

## 4 Sustainable and unsustainable growth

Secular growth characterizes a macroeconomy for which the ongoing rate of saving and investment exceeds the rate of capital depreciation. A change in the growth rate – or more generally – in the intertemporal pattern of consumable output may occur as a result of some change in the underlying economic realities. Advances in technology and additions to resource availabilities, as well as preference changes that favor future consumption over present consumption, impinge positively on the economy's growth rate. Such parametric changes have a direct effect in one or more of the panels of our capital-based macroeconomic framework and have indirect effects throughout. These instances of change in the sustainable growth rate are offered as preliminary to our discussion of the unsustainable growth induced by policy actions of the monetary authority.

### Changes in technology and resource availabilities

Technological advance has a direct effect on the production possibilities frontier and on the market for loanable funds. Although a typical technological innovation occurs in one or a few markets, it allows, through resource reallocation, for increases in the production possibilities all around. That is, the frontier shifts outward (and possibly experiences a change in shape depending on the specific nature of the change in technology); the demand for loanable funds shifts to the right, as business firms take advantage of the new technological possibilities. The resulting higher incomes cause the supply of loanable funds to shift to the right as well.

The direction of movement of the interest rate is indeterminate, depending, as it does, on the relative magnitudes of the shifts in supply and in demand. This indeterminacy, however, presents us with no fundamental puzzle. It simply derives from the fact that the net gain attributable to the technological advance can be realized in part as greater consumption in current and near-future periods and in part as greater consumption in the more remote periods. Although the specific nature of the change in technology may set limits on the particular way in which the gains can be realized, there remains much scope for trading current consumption and

future consumption against one another. The advance in technology, whatever its particulars in terms of the timing of inputs and outputs, serves, in effect, to increase the potential of investable resources. To use the old Classical terminology, it is *as if* the subsistence fund had increased. There will almost always be ample opportunities to draw down the subsistence fund in ways not directly related to the change in technology (for instance, by decreasing current inventories of consumption goods) so as to take immediate advantage of the technological advance. While the rate of interest may rise temporarily while the economy is adjusting to the new technology, it is not necessarily the case – as it is in other macroeconomic constructions – that a (positive) technology shock causes the equilibrium rate of interest to rise.

Figure 4.1 depicts technology-induced growth in an instance where the technological change is interest-rate neutral. Here, we can identify two cases: (1) the technological advance affects all stages of production directly and proportionally, so that no reallocation of resources among the different stages is called for; and (2) scope for resource reallocation allows the implementation of technology that is usable only in one or a few stages to have an immediate or nearly immediate impact on current consumption. In either case, the economy's growth path would be shifted upward but would not otherwise change. The initial and subsequent equilibria are shown by the solid points in Figure 4.1. In the first case, there is no reason to believe that the interest rate would rise even temporarily. Investment, output, income, consumption, and saving would all rise together without putting pressure one way or the other on the rate of interest. In the second case, the demand for loanable funds rises first as producers seek to take advantage of new technology that directly affects, say, an early stage of production. The increase in investment is shown in Figure 4.1 by a rightward shift in the demand for loanable funds from  $D$  to  $D'$ . The interest rate rises, as indicated by the hollow point marking the intersection of  $S$  and  $D'$ . (Note also that the adjustment path between the initial PPF ( $t_0$ ) and the subsequent PPF ( $t_1$ ) exhibits an initial investment bias.) Because the technological advance occurred in an early stage, consumable output does not experience an immediate increase. However, the increased interest rate causes resources not directly involved in implementing the new technology to be reallocated towards the late and final stages of production, which allows consumption to increase. As incomes increase (due to increased investment spending) and consumption increases (due to resource reallocations), saving also increases. The supply of loanable funds shifts from  $S$  to  $S'$ , and the interest rate is driven back to its initial level.

