BOSTON UNIVERSITY
Global Development Policy Center
Economics in Context Initiative

Chapter 9: Economic Fluctuations and Macroeconomic Theory

Appendix

Appendix to Chapter 9 of Essentials of Economics in Context, Second Edition

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APPENDIX:
A1. THE 2007-08 FINANCIAL CRISIS

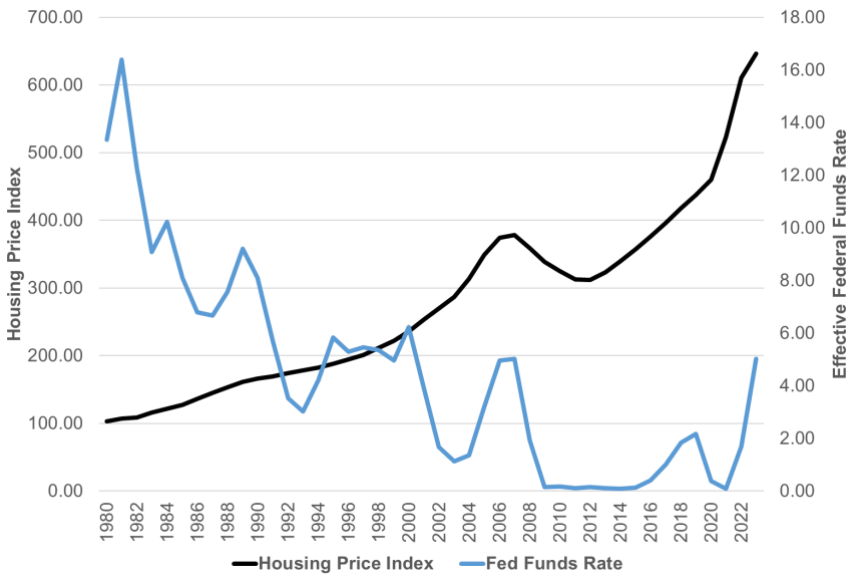
The 2007−2008 financial crisis brought the U.S. and world financial systems almost to the brink of collapse. In their wake, the "Great Recession" caused massive unemployment that lasted for years before returning to more normal levels. The lessons of this period therefore have lasting importance for financial systems and policy.

1. Entering the Crisis

In 2001, in response to the collapse of the dot-com bubble, the Fed lowered the federal funds rate from 6 percent to 1.75 percent with the goal of promoting growth. In the summer of 2003, the rate was lowered still further to 1 percent—its lowest in 50 years. The low federal funds rate led to reductions across the board, including rates for loans and home mortgages.

This low interest rate was a boon to consumers who, amid stagnant wages, increasingly turned to the credit market to meet their consumption needs. The housing market, in particular, saw a boost as the demand for real estate increased, with mortgage rates falling to a 50-year low of just over 5 percent in 2003. This increased demand fueled a rise in home prices, which in turn fed a speculative frenzy where millions rushed to buy, believing that home prices could only go in one direction—up! The buyers included not only would-be homeowners but also speculators who were buying simply with an interest in "flipping" the property (reselling at a higher price). Between the mid-1990s and the mid-2000s, the average annual value of mortgage loans borrowed by U.S. households rose from $200 billion to over $1 trillion.

Figure 9A.1 Housing Bubble and Credit Access, 1980-2023



Many of the mortgages granted during this period were classified as "**subprime**", as borrowers taking these loans typically had low income, high debt, and poor credit history. Historically, subprime borrowers were charged higher interest rates to compensate for the increased lending

risk. But during the housing bubble, they were allowed to borrow at low rates, often tied to risky conditions.

