Macroeconomics

for Emerging East Asia

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9. Models of Equilibrium and Disequilibrium

List of Boxes

List of Figures

9. Models of Equilibrium and Disequilibrium

Macroeconomic models provide a framework for relating key aggregate magnitudes: output; income; the price level; unemployment; the wage rate; consumption; investment; government spending and taxation; the money supply; the interest rate; international trade and capital flows; and the exchange rate. Classical and Keynesian models diverge on how quickly prices and wages adjust to eliminate the twin excess supplies characteristic of a downturn – a glut in product markets and unemployed workers in labor markets. With that, the two schools reach different conclusions on policy.

Schools of thought within macroeconomics diverge in how they regard the market clearing process. The Classical School and its heirs view markets as well-functioning and resilient in response to shocks. The constant hammering of shocks gives rise to fluctuations, to be sure, but these are seen as healthy coping mechanisms in support of vibrant economic growth. Under the Classical paradiagm, macroeconomic policy intervention only adds to uncertainty and impedes the adjustment process. By contrast, the Keynesian School and its offshoots view economic slumps as serious, inexorable, and not self-correcting in any timely fashion. Keynesians favor an active government role in hastening recovery from downturns and in maintaining stability more generally.

The comparative static analysis of this chapter rests on the theoretical construct of equilibrium. In the standard microeconomic application, a market in equilibrium at some price and quantity is subjected to an exogenous shock – a curve shifts and a new equilibrium price and quantity emerge. Comparative statics is a useful analytical tool when the passage of time can be suppressed and the process of transition is not of interest for the purpose at hand.

In macroeconomics, however, the main concern is with instability and disequilibrium. Output fluctuates over time; the labor market fails to clear; and inflation is prone to rearing up. We leave the dynamic analysis of business cycles to the next chapter. In this chapter we focus on static models of aggregate economic activity devised to illuminate deviations from trend, either through disequilibrium being sustained in the Keynesian mode or through adjustment to changes in equilibrium conditions yielding an erratic growth path under the Classical framework.

The first section reviews the basic tenets of the Classical School. The second presents the Income-Expenditure Model inspired by Keynes. This is a disequilibrium model in the sense that excess capacity persists as prices and wages fail to adjust to clear markets within the time frame of the analysis. The Aggregate Demand / Aggregate Supply Model of the third section joins a short-run period in which wages are sticky and a long-run period in which wages and prices fully adjust. This model tracks the interplay of the price level and aggregate output as the response to shock plays out in the short and long runs. The fourth section introduces a more elaborate interpretation of Keynesian disequilibrium in the IS-LM model (the notation referring to investment, saving, liquidity, and money) and outlines its extension to an open-economy context

with the Mundell-Fleming Model. Finally, the fifth section summarizes the evolution in Classical versus Keynesian based schools of thought as manifested in contemporary Dynamic Stochastic General Equilibrium Models.

Classical School

The first challenge for economics as a discipline is to explain how a market economy manages to achieve as much success as it does. Most people most of the time are put to work productively. Investment funds find their way into financing projects of a range of durations and risk profiles. Entrepreneurs develop new products and technologies and devise new ways of doing business. Economies grow and advance over time. The Classical School offered insight into understanding this success. The story is one of prices equilibrating demands and supplies to allocate resources to the uses in which they are most highly valued.

The principle of equilibration that applies to individual markets can be extended to an economy as a whole. Adjustment of wages ensures full employment. Adjustment of interest rates matches saving with investment. An unbroken circle links production to income to spending on what has been produced. Say's Law, named for early 19th century French economist Jean-Baptiste Say, captures this succinctly: Supply creates its own demand.

The full employment equilibrium of the Classical paradigm is formulated in real terms. Money does not figure in. Only relative prices matter. Any good could be chosen as numeraire with the value of everything else expressed in terms of that referent. Introducing money provides a convenient unit of account, but its impact on resource utilization is held to be neutral. Doubling the supply of money simply reduces its value by half in terms of everything else as all prices double. No role is seen for credit expansion to boost real economic activity. When an economy operates inherently at full employment, credit infusions simply lead to higher prices.

Classical economic theory does well in explaining the impressive achievements of a market economy in yielding efficient utilization of resources and weathering shocks. The Classical paradigm, however, was hard pressed to explain the Great Depression of the 1930s. This terrible cataclysm sparked a revolution in economic thought.

Income–Expenditure Model

The Great Depression was a worldwide economic disaster of incomparable proportions. Although a number of other countries fell into recession sooner, the U.S. suffered the longest and deepest downturn. Unemployment reached 25 percent of the labor force. More than a third of all banks failed. Output declined by 30 percent, and by the end of the 1930s had still not recovered to the level of 1929. Globally, the contraction was compounded by the piling on of tariff barriers such that international trade plummeted by two-thirds.

John Maynard Keynes stepped up to meet the intellectual challenge of explaining, counter to Classical doctrine, how an economy can become mired in recession. His *General Theory of Employment, Interest, and Money* was published in 1936. The Income-Expenditure Model is the simplest formalization of Keynes's argument. We first develop the key functional relationships of the model. We then apply the model to explaining persistent unemployment. In

Keynes's view, the way to catalyze recovery is through government fiscal action. We proceed to examine the mechanics of such demand stimulus policies and the impact of the Keynsian expenditures multiplier.

Consumption Function and Planned Expenditures

The Income-Expenditure Model turns on the relationship between consumption and income. Consumption by households is assumed to increase with income, but by less than the full measure of income. That part of income not spent on consumption is saved. Specifying the consumption function in linear form and expressing income as net of taxes, which for simplicity are assumed not to depend on income, we have:

$$C = C_0 + \beta\left(Y - \overline{T}\right),$$

where C = consumption by households;

C_0 = autonomous consumption (consumption when income is zero);

Y = income;

$\overline{T}$ = taxes (the bar indicates exogeneity);

β = marginal propensity to consume (MPC).