Apart from its showing the temporary increase in the rate of interest and the correspondingly bowed-out adjustment path between the two PPFs, our Figure 4.1, depicting technology-induced growth, is virtually identical to Figure 3.8, which depicts secular growth. We might as well have simply modified Figure 3.8 (p. 54) to show a discontinuity in consumable output

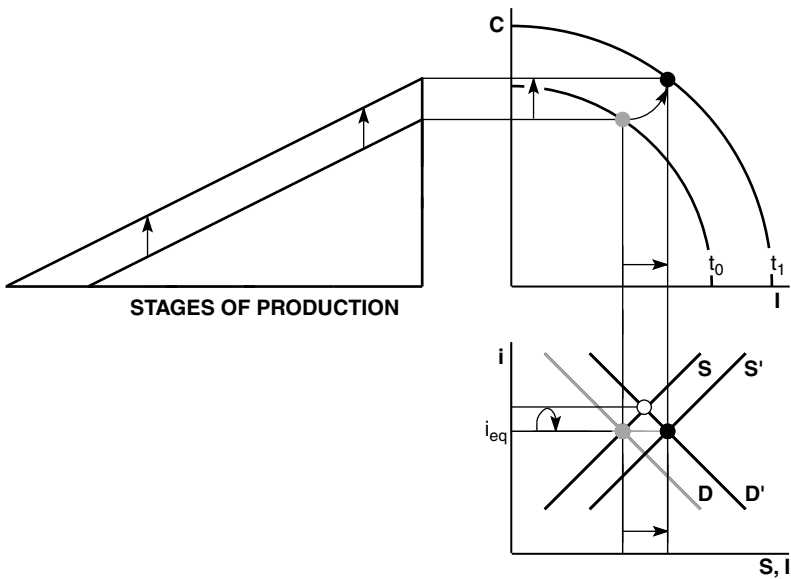


Figure 4.1 Technology-induced growth.

occurring at the time of the change in technology. For instance, the set of curves labeled  $t_2$  (in Fig. 3.8) could be relabeled  $t'_1$ , indicating that a technological advance that had occurred in period  $t_1$  allowed the economy to experience two years' worth of secular growth in a single year.

The notion that the economy experiences smooth secular growth has always been something of a fiction. By their very nature technological advances occur at irregular intervals and with some advances more dramatic than others. Knut Wicksell ([1898] 1962: 165–77) relied on this irregularity to help reconcile observed movements in the rate of interest and the level of prices and to give plausibility to his rocking-horse theory of the business cycle. Joseph Schumpeter ([1911] 1961: 57–64) featured the irregularity in his theory of economic development. Modern proponents of real business cycle theory (Nelson and Plosser, 1982) point to irregular technological shocks as the source of the variation of output that appears – but only appears – to be cyclical in nature. That is, for real business cycle theorists, what looks like cyclical variation may be nothing but the market's response to changes in technology.

Although a technological change is conceived as being interest-neutral in the comparative-statics sense, it is quite possible for the market process that takes a capital-intensive economy from one equilibrium to another to involve high interest rates for a substantial period. Unlike our second case above involving only a transitory change in the interest rate, the application

of new technology may require committing resources to capital-intensive and hence time-consuming production processes in circumstances where the scope for reallocating other resources toward the late stages is limited. In this case, the increased demand for loanable funds may have a dominating effect on the interest rate for some time. Alternatively stated, if the increased supply of loanable funds is not fully accommodating (because higher-priced consumer goods have claimed a larger portion of incomes), the interest rate will rise, serving as a partial brake against fully exploiting the technological advance. The structure of production is being pushed in the direction of increased production time by the technological change itself and pulled in the opposite direction by people's reluctance to forgo current consumption.

It is possible to conceive of a technological change that causes the rate of interest to *fall* during the adjustment process. Imagine the discovery of some simple process that can quickly and almost effortlessly convert kudzu (a worthless vine that blankets the south-eastern United States) into grits and other consumables. The immediate result of the new technology is that income earners are awash in current consumption. With demands for current output more fully satisfied than before, they willingly put more of their incomes at interest. The increase in the supply of loanable funds lowers the rate of interest and channels funds into the implementation of longer-term projects, using technology that, though not new, can only now be profitably implemented. The fact that the kudzu-to-grits technology seems a bit contrived gives plausibility to the more common association between technological advance and a (temporarily) higher interest rate.

