Intermediate Macroeconomics without the IS-LM Model

Akila Weerapana

Abstract: The IS-LM model is the primary model of economic fluctuations taught in intermediate-level undergraduate macroeconomics. Recent works by Taylor and Romer make a strong case for an alternative model, known as the aggregate demand-price adjustment (AD-PA) or the aggregate demand-inflation adjustment (AD-IA) model, as a better model of economic fluctuations. The author argues that the AD-PA model is superior to the IS-LM model for teaching about economic fluctuations in intermediate macroeconomics. He compares the perfomance of the two models in teaching about two important issues in current macroeconomics: the ineffectiveness of monetary policy in stimulating the 1990s Japanese economy and the rapid switch of the U.S. Federal Reserve from contractionary policy to expansionary policy in 2001.

Key words: IS-LM, policy rules, teaching
JEL codes: A0, A2

The cornerstone of undergraduate macroeconomics is the course in intermediate macroeconomics, and one of the cornerstones of intermediate macroeconomics is the IS-LM model. Despite its widespread use, the IS-LM model has been widely criticized, and its survival is largely due to the lack of a credible alternative. However, recent works by Taylor (2000a) and Romer (2000) make a strong case for an alternative model, known as the aggregate demand-price adjustment (AD-PA) or the aggregate demand-inflation adjustment (AD-IA) model, as a model of economic fluctuations built on better foundations. My purpose in this article is to compare how the two models perform in teaching intermediate-level undergraduates about two important issues in current macroeconomics: the ineffectiveness of monetary policy in stimulating the 1990s Japanese economy and the rapid switch of the U.S. Federal Reserve from contractionary policy to expansionary policy in 2001. My goal is to show that the AD-PA model is superior to the IS-LM model in its modeling of the behavior of monetary policymakers, in its avoidance of any real/nominal interest rate confusion, and in allowing students to model directly the behavior of inflation. Furthermore, the case studies show that this can all be done while providing elegant analysis of intermediate macroeconomic concepts. By showing these points, I hope to stimulate more widespread use of the AD-PA model in intermediate classroom settings because

Akila Weerapana *is an assistant professor of economics at Wellesley College (e-mail: aweerapana@wellesley.edu).* *The author thanks John Taylor and David Romer for helpful comments on an outline of the liquidity trap model and Hirschel Kasper and three anonymous referees for helpful comments.*

it has greater potential for bridging the gap to academic research on economic fluctuations, especially where monetary policy issues are concerned.

Almost all of the major textbooks in intermediate macroeconomics (e.g., Abel and Bernanke 2001; Blanchard 2000; Froyen 1998; Gordon 2000; Hall and Taylor 1997; Mankiw 1999) use the IS-LM model (typically in conjunction with the aggregate demand-aggregate supply [AD-AS] model) as the basic model of economic fluctuations. Criticisms of the IS-LM model arise, in part, because of the existence of a wide gulf between the manner in which economic fluctuations is taught to undergraduates (with IS-LM and AD-AS models) and the manner in which economic fluctuations is taught to graduate students (with dynamic, stochastic general equilibrium models of optimizing agents and firms). The main reason for this gap is the complexity of the graduate models; as Froyen (1996) describes in great detail, there has always been a lag before developments in graduate macroeconomics filter into undergraduate classrooms, mainly because of the technical limitations of undergraduate students. However, it is still interesting to note that a greater disparity exists between undergraduate and graduate levels in the teaching of economic *fluctuations* than in the teaching of economic *growth*.

Romer (2000) emphasizes that even though it may be very easy to criticize the IS-LM model for its technical and fundamental deficiencies, it is considerably harder to come up with an alternative model that can be presented to undergraduate students. However, Romer makes a very compelling case that the AD-PA model improves on the IS-LM model by addressing some of its fundamental deficiencies while remaining at least as accessible. The AD-PA model is not presented in most major intermediate macroeconomics textbooks (with the exception of DeLong 2001 and appendices in a couple of other texts, i.e., Hall and Taylor 1997; Colander and Gamber 2001) but is presented in the introductory macroeconomics textbook of Taylor (2001). As Romer (2000, 18) points out, Taylor's book "analyzes fluctuations at a depth comparable to that in standard intermediate books." Having used this model in the classroom, I have been constantly reminded about the truth of Romer's characterization: introductory students using the AD-PA model are able to understand economic fluctuations at a level comparable to intermediate students using the IS-LM model. This is in stark contrast to their understanding of economic growth, which remains much weaker than the intermediate students' knowledge that is based on explicit derivation and manipulation of the Solow model. My focus in this article, however, is not how to present intermediate-level material to introductory students. Instead, my goal is to show that by using the AD-PA model, thus avoiding the IS-LM model and the confusions commonly associated with it, an intermediate-level student can develop a deeper understanding of important contemporary macroeconomic policy issues.

THE AD-PA MODEL

The aggregate demand-price adjustment model has two core relationships: the aggregate demand curve (denoted AD, sometimes also referred to as the aggregate demand inflation or ADI curve), and the price adjustment line (denoted PA, sometimes also referred to as the inflation adjustment or IA line).[1] The AD curve

describes the relationship between gross domestic product (GDP) and inflation, instead of the relationship between GDP and the price level (hence the use of ADI by some authors to distinguish it from the more standard definition of an AD curve). The PA line describes the behavior of the inflation rate in the economy. The first key difference between the AD-PA model and the IS-LM model is that the AD-PA model works directly with inflation instead of the price level, allowing students to see the behavior of the two most familiar macroeconomic variables on their graphs, unlike in the IS-LM model where only the sign, not the magnitude, of price changes can be inferred.

The Aggregate Demand Curve

The AD curve is derived from two relationships: a negative relationship between the real interest rate and GDP and a positive relationship between inflation and the real interest rate. The negative relationship between the real interest rate and GDP is analogous to the IS curve: higher real interest rates reduce investment demand, potentially reduce consumption demand, and also lower net exports through an appreciation of the domestic currency, all of which lead to lower GDP.[2]

The positive relationship between inflation and the real interest rate is based on the actions of the Federal Reserve, which typically responds to increases in inflation by raising *nominal* interest rates and to decreases in inflation by lowering *nominal* interest rates.[3] The behavior of the Fed is assumed to follow a systematic pattern and can be summarized by a monetary policy rule: The interest rate set by the Fed can be expressed as a systematic function of the rate of inflation (π) and other variables such as GDP (y). A simple general example would be a rule of the form[4] $i_t = \gamma_\pi(\pi_t) + \gamma_y(y_t - y_t^*)$, where i_t is the nominal interest rate, y_t is the natural log of GDP, (Y_t), y_t^* is the natural log of potential GDP (Y_t^*), and γ_π, γ_y are reaction coefficients: indicators of how responsive interest rates are to various macroeconomic variables.[5] To avoid the real/nominal interest rate difficulties that plague the IS-LM model, one can derive the policy rule in terms of the real interest rate as $r_t = (\gamma_\pi - 1)(\pi_t) + \gamma_y(y_t - y_t^*)$. Note that the monetary policymaker does not directly control the real interest rate, only the nominal interest rate. For a given expected rate of inflation, the policymaker can achieve a particular real rate by manipulating nominal interest rates. One assumes that a core principle of good monetary policymaking requires that the policymaker "lean against the wind" by raising real rates when inflation is high and by lowering them when interest rates are low.[6]