The marginal propensity to consume, β, is the slope of the consumption function, or the ratio of a change in consumption to a change in income, $\Delta C/\Delta Y$. Logically, β must take on a value between zero and one.

The Keynesian consumption function frames economic behavior in a fundamentally different way from Say's Law. Say's Law is premised on all income being spent. That part of income not directed toward consumption is expected to be absorbed by investment via the market for loanable funds. In the Keynesian scheme of things, by contrast, saving depends not on the interest rate but on income as the counterpart to consumption. Planned investment is treated as independent of current income, motivated rather by expectations about the future. Unplanned investment in the form of changes in inventories is, however, regarded as critically dependent on income as will be explained.

The specification of planned expenditures follows the expenditures approach to measuring GDP detailed in Chapter 4. All elements other than consumption are taken as exogenous as noted with an overbar. Inserting the consumption function specified above into the expenditures equation for GDP yields:

$$\text{Planned Expenditures} = C_0 + \beta\left(Y - \overline{T}\right) + \overline{I} + \overline{G} + \overline{X} - \overline{M},$$

where $\overline{I}$ = planned investment;

$\overline{G}$ = government spending;

$\overline{X}$ = exports;

$\overline{M}$ = imports.

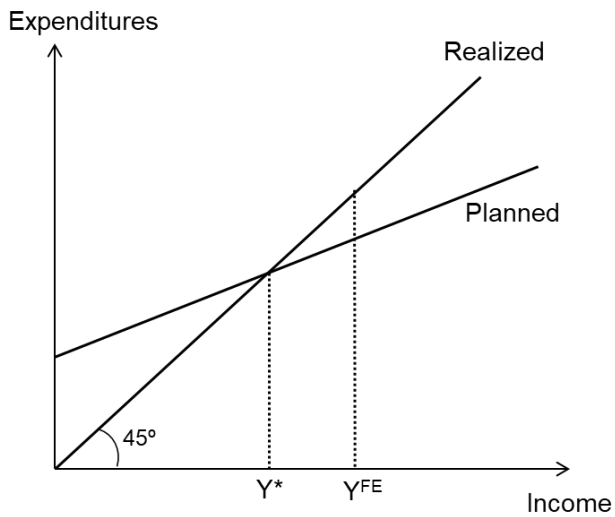
This expression for planned expenditures represents the aggregate demand side of the Income-Expenditure Model.

Persistence of Unemployment

The aggregate supply side of the model is given by the value of output produce which is identically equal to the income earned in the production process. The question to be examined by the model is: What happens when the income earned in production does not generate sufficient demand to purchase the output supplied?

Figure 9.1 captures the story as depicted by Samuelson (1948). The model is sometimes referred to as the "Keynesian Cross". Planned expenditures are an increasing function of income with slope given by the MPC at less than one. The 45 degree line, with slope of one, represents all income, absorbed as it must be in realized expenditures which are defined to include unplanned inventory accumulation or decumulation. Thus realized expenditures are equal to output which is in turn equal to income. The level of output that provides full employment is given by an income of Y^{FE}. At Y^{FE} as depicted, planned expenditures fall short of output produced. The result is the unplanned accumulation of inventory. This inventory build-up prompts producers to lay off workers and cut back production. Only when income drops to Y^* does the economy generate planned expenditures sufficient to clear the market of output produced with any inventory changes matching producer intentions. At income of less than Y^*, inventories are drawn down motivating producers to expand output and income payments.

Figure 9.1: Income-Expenditure Model



At Y*, planned expenditures are just sufficient to absorb all output produced such that inventory changes are neither more nor less than planned. Y* may fall short of full employment output, Y^{FE}.

Alignment between saving and investment in this model (where saving, S, subsumes any cross-border inflows or outflows such that $S = I + X - M$ as explained in Chapter 5) is achieved not through interest rate equilibration as in the Classical model but through unplanned inventory changes. Saving and planned investment may differ *ex ante*. But *ex post*, any saving in excess of planned investment will find expression in the unplanned pile up of inventories.

An equilibrium of sorts is achieved at Y^* in that there is no tendency for change within the structure of the model. Yet this outcome is characterized by persistent unemployment. The labor market does not clear. In a broader sense, then, markets are in a state of disequilibrium. Classical theory holds that the wage rate should fall to eliminate the gap between those supplying labor and those demanding it. In the Keynesian world, however, wages are sticky. Workers resist

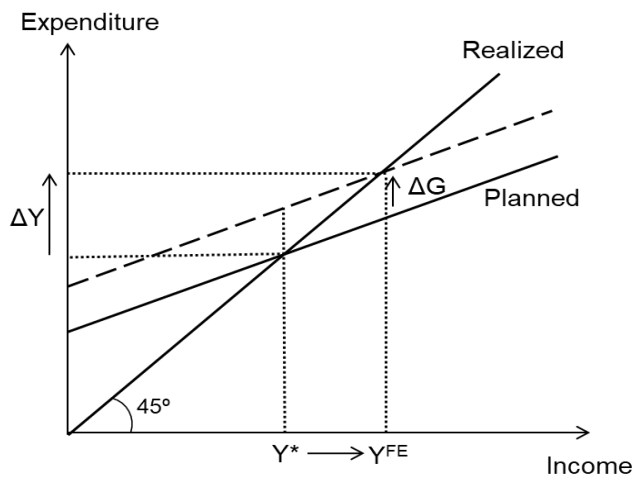
cuts in pay and employers are loath to impose them. The alternative of cutting jobs in the face of a slowdown in sales is more palatable. Moreover, Keynesians argue that any cut in wages would only exacerbate the deficiency of aggregate demand on product markets as with lower wages consumers have less income to spend. For Keynesians the solution to depressed economic conditions is to be found in government stimulus policies.