subprime mortgage: a mortgage given to someone with poor credit

Why were lenders willing to provide such high volumes of high-risk mortgages? First, financial institutions had a lot of funds to lend, and they made a tremendous amount of income from fees for originating and trading loans. Also, financial innovation in the form of **securitization,** which involved pooling various kinds of loans (mortgages, auto loans, credit card debts, and commercial bank loans), slicing and sorting them according to their presumed risk levels, and repackaging them into new financial instruments, motivated the lenders to create more loans. After making an initial loan, the lender could quickly sell it off to another financial intermediary (such as an investment bank). These financial intermediaries would then repackage the loans and sell them off to other investors (hedge funds, pension funds, or foreign investors). This ability to sell off the loans to other financial investors freed up capital for the lenders to make new loans, but this also meant that the lenders had little incentive to ensure the credibility of borrowers to make their payments down the road. The creation of such perverse incentives is what economists refer to as the "**moral hazard**" problem. In this case, the loan originators had no financial incentive to protect against the risk of default by the borrower.

securitization: the process of pooling various kinds of loans, slicing and sorting them according to their risk levels, and repackaging them into financial instruments

moral hazard: the creation of perverse incentives that encourage excessive risk-taking because of protections against losses from that risk

Why weren't the investors buying these financial assets worried about the creditworthiness of the borrowers? Unfortunately, most investors were not aware of the risks because securitization made these assets very complex. Investment in these securities was mainly driven by their attractive rates of return. In addition, the credit rating agencies **(**Standard and Poor's, Moody's, and Fitch Group) on whom investors relied on to evaluate the risks associated with these securities mostly rated them as being very safe. This was partly because these assets were too complex to understand. But there was also a moral hazard problem: the credit rating agencies were paid by the investment banks trying to sell the securities, so they had an incentive to understate the risks of default.

The investment banks, which were most likely aware of the high-risk nature of these financial securities, also continued to create and trade them. This high risk-taking behavior of the banks is partly explained by their being "too big to fail", meaning if these banks reached the verge of failure, the government would have to save them as their failure could hurt the entire economy. Knowing that the government would come to their rescue, large banks had little incentive to manage risks well. This is what happened in 2008: as large financial companies like Lehman Brothers and Merrill Lynch faced huge losses, other big companies that provided credit to these banks faced the risk of failure. As a result, federal regulators "bailed out" other large institutions that came close to failure, despite public resistance to helping the banks whose recklessness had led to the crisis.

2. Impacts of the Crisis

Amid strong economic conditions in the mid-2000s and concerns about possible inflation, the Fed started increasing interest rates gradually, from about 1 percent in 2004 to just over 5 percent in 2006. (See Figure 9A.1.) This change, despite being gradual, caused a sharp increase in mortgage payments for many homeowners. By 2006, many borrowers began falling behind on their monthly payments, housing prices started declining, and some economists warned about the possibility of a large-scale crisis. The Fed, chaired by Ben Bernanke, started lowering interest rates in 2007, but the crisis was inevitable given the huge amount of risky loans made during the boom years.

As home values declined, the value of financial assets—derived from the value of mortgages—fell, resulting in a widespread crisis. Large mortgage companies, such as Countrywide and Washington Mutual, and securities firms and investment banks such as Lehman Brothers and Bear Stearns either went bankrupt, were bought by larger banks, or bailed out by the government. With the failure of large financial firms, lenders became much less willing to give out new loans leading to a "credit crunch" in which families and businesses were unable to obtain loans or refinance mortgages. This led to further intensification of the crisis. Approximately 11 million homebuyers faced foreclosure from 2008 to mid-2012, accounting for about a quarter of the mortgages in the United States. Additionally, an immense amount of financial wealth disappeared as U.S. families lost $10.9 trillion in financial investments related to stocks and bonds (amounting to an average loss of nearly $100,000 per household) from mid-2007 to early 2009.

The impacts of the crisis quickly spread from the financial sector to the real sector. From 2007 to 2009, the U.S. economy lost nearly 9 million jobs. The official unemployment rate hit 10 percent in October 2009 and stayed above 7 percent through late 2013. Total unemployment and underemployment numbers, including marginally attached workers and those working part-time involuntarily, were much higher reaching over 17 percent in late 2009, staying above 13 percent until the end of 2013, and only declining gradually to about 8 percent by 2017.