The combination of the positive relationship between inflation and the real interest rate and the negative relationship between the real interest rate and GDP establishes a negative relationship between inflation and GDP (Figure 1). The intuition works as follows: when inflation rises, the Federal Reserve raises nominal interest rates by enough to increase real interest rates.[7] The increase in real interest rates lowers spending, which in turn reduces output. An increase in inflation will therefore reduce GDP. Conversely, when inflation falls, the Fed will lower real interest rates. The resulting low real rates will increase spending and

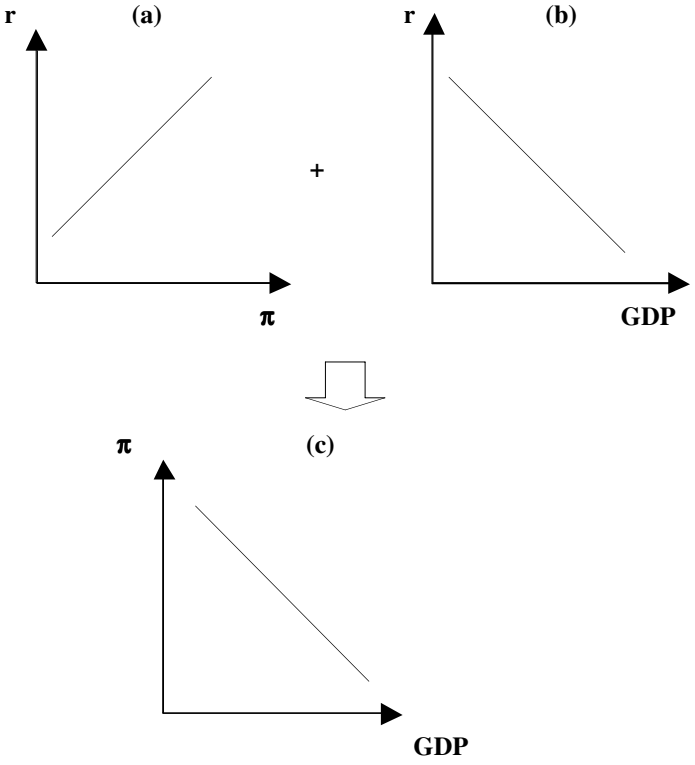

FIGURE 1. The aggregate demand curve.

therefore output. So a fall in inflation will increase GDP.

What causes the AD curve to shift? First, increases (decreases) in spending will increase (decrease) output, regardless of the inflation rate in the economy; it will thus cause the AD curve to shift out (in).[8] Second, monetary policy changes by the Federal Reserve can also affect the AD curve. Fed decisions can be thought of as falling into two categories with respect to inflation: reactive and active. If the Fed changes interest rates *in response* to changes in inflation, that will be a movement along the AD curve rather than a shift in the AD curve. If the Fed raises (lowers) interest rates *without* any change in current inflation (because of concerns about GDP fluctuations or concerns about future inflation), the AD curve will shift in (out).

The Price Adjustment Line

The price adjustment line describes the adjustment of inflation in the economy. The easiest way to think of the PA line is as an expectations-augmented Phillips curve of the form $\pi_t = \pi_t^e + \alpha(y_t - y_t^*) + \varepsilon_t$, where π_t^e denotes expected

inflation, $(y_t - y_t^*)$ denotes the output gap, and ε_t denotes shocks to inflation. As described in Romer (2000) and Taylor (2000a), a simple approach is to assume that inflation responds to the output gap with a lag (perhaps because of staggered wage and price contracts). Then there would be no simultaneity, and the PA line would be of the form $\pi_t = \pi_t^e + \alpha(y_{t-1} - y_{t-1}^*) + \varepsilon_t$ and would be fixed in the short run in the absence of supply shocks.[9] Graphically, then, the PA line is a horizontal line with the vertical intercept signifying the inflation rate that prevails in the economy (panel a in Figure 2). This inflation rate summarizes the outcome of the price and wage setting behavior of firms and workers, as well as the impact of inflationary shocks (Figure 2, panel b).

Over time, the PA line may shift up or down; the direction of the shift of the price adjustment line depends on whether output is higher or lower than potential GDP. If output is greater than potential, one would expect inflation to rise, and if output is less than potential, one would expect inflation to fall, all else equal. This adjustment of prices is shown in Figure 3. In the long run, when out-

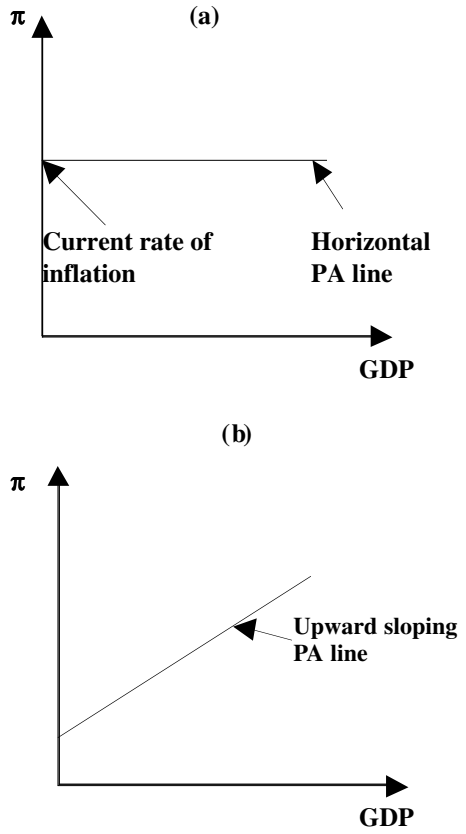

FIGURE 2. The price adjustment line.