Demand Stimulus Policies

The Keynesian story of economic underperformance rests on insufficient aggregate demand. More spending would induce more production and higher employment. Government is able to provide the boost in spending an economy needs, either by increasing its outlays directly or by reducing taxes so that households can take on the spending.

The mechanics of a fiscal stimulus are illustrated in Figure 9.2. An increase in government spending by ΔG shifts the planned expenditures line upward. At the original Y^*, planned expenditures now exceed realized expenditures by ΔG, with demand being met through unplanned disinvestment in inventories. Businesses respond to this unplanned drop in inventory by increasing production, and income rises. With adequate government stimulus, the economy can be pushed to full employment.

Figure 9.2: Demand Stimulus Policies in the I-E Model



Increased government spending can stimulate demand to move the economy to full employment.

A tax cut can similarly stimulate spending by leaving more discretionary income with households to support consumption. Other components of spending ($\bar{I}$ and $\bar{X} - \bar{M}$) are treated as exogenous in this model. Increases in planned investment and exports, were they to materialize, would stimulate economic activity, as would a reduction in imports that creates more opportunity for domestic substitutes.

Note in Figure 9.2 that the given increase in government spending gives rise to an increase in income, ΔY, that is substantially larger in magnitude than the initial spending increase. There is a multiplier effect, to be explained.

The Multiplier

Any initial impetus to planned expenditures is amplified in its effect on income through the expenditures multiplier. In the first instance, the increment to spending goes directly to stimulating new output and income. This new income in turn provides the basis for further consumption spending which creates yet further income and again further spending, and so on, ad infinitum. With each round, however, only a portion of income is consumed while the

remainder is saved. Thus with each round the increment to spending gets smaller such that the total impact approaches a definable limit. The math is laid out in Box 8.1.

A word of caution on the Keynesian remedy to a slump is in order. While increasing government spending and cutting taxes to stimulate an economy may find ready political appeal, the burden of the public debt can weigh against over reliance on Keynesian fiscal policies. Nevertheless, it is possible to raise spending and taxes by equal amounts and still deliver a stimulus within the framework of the Income-Expenditure Model. This is because some of the tax revenue diverted from private parties would have been saved and thus would not have contributed to aggregate demand whereas the government can act to spend all of it.

Box 9.1: Calculating the expenditures multiplier

Suppose a government undertakes a stimulus project involving an investment in public infrastructure launched with an outlay represented by ΔG. That ΔG in spending goes toward contracting work by engineering and construction firms, purchasing materials, and employing civil servants to engage in management and oversight. The spending feeds into incomes in all forms: wages, interest, rents, and profits. In turn, the recipients of these income streams will spend part on consumption and save part. The part spent on consumption then fuels a new round of income increases which generates more consumption and yet more income, and so on.

To trace the ultimate impact on income of the initial spending increase, let us formalize the series of spending increments round by round. At each round, a share of income from the last round equal to the marginal propensity to consume (MPC) becomes new spending.

Round 1	ΔG
Round 2	MPC • ΔG
Round 3	MPC^2 • ΔG
Round 4	MPC^3 • ΔG
⋮	⋮

Thus the increase in income that follows from an increase in government spending is given as:

$$\Delta Y = (1 + \text{MPC} + \text{MPC}^2 + \text{MPC}^3 + \ldots) \cdot \Delta G.$$

Because MPC takes on a value between zero and one, each time the ratio is raised to a higher power the resulting increment is diminished in magnitude. The elements of the series thus approach zero. Algebraically, the sum of the elements of the infinite series is equivalent to 1/(1-MPC). The magnitude in the denominator, 1-MPC, is the marginal propensity to save.

The higher the MPC, the greater the impact of a fiscal stimulus. For an MPC of 0.8, for example, the multiplier is 5. For an MPC of 0.5, the multiplier is only 2.

Aggregate Demand / Aggregate Supply Model

The Income-Expenditure Model discussed in the preceding section treats income and consumption as endogenous variables and explains how an economy can fall short of operating at its potential with no tendency for any timely recovery. All pricing variables, including the wage rate, the interest rate, and the exchange rate, are implicitly held fixed. In the long run, of

course, prices are flexible and will function to resolve demand and supply mismatches. The model of aggregate demand and aggregate supply is an effort to bridge a short-run period when market response to shock is limited and the long-run time frame when an equilibrium is achieved.

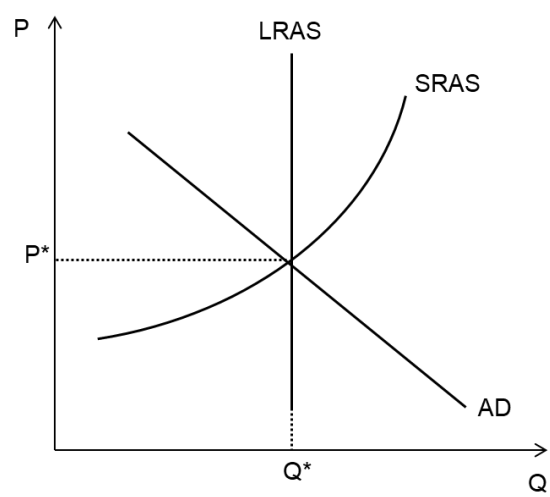
Similar to the model of demand and supply in a particular market, the Aggregate Demand /Aggregate Supply Model focuses on the interaction between prices and quantities. We develop first the demand side, then the supply side. Once the model is formulated, we apply it to analyzing both a recessionary shock and the implementation of government stimulus policies.