As suggested by our reference to Figure 3.8, tracking the changes of the macroeconomic magnitudes after a technological innovation requires that these changes be superimposed onto the secular growth that the economy was experiencing even before the innovation. It may well be that the initial increase in the interest rate, which acts as a brake on the rate at which technological advance is exploited, is followed by a decrease in the interest rate, as the accelerated accumulation of wealth (relative to accumulation prior to the innovation) is accompanied by a change in intertemporal consumption preferences. Allowing for this effect (from innovation to increased wealth to lower time preferences), we see technological innovation as causing the equilibrium rate of interest to fall even though the adjustment to this new equilibrium may involve a temporarily high interest rate. More importantly for the application of our capital-based macroeconomic framework, the economy's pattern of growth, as boosted by the technological advance, is a sustainable one. That is, the change in the underlying economic realities imply an altered growth path; the market process translates the technological advance into the new preferred growth path; and there is nothing in the nature of this market process that turns the process against itself.

The possible consequences of an increase in resource availabilities are similar to those of technological advance. Discovering new mineral deposits

is equivalent in many respects to discovering new and better ways of extracting minerals from old deposits. In either case, the economy's post-discovery growth path is sustainable in the above-mentioned sense. In each instance of increased resource availabilities and technological advance, the specifics of the market process triggered by the parametric change depend on the specifics of the parametric change itself. Apart from our suggested reinterpretation of Figure 3.8 and the incorporation of the wealth effects on intertemporal consumption preferences and hence on the interest rate, the attempt to identify and deal further with some general case is not likely to be worthwhile.

In contrast to changes in technology and resource availabilities, a change in intertemporal consumption preferences has consequences for which the direction of change in the rate of interest and related macroeconomic magnitudes is determinate and for which a general case can be identified. Further, the parallels between the consequences of a change in intertemporal preferences and the consequences of a policy of credit expansion by the monetary authority give special relevance to these preference changes and policy actions.

### Changes in intertemporal preferences

Changes in technology and resource availabilities give rise to permanent, or sustainable, changes in the economy's growth path. Sustainable growth can also be set in motion by **changes in intertemporal preferences**. Our framework is well suited to trace out the consequences of such a preference change. It is convenient simply to hypothesize an autonomous economy-wide change in intertemporal preferences: people become more thrifty, more future oriented in their consumption plans. In reality, of course, intertemporal preference changes are undoubtedly gradual and most likely related to demographics or cultural changes. For instance, baby boomers enter their high-saving years. Or increasing doubts about the viability of Social Security cause people to save more for their retirement. Or education-conscious parents begin saving more for their children's college years. The essential point is that intertemporal preferences can and do change and that these changes have implications for **the intertemporal allocation of resources**.

The assumption underlying labor-based macroeconomics is that there is a high degree of complementarity between consuming in one period and consuming in the next. On the basis of this assumption, it is believed, changes in intertemporal preferences can be safely ruled out of consideration. By contrast, capital-based macroeconomics allows for some degree of intertemporal substitutability of consumption. Rejecting the assumption of strict intertemporal complementarity does not imply – as Cowen (1997: 84), for one, suggests that it does – that the actual changes experienced are frequent and dramatic. Quite to the contrary, the claim is that over time even small changes have a significant and cumulative effect on the

pattern of resource allocation. More pointedly, capital-based macroeconomics suggests that if the interest rate reports a small change when none actually occurred (or fails to report a small change that actually did occur), the consequences can be cumulative misallocations that eventually lead to a dramatic correction.

In Figure 4.2 an increase in thriftiness – in people's willingness to save – is represented by a rightward shift in the supply of loanable funds. The implied decrease in current consumption is consistent with a change in the **intertemporal pattern of consumption demand: people restrict their consumption now in order to be able to consume more in the future.** The implication of higher consumption demand in the future was expressed in Chapter 3 as SUFS: saving-up-for-something. This understanding of the nature of saving gives rise to a key macroeconomic question: How does the market process translate changes in intertemporal preferences into the appropriate changes in intertemporal production decisions? To presuppose, following Keynes, that reduced consumption demand in the current period implies proportionally low consumption demands in subsequent periods is wholly unwarranted. It would follow trivially that for an economy in which the expectations of the business community were governed by such a presupposition, the market process would experience systematic coordination failures whenever saving behavior changed. This rather telling aspect of the Keynesian vision begs the question about the viability of a market economy in circumstances where intertemporal preferences can change and raises the more fundamental question of how the current intertemporal pattern of resource allocation ever got to be what it is.