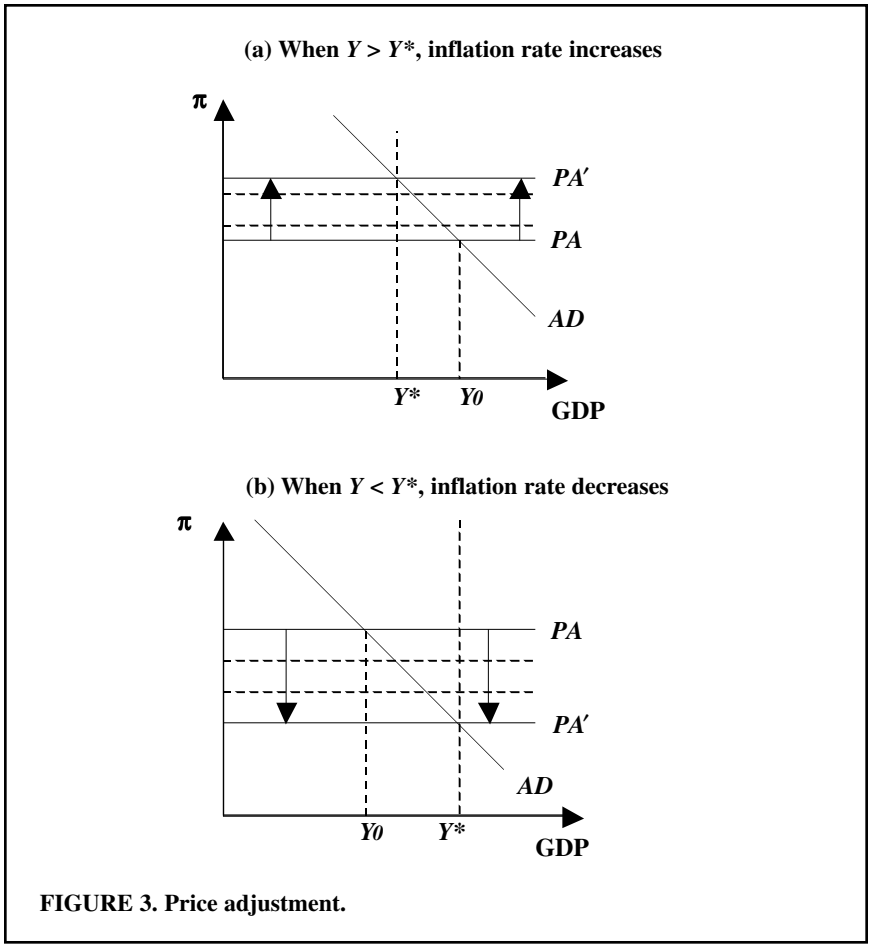

FIGURE 3. Price adjustment.

put reaches potential, inflation will be determined by expected inflation (as with the Phillips curve, the instructor can choose to present cases of rational and adaptive formulations of expected inflation). The assumptions of steady inflation in the absence of shocks in the short run and adjustment to potential output in the long run makes the model Keynesian in its approach. However, this is no different from the IS-LM model as described in most intermediate level textbooks.[10] Furthermore, the PA line has a couple of distinct pedagogical advantages as opposed to the IS-LM approach. First, the short-run assumption of constant inflation is much more palatable than the assumption of constant prices (i.e., zero inflation) to students who have no intuitive reason to believe in a world of zero inflation. Second, in the IS-LM formulation, booms are associated with *inflation* and recessions are associated with *deflation*. In reality, episodes of deflation are rare outside of major slumps and a formulation of higher inflation in booms and lower inflation in recessions is also much easier for students to comprehend intuitively. Finally, students can observe directly the behavior of the variable of interest, inflation, on the

graph. In the IS-LM-AD formulation, higher prices can be observed on the graph, but the only observation one can make about the inflation rate is whether there is inflation or deflation, not whether the magnitude of inflation is rising or falling.[11]

To summarize, we have a simple model that can be described in a two-dimensional graph with the two most relevant economic variables (GDP and inflation) on the axes. Shifts in the AD curve capture changes in demand driven by consumers, investors, the government, foreigners, or the central bank; shifts in the PA line capture changes in inflation resulting from inflation, shocks, changes in expected inflation or the economy's adjustment to its long-run equilibrium. The exposition can be done without appealing to any skills beyond what is needed to grasp the IS-LM model, and it has the added advantage of not causing the student to be confused about whether the model is referring to real or nominal interest rates or whether an increase in price implies a rate of inflation that is higher or lower than the existing rate of inflation.

The advantage of the AD-PA model lies not just in its clarity, however, but also in its power to explain complex situations in a tractable fashion. In the following two sections, I show how to use the AD-PA model to analyze two important issues in current macroeconomics: the ineffectiveness of monetary policy in stimulating the Japanese economy and the rapid switch of the U.S. Federal Reserve from contractionary policy to expansionary since the year 2000. In each section, I will contrast the exposition to an analysis using the IS-LM model to illustrate the superiority of the AD-PA model in terms of its ability to present the material without the confusions associated with the IS-LM model.

CASE STUDY 1: JAPAN IN THE 1990s

The economic woes of Japan following the popping of the "asset bubble" in the early 1990s are well known. I provide in Table 1 a quick summary of what has transpired in the Japanese economy from 1991 to 2000, and, in particular, over the recent years 1997–2000: a stagnant economy, a falling stock market, and rising unemployment coupled with deflation.

How would an intermediate student explain the economic woes of Japan using an AD-PA model? In particular, the student should be able to explain why the repeated attempts of the Japanese government to boost the economy by cutting taxes and increasing government spending have failed, and why the Japanese central bank has been equally hamstrung in its ability to rescue the economy. A small modification of the AD-PA model can help get a handle on the current Japanese economic situation.

Recall that according to the basic assumptions of the AD-PA model, the downward sloping AD curve arises because of the negative relationship between the real interest rate and GDP and the positive relationship between the real interest rate and inflation, as a result of the behavior of the central bank. Also recall that, given $i - \pi = r$, the only way to get a positive relationship between the real interest rate and the rate of inflation is to move nominal interest rates in the same direction as inflation by a larger magnitude than the change in inflation. Japan-

ese nominal interest rates were close to zero for most of the 1990s (Table 1) and, given that nominal interest rates can not go below zero, the Japanese central bank has been unable to lower nominal rates in response to a fall in inflation. This implies the relationship $-\pi = r$. Thus a fall in inflation would lead to an increase in the real interest rate, which in turn would lead to a fall in GDP. Conversely, a rise in inflation would lead to a decrease in the real interest rate, which in turn would lead to an increase in GDP. Therefore, once we have reached a nominal interest rate of zero, we should expect a positively sloped relationship between inflation and GDP. In other words, the downward sloping AD curve develops a kink at an interest rate of zero (Figure 4).[12]

Using this AD curve, one can see how Japan can get trapped in a reces-

TABLE 1. Macroeconomic Conditions in Japan, 1991–2000 (in percentages)

Variable	1991–2000	1997–2000
Average annual real GDP growth	1.24	–0.11
Average annual inflation (GDP deflator)	0.21	–0.33
Average overnight interest rate	2.58	0.26
Average growth of the Nikkei Index	–4.46	–3.90
Average rate of unemployment	3.53	4.16

Sources: IMF International Financial Statistics; Bank of Japan; Economagic.com.