Aggregate Demand

The aggregate demand function relates real demand for all final goods and services in an economy to the general price level. As with demand in a particular market, the relationship is inverse such that a rising price level is associated with a declining demand for real output. The reasons for a downward sloping demand curve on the aggregate level are different from those for a single market, however. First, the real balance effect (also known as the Pigou effect) holds that as prices rise, the purchasing power of given money holdings decreases to cause a decline in demand. Second, the interest rate effect rests on the Keynesian notion of a trade-off between holding liquid money balances to support transactions and tying up wealth in bonds. As prices rise, the need to keep more cash on hand diverts funds out of bonds causing the interest rate to rise which then restrains investment spending. Finally, the exchange rate effect notes that higher domestic prices act to increase the real exchange value of the local currency causing demand for imports to rise and for exports to fall which further undermines demand for home produced goods and services.

Changes in factors other than price that bear on the components of spending (consumption, investment, government, exports, and imports) cause the aggregate demand curve to shift. Important among these factors are expectations about the future, availability of credit, political forces, and global economic conditions.

Figure 9.3:
Aggregate Demand / Aggregate Supply Model



Aggregate demand (AD) is a negative function of the price level. Long run aggregate supply (LRAS) is determined by factors other than the price level. Short run aggregate supply (SRAS) is related positively to the price level.

Aggregate Supply

On the supply side, the short run response to changes in the price level differs from the long run response, as indicated in Figure 9.3. The economy depicted is in a state of both long-run and short-run equilibrium at Q^* and P^*.

In the long run, the supply curve is vertical. This is because in the long run production capacity is determined solely by real factor inputs and technology, not by the price level. With capacity given by Q^*, and

the money supply set exogenously, prices, given time, will arrive at the level, P^*, that ensures full employment of resources.

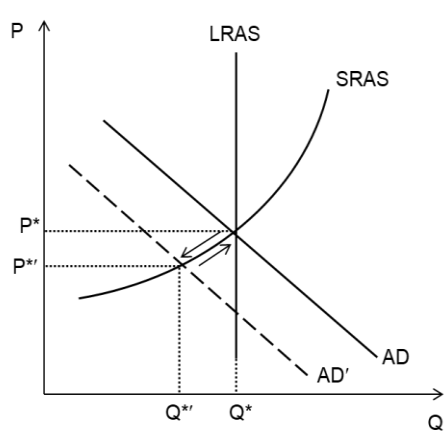
In the short run, shocks can move the economy away from normal capacity operation. Product markets are on the front lines in absorbing shocks. The transmission of the impact to labor markets takes time as terms of compensation are slow to be revisited and revised. Thus in the short run following a shock, real wages will diverge from their long-run equilibrium level. Following a shock that raises output prices, workers will only gradually realize that the purchasing power of their wages has been eroded. Seeking and securing wage increases is a protracted process. In the short run then, price increases result in lower real wages to workers and higher profits to producers. Producers respond by increasing output, which means drawing more people into paid labor and/or boosting worker hours. The economy moves upward along the short-run supply curve. With further passage of time, however, competition in the labor market as producers seek to expand hiring will drive up wages. Profits will then fall back to normal, and the economy will return to its long-run supply curve.

We proceed to apply the model, tracing the response in output and prices to changes in external forces.

Recession

The biggest source of macroeconomic volatility lies with investment demand. Investment is motivated by expectations of future profit, with time horizons that can run to decades. Willingness to take on risk is buffeted by sentiment about future prospects which can swing wildly between optimism and pessimism on a mass scale. Bad times tend to breed ever more doubt, good times ever more euphoria. When an economy overshoots on the upside, the downturn that follows can be sharp.

Figure 9.4: Recession in the AD/AS Model



A drop in aggregate demand leads to recession. The economy moves along the short-run aggregate supply curve to temporarily lower equilibrium price and output levels. With recovery, demand rebounds to restore output to its long run potential.

Figure 9.4 depicts the repercussions of a collapse in confidence. A drop in investment spending is reflected in a shift of the aggregate demand curve to the left. In the short run, the price level falls to $P^{*\prime}$. Facing weak prices, producers scale back production to $Q^{*\prime}$, laying off workers and cutting hours. Even though real wages are actually rising as prices fall relative to nominal wages, cutting nominal wages can be fraught with impediments. Often long-term employment contracts are in place, and even when they are not, nominal wage reductions are bad for worker morale.

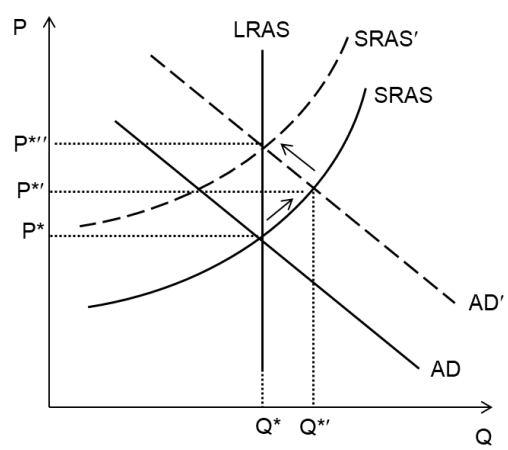
As time passes, durable goods wear out and need replacing and entrepreneurs at some point begin to recover their sense of opportunity. As sentiment turns more positive, spending regains steam. This is reflected in a shift in aggregate demand back to its former position to re-establish full-employment equilibrium at Q^* and P^*. The recession runs its natural course, and the economy recovers.