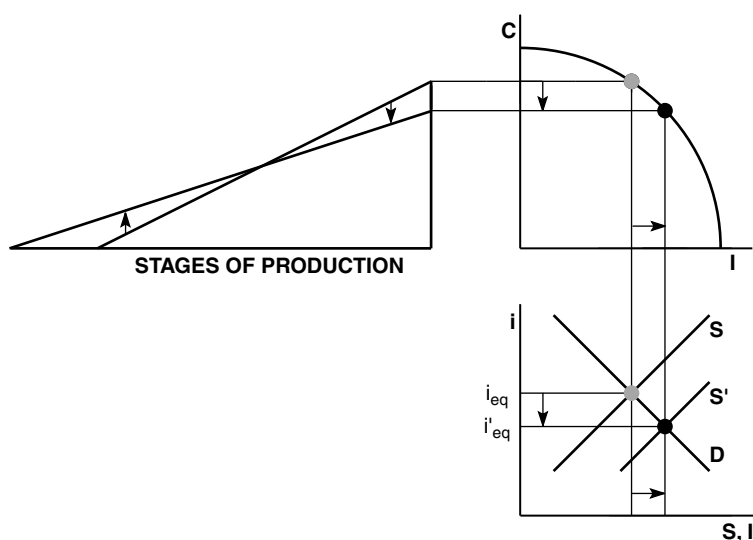


Figure 4.2 Saving-induced capital restructuring.

Straightforwardly, the change in credit-market conditions results in a decrease in the rate of interest and an increase in the amount of funds borrowed by the business community, as depicted by the solid point marking the new equilibrium in the loanable-funds market. The corresponding solid point in the PPF diagram shows that the resources freed up by the reduced consumption can be used instead for investment purposes. Note the consistency in the propositions that (1) there is a movement *along* the PPF rather than *off* the PPF; and (2) there is no significant income effect on the supply of loanable funds. If consumption decreased without there being any offsetting increase in investment, then incomes would decrease as well and so too would saving and hence the supply of loanable funds. The negative income effect on the supply of loanable funds would largely if not wholly negate the effects of the preference change. **Keynes's paradox of thrift would be confirmed: increased thriftiness leads not to an increased growth rate but to decreased incomes.** Making matters worse, the decreased incomes and hence decreased spending may well induce a pessimism into the business community, which would result in a leftward shift in the demand for loanable funds. These and other perceived perversities will be explored more fully in Chapter 8.

In our capital-based macroeconomics, allowing a shift of the supply of loanable funds to move us along a given demand, allowing a lower interest rate to induce a higher level of investment, and allowing the economy to stay on its production possibilities frontier are just mutually reinforcing ways of acknowledging that markets, even intertemporal markets, need not function perversely. The mutually reinforcing views about the different aspects of the market system is what Keynes had in mind when he indicated at the close of his chapter on the "Postulates of Classical Economics" that those postulates all stand or fall together. Figure 4.2 reflects the view that our postulates stand together. The market works. But just how the intertemporal markets work requires that we shift our attention to the intertemporal structure of production. The altered shape of the Hayekian triangle shows just how the additional investment funds are used. The rate of interest governs the intertemporal pattern of investment as well as the overall level. **The lower interest rate, which is reflected in the more shallow slope of the triangle's hypotenuse, favors relatively long-term investments.** Resources are bid away from late stages of production, where demand is weak because of the currently low consumption, and into early stages, where demand is strong because of the lower rate of interest. That is, if the marginal increment of investment in early stages was just worthwhile, given the costs of borrowing, then additional increments will be seen as worthwhile, given the new, lower costs of borrowing. While many firms are simply reacting to the spread between their output prices and their input prices in the light of the reduced cost of borrowing, the general pattern of intertemporal restructuring is consistent with an anticipation of a strengthened future demand for consumption goods made possible by the increased

saving. It is not actually necessary, of course, for any one entrepreneur – or for entrepreneurs collectively – to explicitly form an expectation about future aggregate consumption demand.

The triangle depicts relative changes in spending patterns attributable to increased savings; it does not show the ultimate increase in output of consumption goods made possible by increased investment. To visualize the intertemporal pattern of consumption that follows an increase in thrift, we must superimpose the relative changes depicted in Figure 4.2 onto the secular growth depicted in Figure 3.8. Figure 4.2 by itself suggests an actual fall in consumption. The two figures taken together suggest a slowing of the growth of consumption while the capital restructuring is being completed followed by an acceleration of the growth rate. The growth rate after the capital restructuring will be higher than it was before the preference change. The rate of increase in consumption may go from 2 percent to  $1\frac{1}{2}$  percent to 2½ percent. This pattern of output is consistent with the hypothesized change in intertemporal preferences.