Income and wealth inequality, already severe before the crisis, only intensified after it. From 2007 through 2010, the median household lost nearly 40 percent of their wealth, while the average household net worth of the poorest 25 percent fell to zero. The wealth of middle-income families had increased by 68 percent (from $95,879 to $161,050) between 1983 and 2007, but most of this gain had disappeared by 2013 as their wealth levels fell to $98,000. At the same time, upper-income families saw their wealth more than double from 1983 to 2007 (from $323,402 to $729,930), and although they also faced losses during the recession, by 2013 their wealth had risen to $650,074.

3. Policy Responses for Recovery

To address the economic decline after the crisis, the government instituted a massive fiscal stimulus, the American Recovery and Reinvestment Act (ARRA) (discussed in Chapter 10). Independent analysts estimate that ARRA created between 1.5 million and 7.9 million new jobs from 2009 to 2012.

The recovery efforts of the government also included a $700 billion Treasury bailout—known as the Troubled Asset Relief Program (TARP)—to make emergency loans to firms that were

in critical condition. Major recipients of this bailout included the insurance giant AIG, along with large financial corporations such as Citibank, JP Morgan Chase, Bank of America, and Goldman Sachs. Even non-financial firms, such as General Motors and Chrysler, received billions of dollars in TARP loans as they had invested heavily in financial assets. Though TARP loans were paid back to the government by 2014, there was widespread criticism of a policy that bailed out the banks that created the crisis, rather than helping the middle and low-income homeowners who lost so much wealth as a result.

In the area of monetary policy, the Fed lowered the effective federal funds rate from over 5 percent to 0–0.25 percent and reduced the discount rate from 5.75 percent to 0.5 percent between August 2007 and December 2008. The Fed, through its quantitative easing program, purchased billions of dollars' worth of shaky financial assets that had lost the majority of their value. This increased the value of assets on the Fed's balance sheet from about $950 billion in 2007 to more than $2.5 trillion in 2008. These Fed purchases of "toxic assets" in danger of default helped to inject liquidity into the financial system and reduce the likelihood of systemic crisis.

Despite these efforts, the expansionary monetary policies had limited impact on economic recovery, since the increase in the flow of money did not alleviate the pessimism felt by consumers and businesses, who remained unwilling to start borrowing and spending. In addition, banks were not willing to increase their lending, both because they did not trust the creditworthiness of the borrowers and because they had just suffered huge capital losses.

A major policy response to the crisis, the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank), was adopted to help avert future crises. The goals of the Dodd Frank reform include protecting consumers by ensuring they get clear and accurate information needed to shop for credit, preventing predatory lending, discouraging risky practices, controlling executive pay, protecting investors by requiring rating agencies to disclose the methods used to rate each security, discouraging the formation of large banks by adding restrictions on the activities of firms that are too large, and strengthening oversight and regulations over financial fraud and conflict of interests.

The financial sector was critical of the bill from the start, arguing that it would create significant costs to them and slow down job creation. Over time, the bill has been "watered down" to a great extent due to intense lobbying efforts from the financial sector. While the bill has been credited for making the financial sector safer and more resilient with higher capital and leverage requirements, it has also been criticized as being too complex and not sufficient to deal with some of the key problems in the financial sector.[*] For example, the bulk of derivatives (indirect forms of investment such as options to buy or sell stocks) are still traded directly by banks with little government supervision, and the rating agencies are still paid by the firms that they rate. Also, no regulators were fired and no big bankers subjected to criminal prosecution in the aftermath of the crisis, so there has been little incentive to change behavior in the financial sector. The basic structure, business model, and practices of large banks remain unaltered. In addition, the expansion of nonbank financial institutions has continued with little regulation, raising new dangers for financial stability. In 2008, the Trump administration passed a legislation to revise regulations pertaining to small and regional banks, to free midsize lenders from some of the strictest post-crisis oversight, and to weaken some accountability measures

[*] Montecino, Juan Antonia, and Gerald Epstein. 2015. "Banking From Financial Crisis to Dodd-Frank: Five Years on, How Much Has Changed?" Political Economy Research Institute, Working Paper, July 21.

for larger banks, further weakening the Dodd-Frank regulations. In 2018, legislation was. Policies to address many of these problems and promote financial stability are discussed in Chapter 14.