Demand Stimulus Policies

Governments seek to maintain economic stability through the application of monetary and fiscal policies. A monetary stimulus works through the injection of reserves into the banking system that drive new lending. The ramifications are shown in Figure 9.5. Let us take as a starting point an economy at long run equilibrium given by P^* and Q^*. The increase in spending stimulated by the expansion in credit shifts the aggregate demand curve to the right. The price level rises to $P^{*\prime}$ pushing the economy along its short run aggregate supply curve. Rising prices relative to given wages drive profit growth motivating producers to expand production. Output increases to $Q^{*\prime}$. With time, however, workers react to rising prices with demands for higher nominal wages to preserve the real purchasing power of their pay. The increase in production costs is captured by a shift in the short-run supply curve to the left. As real wages regain their equilibrium level, the economy returns to its long-run aggregate supply curve with output at Q^* but with the price level now at $P^{*\prime\prime}$. The monetary stimulus thus achieves only a temporary increase in output while the effect on prices is lasting.

A fiscal stimulus, involving increased government spending or reduced taxes, is represented with the same initial rightward shift in aggregate demand as in Figure 9.5. As the government competes with the private sector for goods and services, prices are bid up and profitable opportunities abound. The economy goes into overdrive. Once the spending spree runs its course, however, aggregate demand drops back and the economy reverts to its original equilibrium output and price level.

Figure 9.5: Monetary Stimulus in the AD/AS Model



A monetary stimulus can increase output in the short run. But in the long run prices rise with no lasting effect on output.

Stimulus action undertaken, as just outlined, when an economy is functioning at full capacity has only a fleeting effect on output. In the case of a monetary stimulus, the increase in prices is nevertheless enduring. In the case of a fiscal stimulus, any borrowing associated with spending increases or tax reductions results in a higher debt burden. This long-run consequence must be taken into account in assessing the merits of short-term stimulus gains. However, if the starting point is one of less than capacity operation, as in Figure 9.4 at $P^{*\prime}$ and $Q^{*\prime}$, and the recovery process, however foreordained, is protracted, stimulus policies may hold appeal for their catalytic power. Giving a stalled economy a jumpstart and shortening the time needed to regain full employment, if this can be achieved at tolerable cost to the fiscal budget and minimal impact on prices, represents the ultimate in successful macroeconomic policy.

IS-LM Model

In a Keynesian world, markets do not adjust quickly to reach equilibrium. Indeed, during the time frame addressed, a disequilibrium stasis can take hold. Unemployment persists, and

production capacity sits idle. The crux of the problem is that aggregate demand at the full employment level of income is insufficient to induce that level of output and income. The Income-Expenditure Model suppresses prices and wages to cast demand purely as a function of income. By contrast, the Aggregate Demand / Aggregate Supply Model allows for quick adjustment of output prices in response to shocks but assumes stickiness in wages to describe a process of equilibration that plays out over time. The IS/LM model formulated by Hicks (1937) resembles the Income/Expenditure Model in that neither prices nor wages adjust quickly to clear markets leaving output short of potential and workers out of jobs.

The new element in the IS-LM model is an endogenous interest rate which serves as the fulcrum of macroeconomic adjustment to shock. The interest rate affects the economy through two channels. One is real investment spending. The other is the allocation of financial assets between liquid money balances and bonds. We consider each of these channels in turn, then bring them together to explain their joint determination of aggregate output. The model as originally conceived pertains to a closed economy. The Mundell-Fleming Model, which we outline briefly, extends the framework to an open economy.

Our treatment of the IS-LM and Mundell-Fleming Models is cursory. A thorough understanding would require working through comparative static exercises to trace the impact of external shocks, including, importantly, monetary and fiscal policy actions. For our purposes in developing a macroeconomics for Emerging East Asia, models that focus exclusively on a domestically determined market rate of interest are of limited applicability. A better fit is a model that incorporates managed exchange rates, which we develop in Chapter 13. Nevertheless, to varying degrees in the economies of Emerging East Asia, domestic interest rates do play a role in macroeconomic performance. Hence, we outline the structure of the arguments.

Marginal Efficiency of Capital and the IS Curve

The IS curve defines pairs of income (equal to output) and the interest rate that equate investment and saving. Investment is assumed to depend negatively on the interest rate. Simply put, this is because as the interest rate falls, more investment projects become viable. Keynes formalized the argument with his concept of a declining marginal efficiency of capital – the more extensive is investment at a given point in time, the lower is the return to the marginal unit of investment. This is due to diminishing marginal productivity of capital as capital becomes more abundant relative to other factors of production, given the state of technology. A lower interest rate increases the rate of return net of borrowing costs for the entire schedule of possible investment levels such that at the margin some projects that would not have been pursued at a higher rate of interest will be undertaken. Saving and consumption are assumed to depend on income in standard Keynesian fashion.

To capture the investment/saving side of the IS-LM Model, we rewrite the Keynesian expenditure equation expressing investment as a function of the interest rate and setting expenditures equal to income:

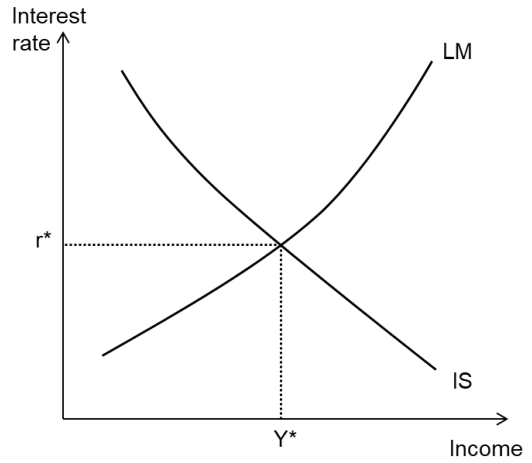
$$Y = C_0 + \beta\left(Y - \overline{T}\right) + I(r) + \overline{G} + \overline{X} - \overline{M},$$

where r = the interest rate.