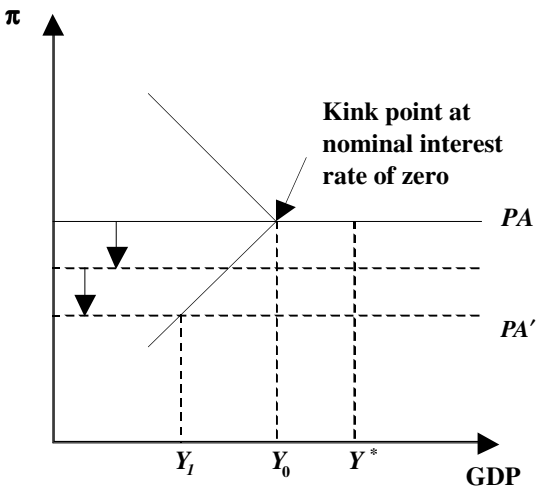

FIGURE 4. Demonstrating a liquidity trap using the *AD-PA* model: Example 1990s Japanese economy.

sion/deflation spiral. An asset bubble collapse will shift the AD curve in. Because $Y < Y^*$, firms will lower relative prices, helping to reduce inflation. Now, the lower inflation will lead to a higher real interest rate and will actually lower GDP in the economy. This pushes Y further below Y^* and sets off another series of negative shocks as firms lower relative prices again. In other words, Japan gets trapped in a deflationary spiral that is very difficult to break out of.

Not only is the basic analysis elegant, but, with the basics in place, the student can tackle a range of potential solutions to the liquidity trap. For example, some economists have argued that the Japanese government was not aggressive enough in its use of expansionary fiscal policy. The magnitude of tax cuts and spending increases becomes critical for Japan to recover in the long run. Slightly expansionary fiscal policy (that moves the AD curve to AD′ and the economy out to Y_1 in Figure 5, for example) will not be able to stop the deflationary spiral. Any tax cut or spending increase has to raise output to or above Y^* to break free of the deflationary spiral (Figure 5). This, of course, raises the stakes for fiscal policymakers and makes it less likely that the government will be able to run the deficits of the magnitude required to sustain the fiscal expansion while maintaining credibility.

Krugman (1998) and Svensson (2001) have recommended that the Japanese central bank make a dramatic announcement that it is willing to create/tolerate a higher inflation rate in the economy by printing vast quantities of yen! Krugman's specific words online were that "this explanation suggests that inflation—or more precisely the promise of future inflation—is the medicine that will cure Japan's

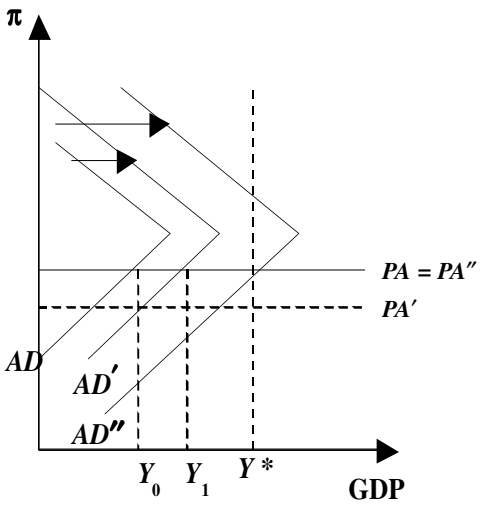

FIGURE 5. Substantial, expansionary fiscal policy as a solution for the 1990s Japanese economy.

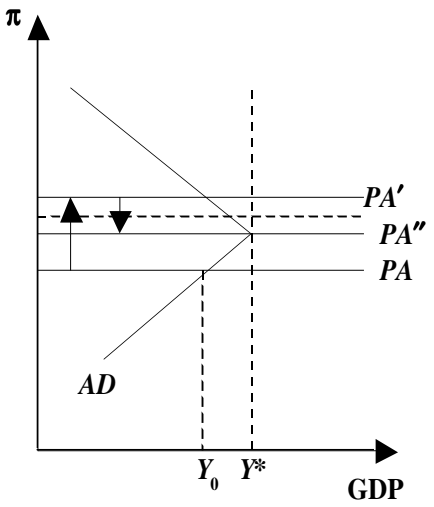

FIGURE 6. Raising inflation expectations as a solution for the 1990s Japanese economy.

ills." Higher inflation expectations will raise the actual inflation rate in the economy and will help lower real interest rates when coupled with a fixed nominal rate. Higher expected inflation will also help the Japanese government's fiscal policymaking by moving the economy to the downward sloping portion of the AD curve, thus helping the economy recover as inflation continues to fall (Figure 6).

Meltzer (1999), among others, has suggested that the existence of the "credit channel" of monetary transmission implied that the Japanese central bank was not as impotent as it seemed. The presence of the credit channel of policy transmission means that as inflation falls the Japanese central bank will still continue to increase liquidity and enable banks to make more loans stimulating economic activity among the smaller firms. This will offset the contractionary effects of the interest rate channel and change the slope of the upward sloping portion of the AD curve, making the deflationary spiral less damaging. If the credit channel is large enough, the AD curve can go back to its regular downward-sloping self (Figure 7).

In summary, the AD-PA model can elegantly capture how a deflationary, contractionary spiral can occur in an economy with low nominal interest rates that is hit by a large negative demand shock. It also provides intermediate-level students with the ability to understand some subtle solutions to the problem that involve nonlinear fiscal policy effects, the credit channel of monetary policy transmission, and inflation expectations. These suggested policies may not work; nevertheless, the intermediate-level student can analyze a very sophisticated problem at a level far higher than the traditional expansionary monetary and fiscal policy approach that they would typically adopt in an attempt to understand the appropriate policies for the economic woes of Japan.

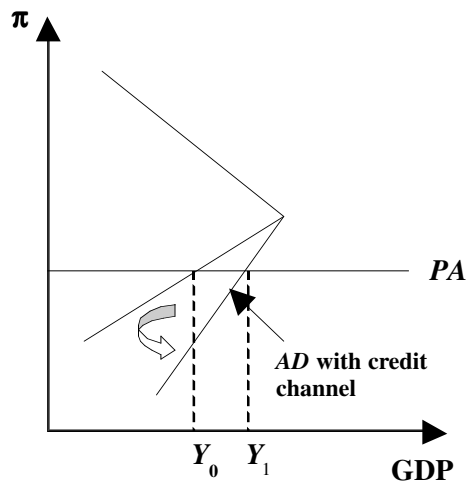

FIGURE 7. The credit channel as a solution for the 1990s Japanese economy.