A2. THE KEYNESIAN MODEL AND AGGREGATE EXPENDITURE SCHEDULE

The Keynesian model is based on the idea that total spending or **aggregate expenditure**†, which we denote as *AE*, depends on the spending behavior of economic actors. Here, we start by presenting a simple model of the economy with only two sectors—households and firms. In this economy, households make consumption spending decisions, and together the household sector generates an aggregate level of consumption, *C*. Purchases of final goods by business firms are considered investment, denoted by *I*. Hence, our basic model of aggregate expenditure with two economic actors is represented by the equation:

$$Aggregate\ expenditure = Consumption + Investment$$

$$AE = C + I$$

aggregate expenditure (AE) (in a simple model without government or foreign trade): what households and firms *intend* to spend on consumption and investment

Recall from our discussion of the Keynesian model in the chapter that the Keynesian consumption function is expressed as:

$$C = \bar{C} + mpc * Y$$

where $\bar{C}$ is "autonomous" consumption, *mpc* is the marginal propensity to consume, and *Y* is aggregate income. If we assign number values to the parameters $\bar{C}$ and *mpc*, we can express the relation between income and consumption stated in the consumption function by a schedule, as in Table 9A.1. Various income levels are shown in Column 1. For now, we set autonomous consumption at 20 (as shown in Column 2). With an *mpc* set equal to 0.8, Column 3 shows how to calculate the second component of the consumption function. Adding together the autonomous and income-related components yields total consumption, shown in Column 4. We also show in Column 5 the implied level of saving. Recall from Chapter 9, that savings is the portion of the income that is not spent (i.e. S= Y-C). For example, the shaded row indicates that when income is 400, $C = 20 + 0.8\ (400) = 20 + 320 = 340$. Saving is calculated as $400 - 340 = 60$. Consumption and saving both rise steadily as income rises.

† Note that for our analysis of the aggregate expenditure schedule, in which we assume a fixed full employment level and stable prices, we will use the term "aggregate expenditure" to denote total consumer and business spending, and later adding government and net foreign spending. In the text, we consider possible impacts of price changes and inflation in our model, we use the broader term "aggregate demand".

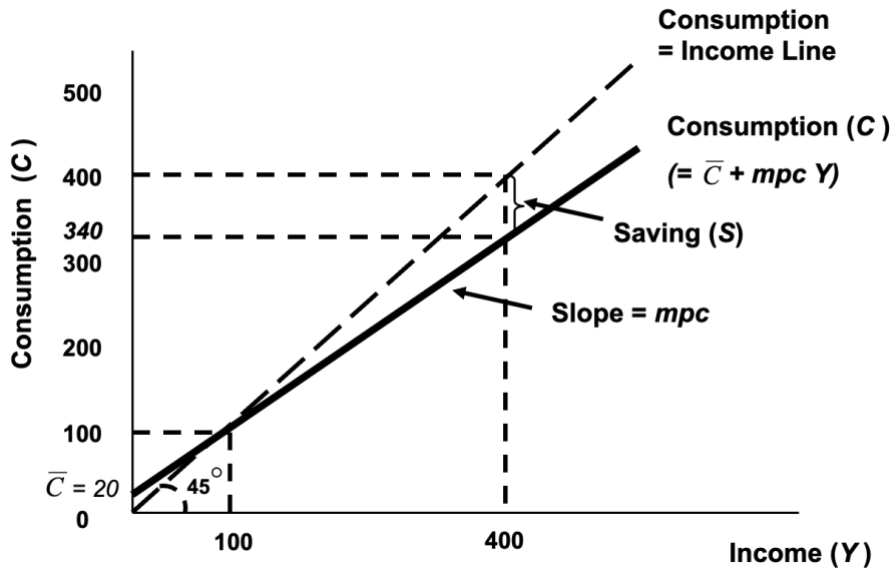
Table 9A.1 The Consumption Schedule (and Saving)