Figure 4.3 differs from Figure 4.2 only by its including some auxiliary diagrams that track the movement of labor during the capital restructuring. The increased saving can be seen as having two separate effects on labor demand. The two concepts at play here, already discussed in the context of the Hayekian triangle itself, are derived demand and time discount. (1) Labor demand is a derived demand. Thus, a reduction in the demand for consumption goods implies a proportionate reduction in the labor that produces those consumption goods. For stages of production sufficiently close to final output, this effect dominates. The demand for retail sales personnel, for instance, falls in virtual lockstep with the demand for the products they sell. (2) Like all factors of production in a time-consuming production process, labor is valued at a discount. The reduction in the interest rate lessens the discount and hence increases the value of labor. In the late stages of production, this effect is negligible; in the earliest stages of production, it dominates. The two effects, then, work in opposite directions – with the magnitude of the time-discount effect increasing with temporal remoteness from the final stage of production. Together, they change the shape of the Hayekian triangle. The intersection of the two hypotenuses (that characterize the capital structure before and after the intertemporal preference change) marks the point where the two effects just offset one another.

The structure of production in Figure 4.3 is cut at three different points to illustrate the workings of labor markets. Labor experiences a net decrease in demand for the stage between the intersection of the hypotenuses and final output; labor experiences a net increase in demand for the stage between the intersection of the hypotenuses and the earliest input. Initially the wage rate falls in the late stage and rises in the early stage. After the pattern of employment fully adjusts itself to the new market conditions (with workers moving from the late stage to the early stage) the wage rate returns to its



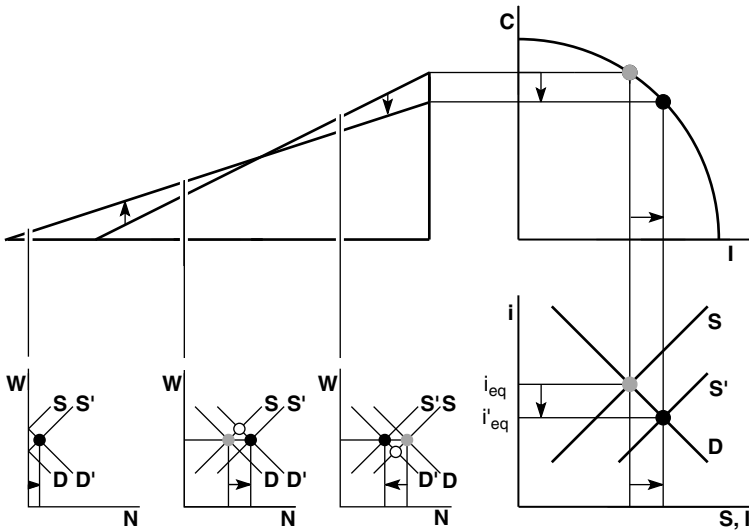


Figure 4.3 Capital restructuring (with auxiliary labor-market adjustments).

initial level. Also shown is the labor market for a stage of production that is newly created as a result of the preference changes. The supply and demand for labor at this stage did not intersect at a positive level of employment before the reduction of the interest rate; after the reduction, some employment is supplied and demanded. The pattern of demand in our stage-specific markets for labor is consistent with that shown by Hayek ([1935] 1967: 80) as a “family of discount curves,” with which he tracks the differential changes in labor demand in five separate stages of production.

Labor in this reckoning is treated as a wholly nonspecific factor of production, but one that has to be enticed by higher wage rate to move from one stage to another. That is, the short-run supply curve is upward-sloping, the long-run supply curve is not. This construction requires qualification in two directions. First, skills that make a particular type of labor specific to a particular stage would have to be classified as (human) capital, an integral part of the capital structure itself. Workers with such skills would not move from one stage to another. Instead, they would enjoy a wage-rate increase or suffer a wage-rate decrease, depending upon the particular stage. Second, the auxiliary graphs depicting movements of nonspecific labor could also depict the movements of nonspecific capital. These capital goods will simply move from one stage to another in response to the differential effects of the time discounting. For instance, trucks that had been hauling sawhorses and lawn furniture may start hauling more sawhorses and less lawn furniture. In general and for any given stage of production, the specific factors undergo price adjustments; the nonspecific factors undergo quantity

adjustments. This understanding allows full scope, of course, for both price and quantity adjustments for the various degrees of specificity that characterize the different kinds of capital and labor. In putting our capital-based macroeconomic framework through its paces, however, it is often convenient – and is consistent with convention – to think of labor as representing the nonspecific factor of production.