To preserve the equality, an increase in I, following from a decrease in r, must be matched by an increase in Y sufficient to yield the necessary saving to support the higher I. Conversely, an increase in the interest rate inhibits investment which causes a decline in income sufficient to realign lower saving with the lower investment. Note that preservation of the saving/investment balance is implicitly ensured within the IS equation since Y minus all terms on the right hand side other than $I(r)$ is equal to saving (where government spending is treated as public consumption).

The IS equation traces an inverse relationship between the interest rate and the level of income, with investment and saving equated in the process. This inverse relationship is shown as the IS curve in Figure 9.6. To find that combination of interest rate and income level that will prevail in equilibrium, we need a second relationship defined on the two variables.

Figure 9.6: IS-LM Model



The IS curve reflects pairs of income and the interest rate that equate saving and investment, the LM curve pairs of the same variables that equate demand for money with given supply.

Liquidity Preference and the LM Curve

The Classical School posited that the interest rate is determined by a market for loanable funds in which saving on the supply side is equated with investment on the demand side. In the IS-LM framework, investment similarly depends on the interest rate, but saving depends strictly on income. Saving is not presumed to flow automatically into the loanable funds market. Rather, savers have a choice between holding non-interest-bearing money balances and interest-bearing bonds. The supply of loanable funds then arises not directly from saving but from the choice to allocate savings toward bond purchases as opposed to cash money balances.

Money balances have the advantage of being liquid. They are immediately available to support transactions. The demand for money for the purpose of supporting transactions increases as income rises.

To overcome the preference of wealth holders for liquidity, interest must be paid on bonds. The choice between money and bonds depends on the current rate of interest, but also on expectations about how the interest rate may change in the future. For when the interest rate rises, bond prices fall, as explained in Chapter 7. Therefore, if expectations are broadly held that the interest rate is likely to rise, holding cash will be seen as preferable. Keynes regarded this interest sensitivity as imparting a speculative demand for money balances. A low interest rate encourages a preference for liquidity due to the low current return on bonds as well as to the greater likelihood that the rate will rise in the future.

Combining the transactions demand and the speculative demand for liquidity (or money) gives us a function defined on the interest rate and income which we set equal to the exogenously given money supply,

$$\bar{M}^S = L(r, Y),$$

where $\bar{M}^S$ = exogenous money supply;

$L(\bullet)$ = the liquidity preference function.

The function $L(r, Y)$ depends negatively on r and positively on Y. The LM equation yields pairs of r and Y at which the public is willing to hold the available supply of money.

For given $\bar{M}^S$, we can trace a relationship that must hold between r and Y. An increase in income will tend to increase the demand for liquidity for transactions purposes. To offset this, the interest rate must rise to induce the holding of bonds as an alternative to money. Thus the relationship between r and Y that preserves a given value for money demand, which will align it with money supply, is positive. This is represented by the upward sloping LM curve of Figure 9.6.

Equilibrium in Income and the Interest Rate

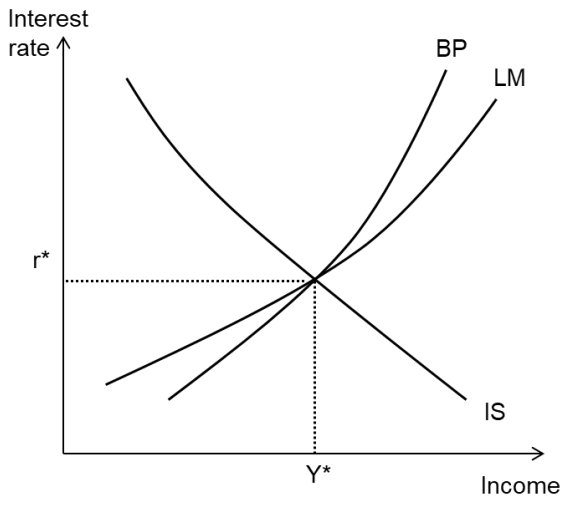
The IS and LM curves of Figure 9.6 jointly determine equilibrium values of income and the interest rate. Pairs of r and Y along the IS curve equate saving and investment. Pairs of the same variables along the LM curve preserve a given level of money demand set equal to an exogenously controlled money supply.

True to form in a model of Keynesian inspiration, the equilibrium income given by Y^* in Figure 9.6 need not represent a full-employment outcome. The economy can be operating at less than capacity with unemployment manifest at Y^* with no impetus for output and income to increase. In the IS-LM Model, both fiscal and monetary policy offer the potential to boost equilibrium output. A detailed exposition of the mechanics is beyond the scope of this text. In brief, expansionary fiscal policy involving government spending increases or tax cuts shifts the IS curve to the right pushing up the interest rate as income rises. The upward movement along the LM curve ensures equality between money demand and fixed money supply as the combination of higher income and higher interest rate have offsetting effects on money demand (higher income raising it, a higher interest rate lowering it). Expansionary monetary policy shifts the LM curve to the right driving the interest rate downward as income rises. The lower interest rate ensures that investment spending will pick up to match the increase in saving that follows from higher income.

External Balance and the Mundell-Fleming Extension

The basic IS-LM Model assumes a closed economy, or at least takes international trade and financial flows as fixed. The Mundell-Fleming Model incorporates an endogenous foreign sector into the analysis. The balance on the current account is assumed to be a function of income and on the financial account a function of the interest rate. As income increases, imports rise and exports decline in response to the increase in domestic demand. Hence the balance on the current account decreases (a surplus shrinks or a deficit expands). As the interest rate rises domestically, more capital flows in and less flows out. The balance on the financial account thus increases (a surplus expands or a deficit shrinks). An increased surplus on one account must be matched by an increased deficit on the other to preserve overall balance.

Figure 9.7: Mundell-Fleming Model



The BP curve extends the IS-LM model to introduce pairs of income and the interest rate that achieve balance in external payments.