(1) Income (Y)	(2) Autonomous Consumption $\bar{C}$	(3) The part of consumption that depends on income, = 0.8 ×Y	(4) Consumption C =20 + 0.8 Y = column(2) + column(3)	(5) Saving S = Y - C = column (1) − column (4)
0	20	0	20	-20
100	20	80	100	0
200	20	160	180	20
300	20	240	260	40
400	20	320	340	60
500	20	400	420	80
600	20	480	500	100
700	20	560	580	120
800	20	640	660	140

We can also see the relationships among consumption, income, and saving in this model in the graph in Figure 9A.2, where the horizontal axis measures income (*Y*) while the vertical axis measures consumption (*C*). The consumption function crosses the vertical axis at the level of autonomous consumption ($\bar{C}$) of 20. The line has a slope equal to the *mpc* of 0.8.

Figure 9A.2 also includes a 45° line, which tells us what consumption would be if people consumed all their income instead of saving part of it. So the vertical distance between the 45° "consumption = income" line and the consumption function tells us how much people save. We can see, for example, that at an income of 100, households, in this model, consume all their income. At levels of income higher than 100, households consume less than their total income, and so have positive levels of savings. At levels of income lower than 100, consumption is higher than income, and households have negative savings, or "dissave."

Figure 9A.2 The Keynesian Consumption Function



Let us now turn to the business sector. As discussed in Chapter 9, spending by businesses is represented by the investment function:

$$I = \bar{I}$$

where the bar over the I indicates that investment is fixed. This is similar in concept to the $\bar{C}$ in the consumption function. Just as $\bar{C}$ can go up or down depending on consumer confidence, $\bar{I}$ can go up or down depending on investor confidence.

Earlier we defined *AE* as the sum of consumption and investment. We can now add investment to the consumption schedule and curve to get a schedule and graph for aggregate expenditure. In Table 9A.2, Columns 1 and 2 just repeat the consumption function from Table 9A.1. In Column 3 we have set investment at 60, for any level of income, in line with the notion that it is all "autonomous." Column 4 calculates the level of aggregate expenditure in the economy. We can see, for example, that at Y = 400, households and businesses together plan to spend 400 on consumption and investment, while at Y = 500, they plan to spend 480.

Table 9A.2. Deriving Aggregate Expenditure from the Consumption Function and Investment

(1) Income (Y)	(2) Consumption (C)	(3) Investment (I)	(4) Aggregate Expenditure AE = C + I = column 2 + column 3
0	20	60	80
300	260	60	320
400	340	60	400
500	420	60	480
600	500	60	560
700	580	60	640
800	660	60	720