The idea that the wage rate returns to its initial level after all the relative adjustments have been made deserves further comment. In Figure 4.3, the interest rate falls; the wage rate remains unchanged. This pattern of change stands in contrast to the pattern that characterizes the analytics offered, for instance, by Samuelson (1962). The neoclassical construction features a so-called factor-price frontier that depicts a negative relationship between the wage rate and the interest rate. In this reckoning, however, labor is cast in the role of the time-intensive factor of production. Inputs consist of dated labor that matures with time into consumable output. Capital, which is nothing but the not-yet-fully-matured labor input, is by construction closer in time to final output than is labor itself. Hence, a fall in the rate of interest would lead, by virtue of the time-discount effect, to a rise in the wage rate. This relationship has its parallel in our capital-based macroeconomics: a fall in the interest rate leads to a rise in the prices of factors of production that are employed in the early stages. The rise is permanent for the specific factors; temporary for the nonspecific factors.

Our treatment of labor in Figure 4.3 also stands in contrast to certain aspects of classical theory, such as is found in David Ricardo's ([1817] 1911: 263–71) treatment of labor and machinery. In his writing, capital is treated as the long-term, or time-intensive, factor of production and labor is treated as the short-term factor. A reduction in the rate of interest, then, favors the use of machinery over the use of labor. If this were Ricardo's whole story, then interest rates and wage rates would move up and down together. In the final analysis, however, displaced labor is hired to help produce the machines. This is the general thrust of Mill's ([1848] 1895: 65) fourth fundamental proposition respecting capital: "demand for commodities [i.e. consumption goods] is not demand for labor." Though slightly cryptic, this once famous aphorism simply means that the principle of derived demand does not apply to labor as a whole. The time-discount effect is sufficiently offsetting in the earlier stages of production that the net effect on total demand for labor is nil. Ultimately, that is, the change in the interest rate affects the pattern of employment and not the magnitude. This is the message in Hayek's third and final appendix in his *Pure Theory of Capital*, "Demand for Commodities is Not Demand for Labor' versus the Doctrine of 'Derived Demand.'"

In our capital-based macroeconomics, labor is treated as a nonspecific factor of production that is employed in all stages of production. It is neither so predominantly concentrated in the early stages of production that the wage rate rises when the interest rate falls nor so predominantly concen-

trated in the late stages that the wage rate falls along with a falling interest rate. Of course, in particular applications, if labor is for some reason believed to be disproportionately concentrated in early stages or in late stages, then Figure 4.3 must be modified to show the corresponding change in the wage rate.

Finally, we can note that the treatment of labor in Figure 4.3 warns against any summary treatment of the labor market. The market's ability to adjust to a change in the interest rate hinges critically on differential effects within the more broadly conceived market for labor. In the late stages of production, wages fall and then rise in response to a reduced interest rate; in the early stages, wages rise and then fall. (The opposing transitional adjustments in wage rates are shown by the hollow points in the auxiliary labor-market diagrams in Figure 4.3.) These are the critical relative wage effects that adjust the intertemporal structure of production to match the new intertemporal preferences.

## **The macroeconomics of boom and bust**

Understanding the market process that translates a change in intertemporal preferences into a reshaping of the economy's intertemporal structure of production is prerequisite to understanding the business cycle, or more narrowly, boom and bust. Capital-based macroeconomics allows for the identification of the essential differences between genuine growth and an artificial boom. The key differences derive from the differing roles played by savers and by the monetary authority.

The intertemporal reallocations brought about by a preference change, as illustrated in Figures 4.2 and 4.3, did not involve the monetary authority in any important respect. The different aspects of the market process that transformed the macroeconomy from one intertemporal configuration to another were mutually compatible, even mutually reinforcing. Equilibrium forces were taken to prevail whether the central bank held the money supply constant, in which case real economic growth would entail a declining price level, or (somehow) increased the money supply so as to maintain a constant price level but without the monetary injections themselves affecting any of the relevant relative prices.