Comparison to the IS-LM Model

A quick comparison to the IS-LM model demonstrates that the AD-PA analysis does not miss any key concepts. The comparison also suggests that the AD-PA models analysis is arguably more tractable than the IS-LM analysis.[13] As with the AD-PA model, the basic underpinnings of the IS-LM model change as the nominal interest rate falls below zero. In general, an upward sloping LM curve shows all the combinations of income and (nominal) interest rates that equate money demand with an exogenously fixed money supply. Lower income leads to a decrease in money demand, which in turn requires lower nominal rates to restore money market equilibrium and vice versa. However, because nominal interest rates have a lower bound of zero, as the lower bound is approached, money demand has to become completely elastic with respect to the nominal interest rate. This is the only way that equilibrium can be maintained without interest rates falling into negative territories. This implies a flat LM curve in the region closest to the nominal interest rate of zero (Figure 8, panel a).

I then use the IS-LM diagram to derive the AD curve by changing price and mapping out the resulting level of GDP. When *P* decreases, the upward sloping portion of the LM curve shifts out but the economy stays trapped on the horizontal part of the LM curve (Figure 8, panel b). This is another way of stating that the effectiveness of expansionary monetary policy is high when the LM curve is steep,[14] but when the LM curve is flat, expansionary monetary policy is ineffective in changing output. In terms of the aggregate demand framework, we have a vertical AD curve at the level of GDP required to clear the money market (Figure 9).[15]

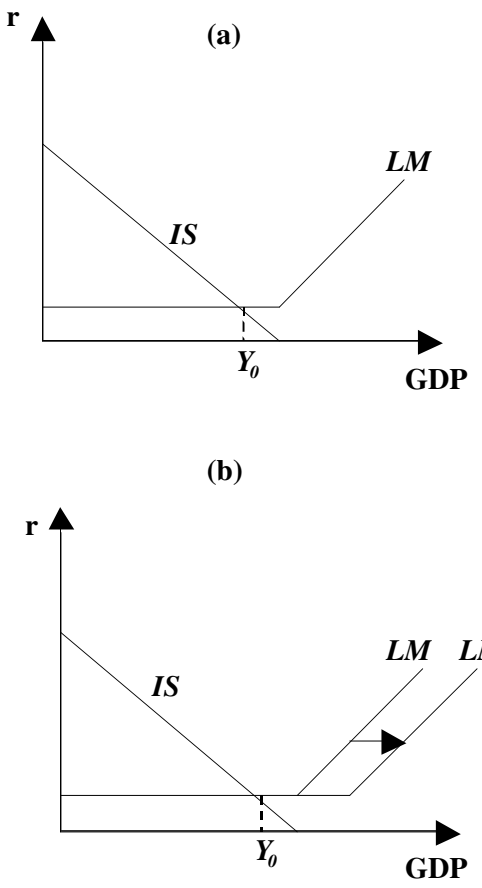

FIGURE 8. Demonstrating a liquidity trap using the *IS-LM* model.

What happens over time? Extending to the aggregate demand framework, because the Japanese economy is in recession, prices will, in fact, fall over time. In the typical scenario, as prices fall, the real money supply expands, shifting the LM curve out, lowering interest rates, increasing output, and moving the economy back to potential output. In this case, however, as the vertical AD curve shows, output will not change over time.[16] In other words, even though the upward sloping portion of the LM curve shifts out, the economy stays trapped on the horizontal part of the LM curve. The LM curve does not adjust over time to bring the economy back to potential output. Instead, there is a combination of deflation and a stagnant economy.

How does the analysis using the IS-LM model compare to that using the AD-PA model? In both cases, the underlying model has to be changed to adapt to the special circumstances, and a student has to have a good understanding of the

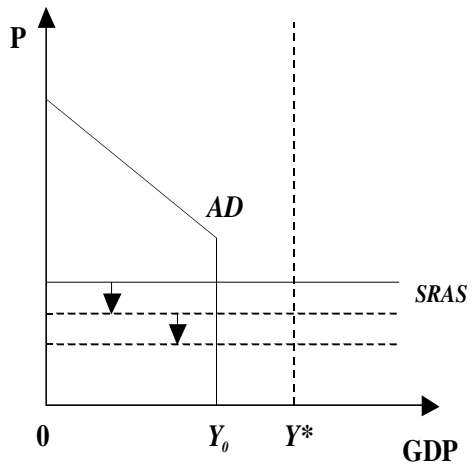

FIGURE 9. Demonstrating a liquidity trap using the *AD-AS* model.

underpinnings of the model to grasp the subtleties. One key difference between the two models emerges when we try to think about what is happening to real interest rates in the economy. In the AD-PA approach, when $Y < Y^*$, the rate of inflation falls. The combination of zero nominal interest rates and falling inflation implies rising real interest rates. According to the AD-PA model, the rising real interest rates then lead to falling output—a deflation-contraction spiral. In contrast, in the IS-LM/AD-AS model, when $Y < Y^*$, prices fall. As the vertical AD curve shows, despite the falling prices, output stays constant. According to the underpinning IS relationship, the fact that output is constant implies that real interest rates are constant. Constant real interest rates, given zero nominal interest rates, imply a constant rate of deflation. In other words, not only are prices falling, but they are falling at a constant rate, a fact that is not easy to glean from the AD-AS diagram.

Another key difference is that the IS-LM model shows that monetary policy is powerless (Figure 10) in a liquidity trap situation, but fiscal policy becomes very powerful (Figure 11). This difference is because an increase in spending shifts out the IS curve, increasing Y by the full multiplier effect in the absence of rising interest rates.[17] The Japanese government could technically increase GDP by expansionary fiscal policy, moving the economy to a higher level of Y, at which it would stay. In contrast, in the AD-PA analysis expansionary fiscal policy that left us below Y^* would not be helpful in that the economy would just contract back to the original level of output. This can be seen by contrasting the shift of the AD curve to AD′ in Figure 5 with the shift of the AD curve to AD′ in panel b of Figure 11. In essence, it is difficult to reconcile the ineffectiveness of Japanese fiscal policy with the predictions of the IS-LM model.