Figure 9A.3 Aggregate Expenditure

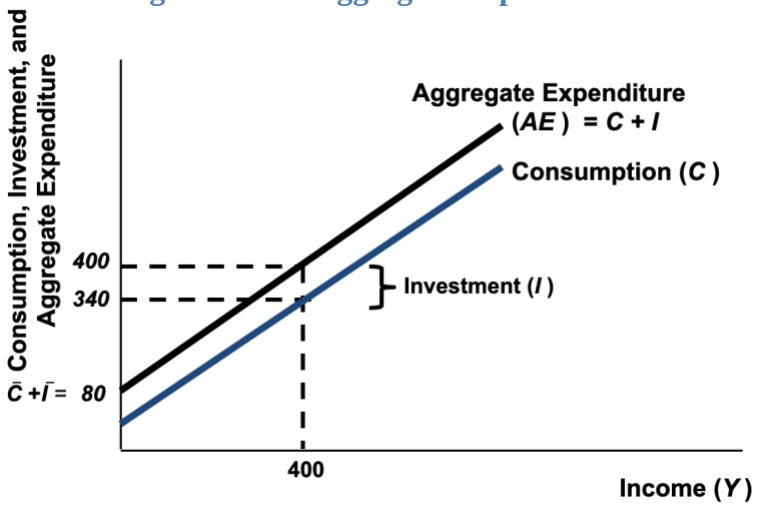


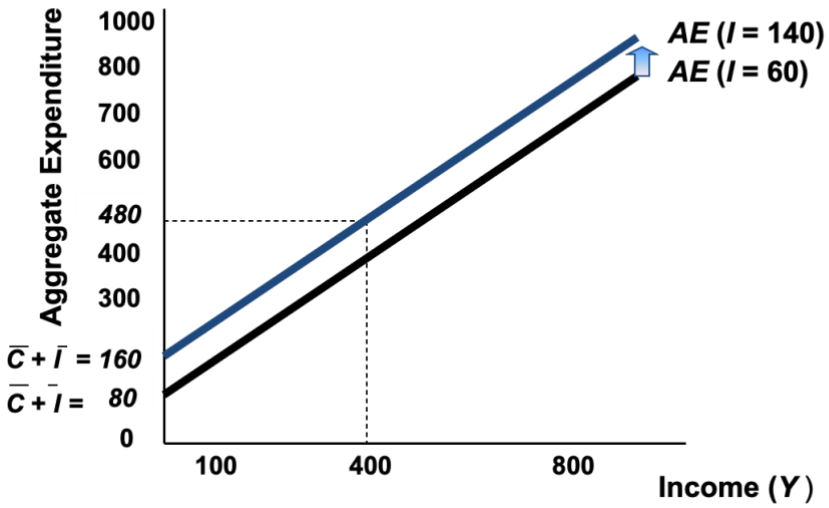
Figure 9A.3 shows the relationship between income and aggregate expenditure. The *AE* line lies exactly 60 units vertically above the *C* line, at every level of income. Its intercept is the sum of autonomous consumption and investment. Its slope is the same as that of the consumption function. We can see that when, for example, $Y = 400$, then $C = 340$ and $AE = 400$.

The *AE* curve shifts up or down as autonomous consumption or autonomous investment changes. Suppose that investment is 140, instead of 60. Table 9A.3 calculates *AE* for selected levels of income like those that we used before, but at this higher level of *I*. Because neither $\bar{C}$ nor the *mpc* has changed, Column 2 is the same as in earlier tables.

Table 9A.3 Aggregate Expenditure with Higher Intended Investment

(1) Income (Y)	(2) Consumption (C)	(3) Investment (I)	(4) Aggregate Expenditure (AE)
0	20	140	160
300	260	140	400
400	340	140	480
500	420	140	560
600	500	140	640
700	580	140	720
800	660	140	800

Figure 9A.4 Aggregate Expenditure with Higher Intended Investment



This new aggregate expenditure schedule is graphed in Figure 9A.4. The intercept is now 160, which is equal to $\bar{C}$ of 20 plus $\bar{I}$ of 140, while the slope is still equal to the *mpc*. Notice that now, at an income level of 400, aggregate expenditure is 480 instead of 400. With investment increased by 80, aggregate expenditure at any income level increases by 80 as well.

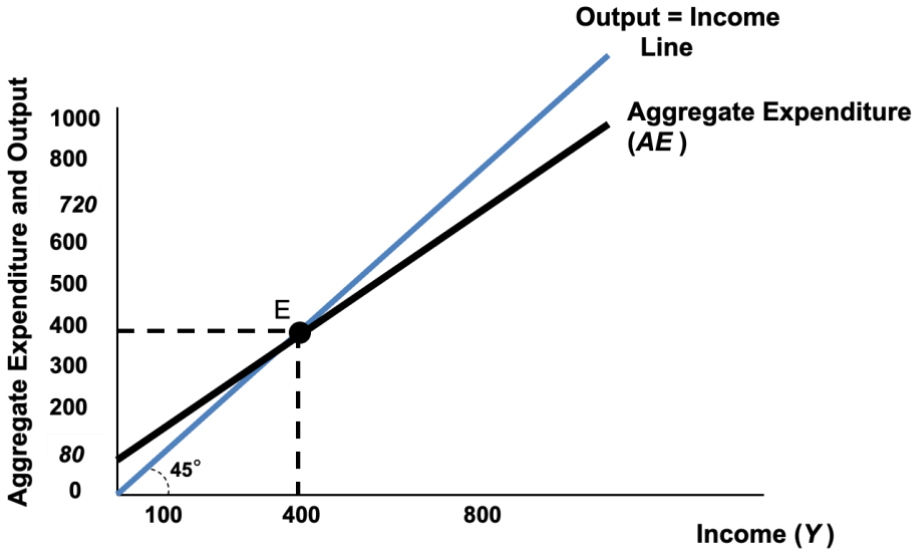
Figure 9A.4 could also be used to illustrate an increase in $\bar{C}$ from 20 to 100 (an increase of 80) while investment remains at 60. Any combination of $\bar{C}$ and $\bar{I}$, that sums to 160 would yield this graph. In economic terms, any increase in autonomous consumer and investor desired spending increases aggregate expenditure.