The BP curve of Figure 9.7 represents pairs of income and the interest rate that preserve balance in the external balance of payments. As income increases and the current account balances declines, the interest rate must rise in order to bring about the necessary increase in the financial account balance to compensate. The positive slope of the BP curve indicates that income and the interest rate must move in the same direction to ensure balance in the balance of payments. A steep slope in the BP curve means that a large change in the interest rate is associated with a given change in income implying that barriers to capital flows allow the domestic interest rate to deviate readily from a global standard. If capital were perfectly mobile across the border, the global interest rate would prevail and the BP curve would be perfectly elastic.

A change in the exchange rate causes the BP curve to shift. A reduction in the value of the domestic currency in terms of foreign currency shifts the BP curve to the right as higher exports and lower imports sustain an increase in domestic output at any given interest rate. With no intervention by the monetary authority, the exchange rate must adjust to bring about balance, the BP curve thus shifting until all three curves intersect at the same value of *Y*. The BP curve may lie above or below the intersection of the IS and LM curves if at the *Y** value established by these two curves the monetary authority intervenes in the foreign exchange market to support a wedge between the current account balance and the opposing financial account balance.

In the Mundell-Fleming open economy model, exchange rate management provides an additional macroeconomic policy lever for use in conjuction with monetary and fiscal policy, provided that capital is not perfectly mobile and the domestic interest rate may diverge from a global standard. If *Y** falls below full-employment income, a judicious use of monetary, fiscal, and exchange rate policies can push the system of IS, LM, and BP curves to the right to achieve balance along all dimensions at a higher level of income.

Evolving Schools of Thought

The Classical and Keynesian schools of thought have evolved over time in contention with one another. Classical theory provides an explanation for the demonstrated success of market economies in generating growth and creating jobs. Keynesian theory recognizes that economic performance fluctuates relative to potential and governments thus find scope to intervene. A compromise worldview involving Classical foundations to explain long-run tendencies but allowing an ancillary role for stabilization measures to keep an economy functioning at its full-employment Classical best came to predominate by the 1950s. Economist

Paul Samuelson dubbed this the "Neoclassical Synthesis" in the third edition of his best selling principles text.

The Neoclassical Synthesis represented a moderation of the more radical stand Keynes took in the *General Theory*. Keynes saw demand shortfall as a chronic and pernicious malady of the capitalist system. His concerns led him to argue "that the duty of ordering the current value of investment cannot safely be left in private hands" (p. 164), and consequently "that a somewhat comprehensive socialisation of investment will prove the only means of securing an approximation to full employment" (p. 375). For more on Keynes's not so prescient musings on the fate of private investment and the "euthanasia of the rentier", along with a digression into his more prophetic warnings on war reparations, see Box 8.2.

Criticisms laid against Keynesianism on theoretical grounds, in conjunction with the play of events in the 1970s, led to a waning of influence in this school of thought. The lack of microeconomic foundations to explain why wages and prices should fail to clear markets was a vulnerability. Firms and households were assumed to behave rationally in trading labor and commodities at a micro level, yet they were purportedly unable to adjust to changing circumstances at the macro level. Keynesian advocacy of fiscal stimulus to overcome weak demand was also subject to attack. Increases in government spending were presumed to impact the economy with a multiplier effect as new spending generated new income which in turn triggered new spending and so forth. Theories of consumption developed by Friedman (1957) and Modigliani (1966), however, maintained that changes in consumption habits were not so easily dislodged from patterns based on long term earnings prospects and that income regarded as transitory would mostly be saved. The supposed multiplier effect would thus dissipate quickly. Finally, on practical grounds, if markets were prone to malfunctioning, policy was not less so. Lags in implementation and results were long and variable. Moreover, the politics of stimulus and restraint were asymmetrical. Fiscal budgets once unbalanced were hard to rebalance and credit having been unleashed was tough to reign back in.

The undoing of the Keynesian revolution was wrought by the simultaneous emergence of stagnant growth and high inflation – stagflation – in the US in the 1970s. Stagnant growth with its accompanying high unemployment was in principle supposed to forestall upward pressure on wages and prices. This breech of the Keynesian order provided the opening for the Classical school to regain the ascendency by offering an explanation of events that rested on explicit microeconomic foundations. If employers expected output prices to rise at a given rate, they would be prepared to raise wages by that rate, while workers expecting their cost of living to rise at the going rate would demand the very wage increases employers were prepared to offer. Markets would clear based on rational expectations on the part of economic agents. The consequences of shocks, including any demand stimulus measures implemented by the government, were foreseeable and were thus incorporated into supply and demand behavior. Within this framework, observed reductions in employment during a downturn were interpreted as the result of calculated choice. Under the various monikers of New Classical Economics or the Rational Expectations School or Real Business Cycle Theory, econometric models were constructed on the premise of market equilibration and found to closely replicate observed features of the typical business cycle.

Box 8.2: What else Keynes said

Long before he wrote the *General Theory*, Keynes had achieved considerable stature not only as an economic theoretician but as a voice in world affairs. His *Economic Consequences of the Peace*, written in 1919, was a polemic against the spoliation of Germany by the victors of World War I. Keynes felt so strongly about this issue that he withdrew as an advisor to the peace negotiations in protest against a treaty he believed would "sow the decay of the whole of civilized Europe." (p. 225)

In his writing, Keynes developed the empirical case that Germany's capacity to pay reparations fell far short of the terms imposed by the Treaty of Versailles. He argued further that for Germany to make payments even on the order he was proposing, the country's exports would have to increase and imports decrease greatly to generate the necessary foreign exchange. This could happen only if Western Europe and the US opened their own markets to German products and faced up to greater competition from German goods worldwide. Keynes advocated an alternative proposal whereby the U.S. would forgive the debts it was owed by Britain, France, and Italy, and these countries would in turn scale back greatly their demands on Germany.