This IS-LM-based analysis requires a bit of algebra but should certainly be

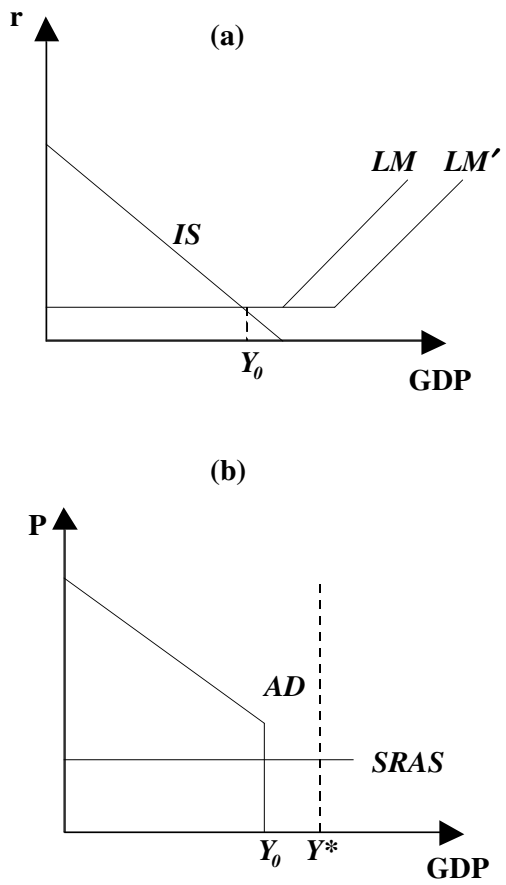

FIGURE 10. Expansionary monetary policy is powerless in a liquidity trap.

accessible to a good intermediate-level student. Arguably then, the AD-PA model can present an elegant description of the same scenario in a much more tractable fashion accessible to a broader audience. At the very least, the AD-PA model is as good as the IS-LM model in analyzing situations, even when monetary policymakers, whose behavior it does a better job of describing, are relatively powerless.

CASE STUDY 2: THE RECENT BEHAVIOR OF THE U.S. ECONOMY

The second case to which I apply the AD-PA model is the U.S. economy, which went through an almost unprecedented boom from 1997 to 2000 followed by a dramatic slowdown in 2001. Some basic macroeconomic data (Table 2) characterize the economic developments of this period.

TABLE 2. Macroeconomic Conditions in the United States, 1997–2001 (all numbers shown, except for oil prices, are in percentages)

Variable	1997	1998	1999	2000	2001
Real GDP growth	4.22	4.66	4.31	2.77	1.02
CPI inflation	1.68	1.59	2.64	3.32	3.74
Fed Funds rate	5.50	5.31	5.02	6.33	4.64
S&P 500 growth	25.84	21.24	18.28	–7.09	–14.36
Unemployment	4.90	4.53	4.20	3.98	4.40
Oil prices	$18.66	$13.73	$20.63	$31.02	$27.33

Sources: Macroeconomic data from the Bureau of Economic Analysis, Bureau of Labor Statistics, and Standard & Poors, all via www.Freelunch.com. Growth rates are calculated from the fourth quarter of the previous year to the fourth quarter of the year in question, except in 2001 where the annualized growth for the first two quarters of 2001 is used.

In my opinion, at the end of the semester, an intermediate macroeconomics student should be able to tell a compelling story about the boom and the slowdown, or should at least have a good basic framework of analysis with which to explore more subtle arguments about what exactly took place in the U.S. economy. We can easily construct a set of candidate explanations for the rapid growth spurt in the latter part of the 1990s. Such a list may include: (1) the boom in information technology associated with the development of the Internet, (2) sound fiscal policy leading to budget surpluses after years of budget deficits, (3) sound monetary policy decisions made by Alan Greenspan and the Fed that kept confidence high and inflation expectations low, (4) high levels of consumer and investor confidence led in part by high levels of wealth created by a booming stock market, (5) cheap imports following the East Asian economic crisis of 1997, and (6) lower oil prices through much of the 1990s.[18]

Now let us see how an intermediate-level student could explain recent developments in the U.S. economy using an AD-PA model. In particular, the student should be able to explain the rapid transition from rapid growth to slow growth that the economy underwent over the 18 month period from early 2000 to 2001, as well as to rationalize the behavior of the Federal Reserve, which went from sustained rate hikes in 2000 to even more dramatic rate cuts in 2001.

First, consider the 1997–1999 period. The wealth effect created by the booming stock market stimulated consumption, and the easy access to capital led to a boom in investment, both of which push the AD curve out. The lower oil prices (favorable supply shocks, i.e., low ε) and good monetary and fiscal policy decisions (which helped keep inflation expectations, π^e, low) helped keep inflation low, thus shifting the PA line down as well. All this coupled with an increase in productivity associated with the information technology boom, which would shift out the potential output level in the economy, would result in a rosy economic situation (Figure 12). Note that the behavior of the two key macroeco-

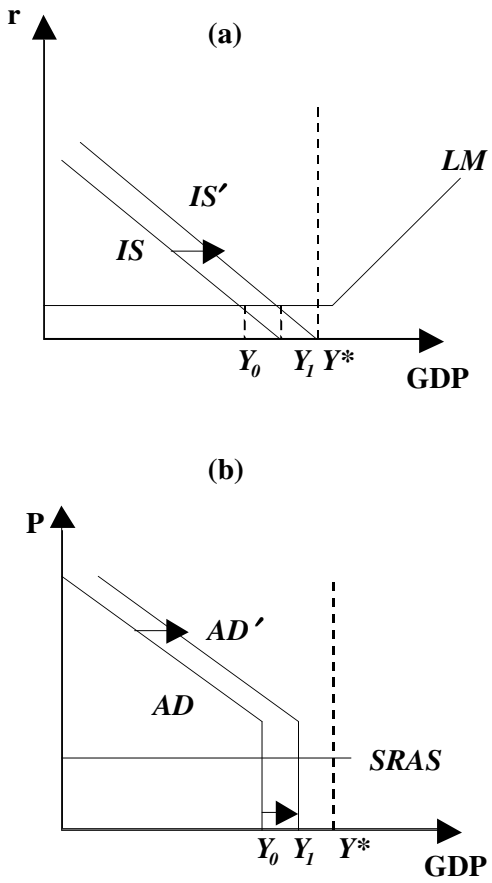

FIGURE 11. Expansionary fiscal policy is powerful in a liquidity trap.

nomic variables, inflation and real GDP, can be observed directly from the graph.

Then consider what happened in 2000. A reasonable approach would be to say that a combination of the following factors helped slow the economy down. First, the information technology revolution was not as significant as it had first seemed, resulting in a stock market correction and a subsequent fall in consumer and investor spending. Second, the Fed raised interest rates several times in 1999 and early 2000, mostly because inflation rose above what the Fed may have deemed to be an acceptable level but also potentially because the run up in asset prices worried the Fed.[19] In late 2000, these rate hikes started to take effect. Finally, higher oil prices returned with a vengeance, with the price of oil rising by 50 percent in 2000. This combination of factors can drive the U.S. economy close to recession (Figure 13).

