankiw is confident that another Great Depression will not happen again, because the Fed would never allow another deflation! Implicitly, it appears that Mankiw concludes that deflation would be bad for the economy, i.e. that the destabilizing effects of deflation are greater than the stabilizing

effects, and thus that the AD curve is upward sloping, and deflation does not provide an effective mechanism for the economy to return to full employment, especially in a time of crisis, just when we need it most. Instead, deflation might cause another Great Depression!

This conclusion undermines the whole ADAS framework, and especially the assumption that a price decline results in a downward movement along a stable AD curve, until output returns to its full employment natural level. Instead, these destabilizing effects could lead to a downward spiral of prices and demand and output.

3. Conclusion

Mankiw concludes Part 4 of his textbook (on short run fluctuations) as follows:

> **If you find it difficult to fit all the pieces together, you are not alone.** The study of aggregate supply remains one of the most unsettled – and therefore the most exciting – research areas in macroeconomics. (401; emphasis added)

I argue that the reason why so many students (and professors as well) "find it difficult to fit all the pieces together" is that **the pieces do not fit together logically**! The pieces – the AD and AS curves – are mutually contradictory. It is not only that the theory of AS is unsettled, but more fundamentally that all the theories of AS are logically inconsistent with the ISLM theory of AD with which it is combined. In addition, AD and AS are defined in confusing and misleading ways. The fact that students "find it difficult" is a good sign, not a bad sign. It is not a sign that students are not smart enough for the theory, but rather that the theory has serious problems, and students are smart enough to have an intuition about these problems, even though they usually cannot fully identify and articulate them.[12]

In addition to these logical inconsistencies, the static ADAS theory is based on the unrealistic assumptions that output less than full employment natural output causes prices to fall, and that this deflation would be a good thing for the economy – it would increase AD and move the economy back to full employment long run equilibrium output. The current economic crisis has revealed with dramatic clarity the falseness of these assumptions, especially the positive effects of deflation on AD. Rather than continue to make these unrealistic assumptions, macro theory should be primarily about the rate of inflation (rather than the price level), and should analyze in depth the positive and negative effects of deflation.

A full discussion of alternatives to ADAS for intermediate macro textbooks is beyond the scope of this paper, but (very briefly) my own alternative would be essentially to return to the ISLM model to explain output (or perhaps replace the upward sloping LM curve with a horizontal "MP" line at the rate of interest determined by the central bank), plus an improved Phillips curve to explain inflation (augmented with inflationary expectations, supply shocks, etc, and without a "natural rate of unemployment"). The ISLM + Phillips curve theory has its own weaknesses (see below), but at least it is logically consistent, and can explain the adjustment process from disequilibrium to equilibrium, and does not assume that deflation will eliminate unemployment.

The ISLM + Phillips curve theory is still the basis for most macroeconomic computer models of the US economy and other economies. Applied macroeconomists have never accepted the ADAS framework; for one thing ADAS explains only the price level and they are interested in the rate of inflation. So I think the textbook authors

should forget the contradictory and confusing ADAS and teach students the ISLM + Phillips curve model that macroeconomic practitioners still use.[13]

Actually, this is in effect what most of the textbooks do now anyway (in a very misleading way). They typically derive the ADAS framework, and then drop it, without any empirical applications (as Mankiw does, as discussed above). And then they derive the Phillips curve from the AS curve (without the AD curve), and then discuss the real world in terms of the ISLM + Phillips curve, not ADAS. So I suggest that authors forget this contradictory and misleading and unnecessary detour to ADAS, and go straight from ISLM to the Phillips curve.

In addition, I would also emphasize that the ISLM model is still limited in important ways, and is only the beginning of a full understanding of the macro economy and macroeconomic policies. I would attempt to supplement the basic ISLM model in the following important ways:

(1) Discuss the importance of expectations in affecting the outcomes of fiscal and monetary policies, especially through the effects of expectations on nominal interest rates and hence on investment and consumption. This subject is complicated and no definite conclusions can be reached, but at least students should be given an idea of how changing expectations can affect the IS and LM curves and hence can affect the results of government policies.