As discussed in Chapter 9, the Keynesian model is based on the assumption that the macroeconomy is in an *equilibrium* when output, spending, and income are in a balance. In other words, at equilibrium the total spending and total income must be equal to each other. Mathematically, the equilibrium condition is defined by:

$$Y = AE$$

This equilibrium condition can be represented in a graph by adding a 45° line to the graph for aggregate expenditure, with income on the x-axis and aggregate expenditure on the y-axis. This is represented in Figure 9A.5—often called the "Keynesian cross" diagram—with the *AE* curve representing the sum of consumption and investment at any income level. Along the dashed line is a 45° line, the values on the two axes are equal. So, the 45° line represent situations where output equals income. In this figure, the equilibrium occurs where the *AE* line crosses the 45° line, i.e. at an income level of 400.

Figure 9A.5 The Keynesian Cross Diagram



A3. AN ALGEBRAIC APPROACH TO THE MULTIPLIER

The formula for the multiplier in the simplest Keynesian model can also be derived using tools of basic algebra, starting with rearranging the equation for *AE:*

$$AE = C + \bar{I}$$

We can substitute in the Keynesian equation for consumption, $C = \bar{C} + mpc\ Y$, and use the fact that in this model all investment is autonomous, to get:

$$AE = (\bar{C} + mpc\ Y) + \bar{I} = (\bar{C} + \bar{I}) + mpc\ Y$$

The last rearrangement shows that the *AE* curve has an intercept equal to the sum of the autonomous terms and a slope equal to the *mpc*. Changes in either of the variables in parentheses, by changing the intercept, shift the curve upward or downward in a parallel manner.

By substituting this into the equation for the equilibrium condition, $Y = AE$, we can derive an expression for equilibrium income in terms of all the other variables in the model:

$$Y = (\bar{C} + \bar{I}) + mpc\ Y$$

$$Y - mpc\ Y = \bar{C} + \bar{I}$$

$$(1 - mpc)\ Y = \bar{C} + \bar{I}$$

$$Y = \frac{1}{(1-mpc)}(\bar{C} + \bar{I})$$

If autonomous consumption or intended investment increases, these each increase equilibrium income by $mult = 1/(1 - mpc)$ times the change in autonomous consumption or investment.

To see this explicitly, consider the changes that would come about in Y if there is a change in I from I_0 to a new level, $\bar{I}_1$, while autonomous consumption (and the *mpc*) stays the same. We can solve for the change in Y by subtracting the old equation from the new one:

$$Y_1 = \frac{1}{1-mpc}(\bar{C} + \bar{I}_1)$$

$$Y_0 = \frac{1}{1-mpc}(\bar{C} + \bar{I}_0)$$

$$Y_1 - Y_0 = \frac{1}{1-mpc}(\bar{C} - \bar{C} + \bar{I}_1 - \bar{I}_0)$$

But $\bar{C}$ (and the *mpc*) is unchanged, so the first subtraction in parentheses comes out to be 0. We are left with:

$$Y_1 - Y_0 = \frac{1}{1-mpc}(\bar{I}_1 - \bar{I}_0)$$

or

$$\Delta Y = mult\ \Delta\ \bar{I}$$

where $mult = 1/(1- mpc)$. Similar analysis of ΔC (holding intended investment constant) would show that the multiplier for that change is also $1/(1 - mpc)$.