Our understanding of boom and bust requires us to take monetary considerations explicitly into account for two reasons. First, the relative-price changes that initiate the boom are attributable to a monetary injection. The focus, however, is not on the quantity of money created and the consequent (actual or expected) change in the general level of prices. The nearly exclusive attention to this aspect of monetary theory was the target of early criticism by Hayek ([1928] 1975a: 103–9). Rather, following Mises and Hayek, our focus is on the point of entry of the new money and the consequent changes in relative prices that govern the allocation of resources over time. A second reason for featuring money in this context is very much related to the first.

The different aspects of the market process set in motion by a monetary injection, unlike the market process discussed with the aid of Figures 4.2 and 4.3, are *not* mutually compatible. They work at cross-purposes. But money – to use Hayek’s imagery – is a loose joint in an otherwise self-equilibrating system. The conflicting aspects of the market process can have their separate real effects before the conflict itself brings the process to an end. The very fact that the separate effects are playing themselves out in intertemporal markets means that time is an important dimension in our understanding of this process.

Dating from the early work of Ragnar Frisch (1933), it has been the practice to categorize business cycle theory in terms of the impulse (which triggers the cycle) and the propagation mechanism (which allows the cycle to play itself out). Describing the Austrian theory of the business cycle as monetary in nature on both counts is largely accurate. Money, or more pointedly, credit expansion, is the triggering device. And although in a strict sense the relative-price changes within the intertemporal structure of production constitute the proximate propagation mechanism, money – because of the looseness that is inherent in the nature of indirect exchange – plays a key enabling role.

Figure 4.4 depicts the macroeconomy’s response to credit expansion. Intertemporal preferences are assumed to be unchanging. The money supply is assumed to be under the control of a monetary authority, which we will refer to as the Federal Reserve. The supply of loanable funds includes both saving by income earners and funds made available by the Federal Reserve. The notion that new money enters the economy through credit markets is consistent with both the institutional details of the Federal Reserve and with the history of central banking generally. Students of macroeconomics find themselves learning early on the differences among the three policy tools used by the Federal Reserve to change the money supply: (1) the required reserve ratio set by the Federal Reserve and imposed on commercial banks; (2) the discount rate set by the Federal Reserve and used to govern the level of direct short-term lending to commercial banks; and (3) open market operations through which the Federal Reserve lends to the government by acquiring securities issued by the Treasury. These tools differ from one another in terms of the frequency of use, the intensity of media attention, and the implication about the future course of monetary policy.

Of overriding significance for our application of capital-based macroeconomics, however, is the characteristic common to all these tools. The three alternative policy tools are simply three ways of lending money into existence. Reducing the required reserve ratio means that commercial banks have more funds to lend, which means they will have to reduce the interest rate to find additional borrowers. Lowering the discount rate will cause banks to borrow more from the Federal Reserve – with competition among the banks reducing their lending rates as well. Central bank purchases of Treasury securities constitute lending directly to the federal government,

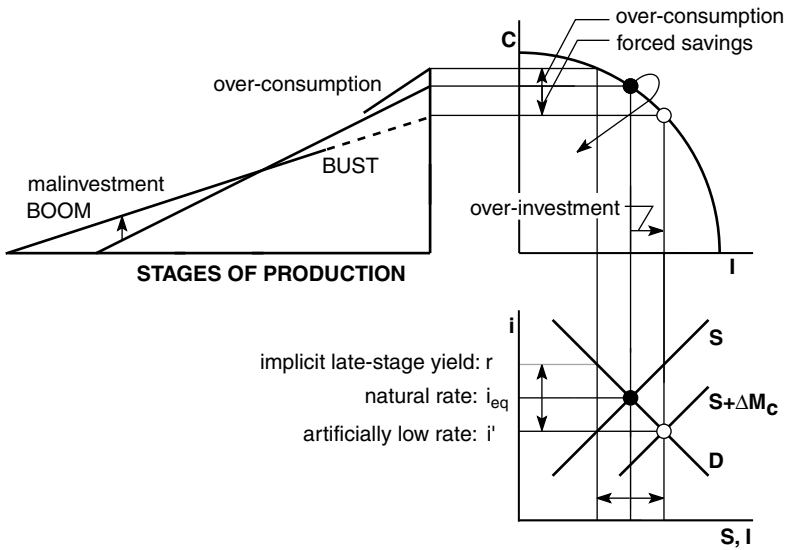


Figure 4.4 Boom and bust (policy-induced intertemporal disequilibrium).

which, like other instances of increased lending, puts downward pressure on the interest rate.