(2) Place much more emphasis on **debt** and the **financial sector** of the economy. This would include all types of debt: non-financial business debt, financial business debt, and household debt. These forms of debt would be incorporated as determinants of investment and consumption and as potential sources of instability. Relatedly, the

determination of interest rates should be analyzed in terms of real financial markets, not the hypothetical Keynesian "money market". For this purpose, I would use Minsky's theory of financial markets and financial instability.[14]

(3) Add **profit** (or the rate of profit) as a key variable and an important determinant of investment spending (in addition to the rate of interest). It is very disappointing that standard macroeconomics attempts to provide a theory of capitalist economies without ever considering variations in profit or the trend in the rate of profit. Of course, if profit is included as a determinant of investment, then one would need a theory of profit to explain variations and trends. For this purpose, I would add Marx's theory of profit.[15]

(4) Analyze **endogenous causes** of economic crises and instability (falling profits, stagnant wages, increasing inequality, rising debt levels, etc.), rather than simply assume inherent stability and "exogenous shocks" as the only possible causes of instability. Minsky and Marx will of course be very helpful in this regard as well. I have argued (Moseley 2009) that the current crisis was caused by the endogenous trends of a declining rate of profit and rising debt ratios, which led to the bubble and then to the bust.

In sum, I think the economic crisis is both a sufficient reason and an opportune time to jettison the logically inconsistent ADAS framework altogether from intermediate macroeconomics textbooks. ADAS was a pedagogical experiment that failed. Let's acknowledge that failure and move on, and search for better alternatives.

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Figure 1 – Disequilibrium

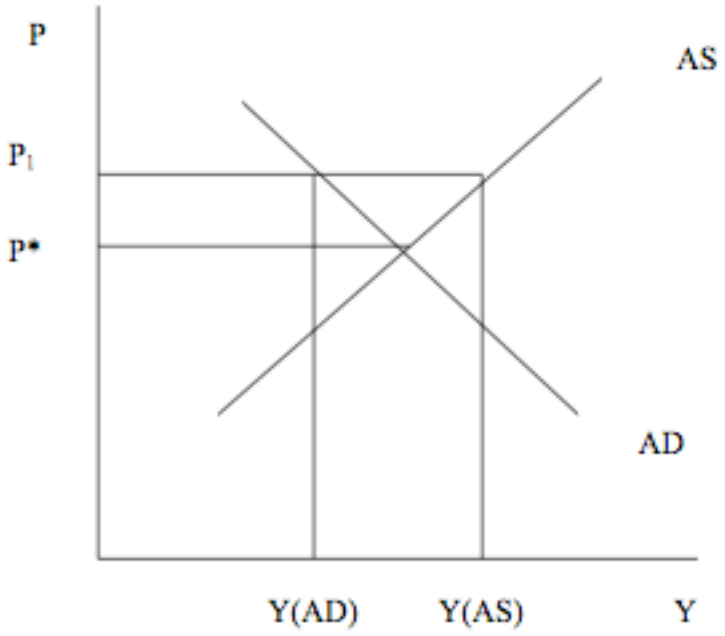
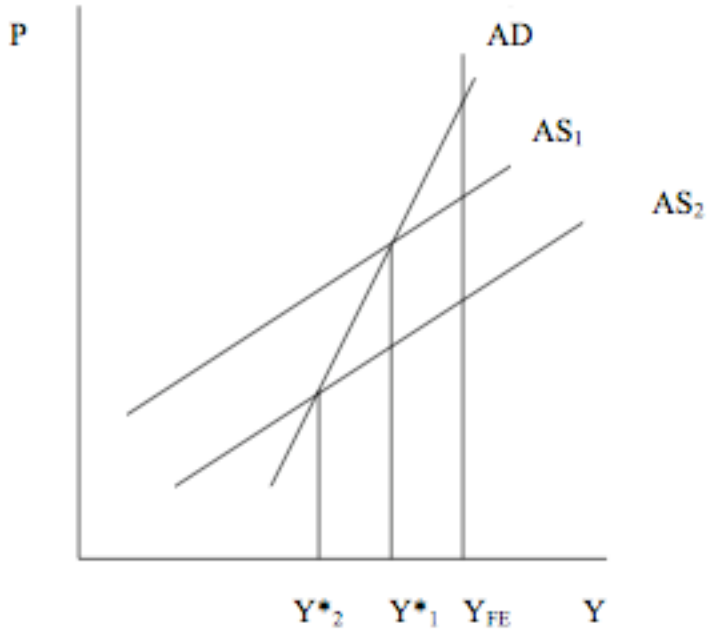


Figure 2 - Deflation



ENDNOTES

[1] Since there are two markets, the adjustment process to equilibrium is complicated, and different paths to equilibrium are possible, depending on the initial point of disequilibrium and the speed of adjustment in each market. For a good discussion of the adjustment to equilibrium in the ISLM model, see Barreto (1995).

[2] Rao (1998, p. 57) has commented on the reaction of students at this crucial point of the ADAS theory: "The intelligent student is left to ponder how the level of output that was already determined by the ISLM model, can once again be determined by the aggregate demand and aggregate supply functions, given that the aggregate demand function in this model is derived from the ISLM model."