In 2001, the Federal Reserve switched dramatically from rate hikes to rate

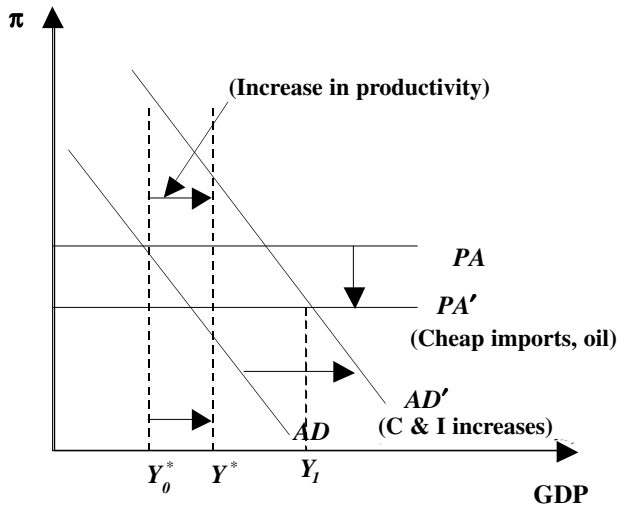

FIGURE 12. Analyzing the 1997–1999 U.S. economy using the *AD-PA* model.

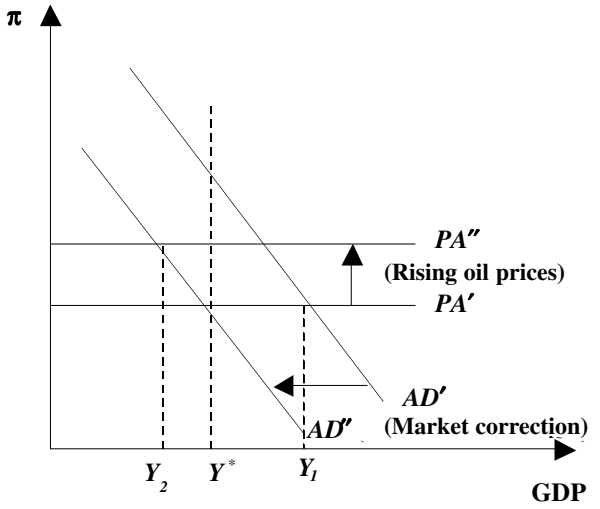

FIGURE 13. Analyzing the slowdown in 2000 using the *AD-PA* model.

decreases, with six rate cuts totaling 275 basis points even before the events of Sept. 11, 2001.[20] One inference is that the Fed has decided to pay much greater attention to the GDP and unemployment numbers, an inference consistent with the statements issued by Alan Greenspan in 2000.[21] Another interpretation is that, in addition to the simple endogenous reaction described in the policy rule, the

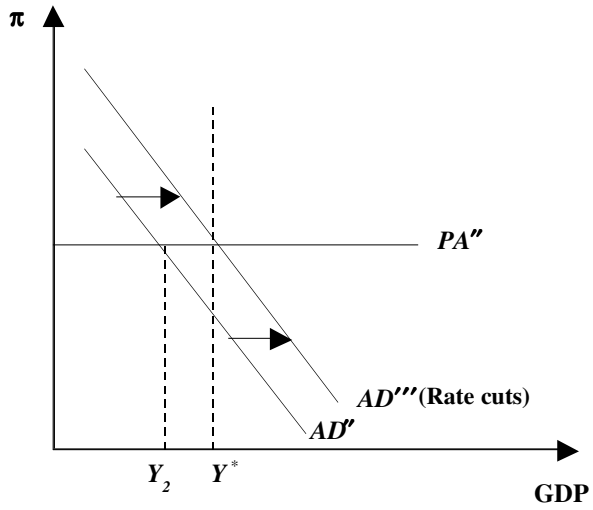

FIGURE 14. Analyzing the Rate Cuts of 2001 using the *AD-PA* model.

Fed may take into account the future outlook for unemployment, GDP, and a variety of other leading indicators in formulating policy decisions. Given the not-so-promising outlook for the U.S. economy, the Fed may have decided to make a pre-emptive strike against a potentially looming recession by cutting rates. Rate cuts that are not reacting to inflation decreases will shift the AD curve out and, the Fed hopes, move the U.S. economy back toward potential or at least away from the brink of recession (Figure 14).

Comparison to the IS-LM Model

What are the advantages of the AD-PA approach over the IS-LM approach? After all, one could do an IS-LM analysis that is very similar to Figure 12, capturing investor and consumer confidence, lower prices, lower interest rates, and so forth. The primary advantage of the AD-PA model comes when we think about the actions of the Federal Reserve in 2000 and 2001. The AD-PA model clearly shows the student that Greenspan is not making arbitrary decisions to lower and raise interest rates; in fact, his behavior can be described well by the very simple policy rule $i_t = \gamma_\pi(\pi_t) + \gamma_y(y_t - y_t^*)$. In 2000, when the economy was showing signs of overheating and inflation was on the rise, Greenspan reacted by raising interest rates, just as the rule predicted he should. In 2001, especially after the first quarter, when Greenspan seemed to be concerned about the slowdown in GDP growth, he responded by lowering interest rates.[22]

Even if one does not believe that the behavior of the Fed is systematic enough to be explained by a simple policy rule, at the very least, the systematic behavior predicted by such a policy rule should form a baseline from which to make more

subtle assessments of the Fed's actions. For example, some of the earliest rate cuts in the first quarter of 2001 may be understood as occasions where the Fed raised rates more than current economic conditions seemed to validate. The Fed's decision to move more than the policy rule indicated serves as an opportunity for the instructor to ask students to look at the Fed's statement in which they justified their actions by citing concern for the future health of the economy. Also, we may need to work harder to understand why the Fed preferred to make five 50-basis-point cuts followed by a 25-basis-point cut, instead of fewer but larger cuts. Or why the Fed chose to announce some rate cuts in between FOMC meetings instead of at the FOMC meetings.

CONCLUSION

The Federal Reserve plays an important role in influencing economic fluctuations; we should therefore prefer a model that provides a better foundation from which to understand the Fed's behavior. In this respect, the AD-PA model is superior to the IS-LM model. In addition, the AD-PA model is as good as, if not better than, the IS-LM model in depicting other changes taking place in the economy. Romer (2000) makes a very thorough argument that the increasing irrelevance of money targets, avoiding the nominal-real interest rate confusion, avoiding the modeling of money demand, and focusing on inflation instead of the price level are all compelling reasons for preferring the AD-PA model to the IS-LM model as the baseline model of teaching economic fluctuations to undergraduates. In this article, I use two case studies (the 1990s Japanese economy and the U.S. economy from 1997 to 2001) as illustrative examples to further Romer's argument that the AD-PA model is a better pedagogical tool for teaching economic fluctuations in intermediate macroeconomics than the much more widely used IS-LM model.