Keynes wrote ardently:

> *"I believe that the campaign for securing out of Germany the general costs of the war was one of the most serious acts of political unwisdom for which our statesmen have ever been responsible. To what a different future Europe might have looked forward if either [British Prime Minister] Mr. Lloyd George or [U.S. President Mr. Woodrow] Wilson had apprehended that the most serious of the problems which claimed their attention were not political or territorial but financial and economic, and that the perils of the future lay not in frontiers or sovereignties but in food, coal, and transport. … [T]he financial problems which were about to exercise Europe could not be solved by greed. The possibility of their cure lay in magnanimity."* (pp. 146-147)

The book became an international best seller – arriving too late, however, to alter history's harrowing course toward Nazism and another world war. Yet in the aftermath of World War II, the lessons had seemingly been absorbed. The U.S. dedicated enormous sums to the post-war reconstruction of Europe and Japan, launching an era of prosperity that redounded to all.

For all his brilliance, Keynes was not without ideas that failed to withstand the test of time. One of his odder notions in hindsight was that continued capital accumulation would lead to a day when the return on capital would fall to zero and result in the "euthanasia of the rentier" with profound implications for social organization. From the *General Theory*:

> *"If I am right in supposing it to be comparatively easy to make capital-goods so abundant that the marginal efficiency of capital is zero, this may be the most sensible way of gradually getting rid of many of the objectionable features of capitalism. For a little reflection will show what enormous social changes would result from a gradual disappearance of a rate of return on accumulated wealth. A man would still be free to accumulate his earned income with a view to spending it at a later date. But his accumulation would not grow. He would simply be in the position of Pope's father, who, when he retired from business, carried a chest of guineas with him to his villa at Twickenham and met his household expenses from it as required."* (p. 221)

Some 80 years on, society is no closer to the day when prospects for a positive return on investment have disappeared. Technological innovation seems to have provided escape from this fate, generating seemingly unending opportunities for lucrative undertakings.

The presumption of New Classical Economics that involuntary unemployment did not exist was dissatisfying to those of a Keynesian persuasion. To counter the intellectual dominance the New Classical School had achieved by the 1970s, the New Keynesians had to offer more rigorous micro foundations to explain the failure of markets to clear. Keynes had argued that wage bargains were struck in nominal terms so that in an environment of weak demand and falling output prices, real wages tended to rise, discouraging hiring even as nominal wages remained fixed. The incentive wage theory of New Keynesians furthers this line of reasoning by positing that labor productivity and turnover respond to compensation. Nominal wage cuts, even in an environment of slack labor markets, discourage effort and hinder retention, the latter raising costs associated with recruitment and training. Prices in product markets can be sticky due to the costs of communicating price changes, known as "menu costs", and to the complexities of pricing in imperfectly competitive markets. Firms that exercise market power are accustomed to maintaining higher prices in acceptance of reduced sales. Under such circumstances, no firm wants to start a bidding war.

The debate between Classical and Keynesian Schools has yielded more sophisticated theories of how markets work and a better understanding of how to conduct stabilization policy. As the Neoclassical Synthesis emerged out of the Keynesian revolution that had challenged the Classic School before it, so a new synthesis has in more recent years bridged the gap between the New Classicals and the New Keynesians. The New Classical econometric models that provide for general equilibrium across markets for goods, labor, and assets and incorporate dynamic adjustment processes have been adapted to accept New Keynesian-style price stickiness. These models allow for labor to be unemployed and firms to operate at less than capacity.

The models presented in this chapter are static in nature. They characterize an economy in the moment, introduce a shock, then examine the outcome, with no cognizance of the passage of time. The Aggregate Demand / Aggregate Supply Model starts from full employment equilibrium, brings in a disturbance, then traces the return to equilibrium. The Income-Expenditure and IS-LM models take as their starting point a disequilibrium situation in which the economy is operating at less than capacity with no promise of timely recovery. The shocks of interest in this context are policy measures that bring the economy up to speed. Again the analysis proceeds with no explicit time dimension. Yet business cycles are dynamic by nature. They involve movement of an economy over time, up and down, constantly in flux. The next chapter takes up the dynamics of boom and bust cycles.

Data Note

Information on the Great Depression is from Smiley (2008).

Bibliographic Note

Mankiw (2006) describes reading Keynes's *General Theory* as "both exhilarating and frustrating". A great mind applying itself to an enormous topic is much to be appreciated, in Mankiw's view, even as the outcome is amorphous and less than logically satisfying. Mankiw is similarly entertaining in his characterizations of the two sides of the New Classical versus New Keynesian debates. Blanchard (2008) provides another fine summary of the tension between schools of thought and attempts at resolution.

The two models associated with Keynes in this chapter were not articulated graphically by Keynes himself. Rather, the graphical analyses were developed by others to interpret Keynes. The Income-Expenditure Model appeared in the first edition of Paul Samuelson's principles text (1948, p. 275). The IS-LM Model was devised by Hicks (1937), who was well on his way to formulating it before the *General Theory* was published. For a statement on the value of the IS-LM Model, see Krugman (2011). Debate has swirled around whether these models are valid representations of Keynes's thinking. Not only did Keynes never deign to react to Hicks's model, according to his biographer, Robert Skidelsky, he "tended to ignore anything which Hicks did." (interview in Snowden and Vane, 2005) Regardless, Keynes's name is attached to a school of thought that has taken on a life of its own.

Works by Mundell (1963) and Fleming (1962) laid the foundations for open economy macroeconomics. Salvatore (2013) offers a refined textbook treatment of the Mundell-Fleming Model.

Instructional material on the Aggregate Demand / Aggregate Supply model, including illuminating interactive graphics and self-quizzes, is posted on the *thinkeconomics* website developed by Dennis and Rebecca Kaufman.

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