[3] Colander has made a similar point about deflation: "These dynamics are not those that most economists believe characterize the dynamics in our economy. Specifically, price level decreases have generally not brought about full employment …" (1998, p. 139). And again: "I think that most economists would agree that the underlying disequilibrium adjustment story that appropriately accompanies the AS/AD model is not descriptive of the real world, but is simply a defensive story to maintain the logic of the AS/AD model of the economy. If we honestly told students that these are the underlying stories behind the analysis, most of them would ask, "Why are you teaching us this? This is not the way the economy works." (1995, p. 178)

[4] Bernanke made a famous speech in 2002, when he was a Governor of the Fed (not yet Chairman), entitled "Deflation: Making Sure 'It' Doesn't Happen Here", but this speech is not mentioned in his textbook.

[5] Greenwald and Stiglitz (1993, p. 36) had this to say about the Pigou effect: "Quantitatively, it is surely an *n*th order effect; one calculation put it that, even at the fastest rate at which prices fell in the Great Depression, it would take more than two centuries to restore the economy to full employment."

[6] This conclusion would still follow if the AD curve were vertical or even slightly negatively sloped. In the latter case, it would take a greater amount of deflation in order to move the equilibrium output to the natural output (compared to the conventional AD curve without the "bankruptcy effect"), which would probably magnify the negative effects of deflation. A 30% deflation would do a lot more damage than a 10% deflation.

[7] It is surprising and disappointing that Mankiw did not include Dornbusch and Fischer's "cost plus" theory of AS in this rather long list of theories of AS (nor in subsequent editions), especially since their interpretation is similar to his own interpretation in the fundamental sense of defining AS as a price.

[8] Mankiw's prototypical example is restaurant menus (hence the name "menu costs"). But surely restaurant menus are not typical of large manufacturing and service corporations today, who in this internet age can change prices almost costlessly with the stroke of a few computer keys. Airlines seem to change prices almost every day!

[9] Other important differences are that Mankiw's dynamic AD curve does not depend on income, and thus there is no multiplier effect in the dynamic ADAS model.

[10] Mankiw mentions that the dynamic ADAS model presented in Chapter 14 is a simplified version of a "dynamic stochastic general equilibrium" (DSGE) model on the frontier of macroeconomic research, and that DSGE models are based on the optimizing decisions of individual households and firms. But Mankiw does not mention that these DSGE models are based on unrealistic assumptions in the extreme: households live forever and are all the same (the "representative household") – same preferences, same income, same status as creditors (no households are debtors), etc; all firms last forever and are the same (the "representative firm) – same size, same production function, same debt/equity ratios, etc.); and a complete set of futures markets are assumed to exist (i.e. markets and prices exist today for all goods, on all future dates, and for all future contingencies!). There is a Central Bank, but no banks. The monetary policy of the Central Bank affects the economy through it effects on household saving and consumption decisions and labor supply decisions, not through its effects on bank lending decisions. It is especially inappropriate in an analysis of monetary policy to assume that all households are creditors. Surely debtor and creditor households will have different reactions to a given monetary policy.

[11] The label "debt deflation theory" is misleading because that is the name of Irving Fisher's theory of depressions in the 1930s, and Fisher's theory says nothing about this redistributive effect, but instead emphasizes what I have called the "bankruptcy effect".

[12] One is reminded of Colander's "precocious student", who asks probing questions about the inconsistencies between the ISLM model and the ADAS model, and does not receive good answers from the professor, and decides to switch to another major (1995, pp. 174-76) and also Rao's "intelligent student" quoted in endnote 2.

[13] Blinder (1997, p. 241) has noted: "Furthermore, practical models used for short-run policy analysis do not have an upward-sloping aggregate supply function and do not solve for a market-clearing price level."

[14] In Mankiw's latest edition, a Case Study is added on "The Financial Crisis of 2008 and 2009". The analysis is *ad hoc* and is not based on either the ISLM or the ADAS model. The main emphasis is on the housing boom (due mainly to changes in the home mortgage market: subprime, securitization, deregulation), which was unsustainable and eventually burst, which in turn caused defaults and foreclosures on mortgages and a very serious financial crisis, because of the huge losses for banks and other financial institutions. However, neither ISLM nor ADAS include a theory of asset bubbles or a significant financial sector. Therefore, the standard ISLM and ADAS models are of little or no help in explaining the recent financial crisis.

Also in this latest edition, a Case Study from previous editions entitled "The Remarkable Stability of the US Economy" is deleted (for obvious reasons). This deleted Case Study indicates the inappropriate optimism that results from a theory which largely ignores debt and the financial sector.

[15] The neoclassical marginal productivity theory of profit has been thoroughly discredited by the capital controversy of the 1960s-70s, and is of no use anyway in an analysis of the trends and fluctuations of profit or the rate of profit because it is a static theory.