Although the two cases by themselves are not proof of the superiority of the AD-PA model, one can argue that because the AD curve is built on a relationship between GDP and real interest rates that is identical to an IS curve, the decision about which model is preferable is based exclusively on the money side of the model. In that case, it would be hard to argue that the LM curve is the right way to think about money in today's economy. In my opinion, the only case that the IS-LM model is better equipped to handle than the AD-PA model is a shock to money demand.

The AD-PA model is by no means without fault. The treatment of expectations in the Phillips curve is simplistic, as are the lack of an explicit alternative channel of monetary transmission and the focus on a single interest rate as both reflecting policy decisions and affecting consumer and investor behavior. Using the AD-PA model to study economic fluctuations, however, will enable students to grasp the basic ideas quickly and allow more time for instructors to focus on teaching about the term structure of interest rates, forward-looking consumption, search models of unemployment, and other topics that can close the gap between the material learned in intermediate macroeconomics and graduate-level macroeconomics.

APPENDIX: ALGEBRAIC DERIVATION OF THE IS-LM MODEL UNDER A LIQUIDITY TRAP

A simple mathematical description of the IS curve is

$$Y = \frac{\bar{Y}}{1-b(1-t)} - \frac{d}{1-b(1-t)}r,$$

where $\bar{Y} = \bar{C} + \bar{I} + \bar{G} + \bar{NX}$

is exogenous spending in the economy. A simple mathematical description of an LM curve is

$M/P = kY - hr$ or $r = 1/h(kY - M/P)$.

Note that we do not distinguish between nominal and real rates here.

The horizontal intercept (when $r = 0$) is at $Y = M/kP$. Increases in P shift this intercept in; decreases in P shift the intercept out.

Substituting for r from the LM curve, I get the following expression for the AD curve:

$$Y = \frac{Y}{1-b(1-t)} - \frac{d}{1-b(1-t)}\left\{\frac{1}{h}\left[kY - \left(\frac{M}{P}\right)\right]\right\}, \text{ which simplifies to}$$

$$Y = \frac{\bar{Y}}{1-b(1-t)+dk/h} + \frac{d/h}{1-b(1-t)+dk/h}\left(\frac{M}{P}\right).$$

In a liquidity trap, the elasticity of money demand with respect to the interest rate is infinite, that is, $h \to \infty$. When I take the limit in the above equations, I find that the LM curve is horizontal, at $r = 0$ and that the AD curve becomes

$$Y = \frac{\bar{Y}}{1-b(1-t)}.$$

In other words, the LM curve is horizontal, and the AD curve is vertical. Furthermore, changes in P affect neither the interest rate nor GDP, as discussed in the text.

NOTES

1. This model is presented comprehensively in Romer (2000); I only sketch the fundamentals here. For obvious reasons, I will not present a similar description of the IS-LM model.
2. Concepts such as the multiplier, which are traditionally applied to the IS curve, can easily be applied here, so that eventually movements in the AD curve are related to the size of the multiplier.
3. I am grateful to an anonymous referee for pointing out a potential chicken-and-egg problem in that I need to use the Fed's behavior to build a model that can then be used to understand Fed behavior. In practice, I work around this by asking my students for the simplest possible description of how the Fed reacts to inflation; the response is always, "They raise interest rates." I use this to build the fundamentals of the AD curve and then add more structure to the policy rule later.
4. This type of monetary policy rule is widely used in the recent literature on monetary policy following the work of Taylor (1993).
5. The policy rule can be easily modified to accommodate the behavior of a policymaker who has a target level of inflation that is greater than zero.

6. This requires that nominal rates be moved in the same direction as the change in inflation but by a greater magnitude; that is, the reaction coefficient on inflation $\gamma_\pi > 1$.
7. Henceforth, skip this step and assume that the Fed can influence (but not completely control) real interest rates directly.
8. In other words, the AD curve will shift for any of the reasons that cause the IS curve to shift.
9. Dropping the assumption that inflation responds to output with a lag would generate an upward sloping PA line, as shown in panel (b) of Figure 2. This option remains accessible to any instructor who is uncomfortable with the short-run stickiness assumption.
10. This is no different from a horizontal short-run AS curve and vertical long-run AS curve. Romer (2000) provides an exposition of how to modify the PA line to be analogous to an upward sloping short-run AS curve.
11. These are only a subset of the reasons for preferring the AD-PA model's exposition. The reader is once again referred to Romer (2000) for a fuller exposition.
12. See Taylor (2000b) for a discussion of this kinked AD curve.
13. Liquidity trap analyses using the IS-LM model are more common, so I will only sketch out the basics. An interested reader or undergraduate can find a wealth of material, with Krugman (1999) being a representative example.
14. The LM curve is steep when money demand is more inelastic with respect to the interest rate. Then an increase in the money supply requires a larger fall in interest rates to restore equilibrium, resulting in higher output.
15. An algebraic analysis is worked out in the Appendix.
16. Intuitively, if changes in the nominal money supply (which, with fixed *P*, affect the real money supply [*M*/*P*]) are ineffective then changes in prices, which also affect the real money supply, are ineffective as well. Krugman (1998) works out a much more complicated version of the IS-LM model mathematically to show that large changes in prices, as well as large changes in money supply, can indeed break the liquidity trap.
17. See the Appendix for a derivation of the vertical AD curve in a liquidity trap situation. The intuition is that according to the IS-LM model, when *Y* falls below *Y**, it is the *price level* that declines. Furthermore, prices fall at a constant rate, so that the combination of zero nominal rates and constant deflation implies a constant real interest rate, leaving *Y* unchanged as well. In contrast, in the AD-PA model, when *Y* falls below *Y**, it is the *inflation rate* that declines. The declining rate of inflation implies rising real interest rates and declining *Y*.
18. Note that these are informally gathered candidate explanations. The goal is for students to see if they can use their basic model of fluctuations to understand real-world developments, instead of empirically establishing whether one or more of these explanations does in fact explain the behavior of the U.S. economy.
19. Note that the increase in interest rates driven by the response to rising inflation would be a movement along the AD curve. The response to rising asset prices is what shifts the AD curve in Figure 13.
20. Note that I am analyzing the pre-Sept. 11, 2001 situation. I am searching for the elusive explanation for the U turn taken by the U.S. economy even before the distinct negative shock associated with Sept. 11, 2001.
21. For example, the April press release issued by the Fed states that "capital investment has continued to soften" and that "[t]his potential restraint, together with the possible effects of earlier reductions in equity wealth on consumption and the risk of slower growth abroad, threatens to keep the pace of economic activity unacceptably weak" (Board of Governors 2001).
22. In the IS-LM framework, I treat the response of the Fed as being exogenous. It is not arbitrary, in the sense that the Fed is assumed to act to stabilize the economy, but there is no explicit description of systematic Fed behavior built into the model.

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