We see the direct effect of lending money into existence, the impulse, on the supply side of the loanable-funds market in Figure 4.4. The extent of the credit expansion (the horizontal displacement of the supply of loanable funds) is set to match the increase in saving shown in Figures 4.2 and 4.3. This construction gives us the sharpest contrast between a preference-induced boom and a policy-induced boom. The new money in the form of additional credit is labeled  $\Delta M_c$  in recognition that monetary expansion may not translate fully into credit expansion. Some people may choose to increase their holdings, or hoards, of money (by  $\Delta M_h$ ) in response to policy-induced changes in the interest rate. Such changes in the demand for cash balances, while certainly not ruled out of consideration and not without effects of their own, are of secondary importance to our capital-based account of boom and bust.

The initial effect on the rate of interest is much the same for both the preference-induced boom of Figure 4.2 and the policy-induced boom of Figure 4.4. An increased supply of loanable funds causes the interest rate to fall. In application, of course, we must gauge this “fall” relative to the rate that would have prevailed in the absence of credit expansion. What matters is the divergence between the market rate and the natural rate (to use Wicksell’s terminology). Suppose, for instance, that there is upward pressure on the natural rate because of technological innovations that directly

affect the early stages of production (as depicted in Figure 4.1) but that the Federal Reserve expands credit to keep interest rates from rising. There is no basis for believing that the unchanged rate of interest would allow the market to adjust more quickly or more efficiently to the change in technology. Rather, our analysis of boom and bust would still apply – due allowances being made for the market's simultaneous attempt to adjust for changes in the underlying economic realities.

The telling difference between Figures 4.2 and 4.4 is in terms of the relationship between saving and investment. In Figure 4.2, investment increases to match the increase in saving. But in Figure 4.4, these two magnitudes move in opposite directions. Padding the supply of loanable funds with newly created money drives a wedge between saving and investment. With no change in intertemporal preferences, the actual amount of saving decreases as the interest rate falls, while the amount of investment, financed in part by the newly created funds, increases.

We can trace upward to the PPF to get a second perspective on the conflicting movements in saving and investment. Less saving means more consumption. Market forces reflecting the preferences of income-earners are pulling in the direction of more consumption. Market forces stemming from the effect of the artificially cheap credit are pulling in the direction of more investment. One set of forces is pulling north (parallel to the C axis); the other set pulling east (parallel to the I axis). The two forces resolve themselves into an outward movement – toward the north-east. Increases in the employment of all resources, including labor, beyond the level associated with a fully employed economy cause the economy to produce at a level beyond the PPF.

Is it possible for the economy to produce *beyond* the production possibilities frontier? Yes, the PPF is defined as *sustainable* combinations of consumption and investment. Why is it that the opposing market forces do not simply cancel one another, such that the economy is left sitting at its original location on the PPF? There are two ways to answer this question both of which derive from Hayek's notion of money as a loose joint. First, because of the inherent looseness, the decisions of the income-earner-consumer-saver and the separate (and ultimately conflicting) decisions of the entrepreneur-cum-investor can each be carried out at least in part before the underlying incompatibility of these decisions become apparent. The temporary success of monetary stimulation policies as experienced by all central banks of all Western countries is strong evidence of the scope for real consequences of the sort shown. Second, and equivalently, the movement beyond the PPF is in fact the first part of the market process through which the opposing forces do ultimately cancel one another.

If this temporary movement beyond the frontier were the essence of capital-based account of boom and bust, then our capital-based theory and the widely expounded labor-based theory that involves a play-off between the short-run Phillips curve and the long-run Phillips curve would be very

similar. At this point in the analysis, the most salient difference between the two theories stems from the difference in the way money is injected. In our capital-based analysis, money is injected through credit markets and impinges in the first instance on interest rates. In Phillips curve analysis, money is (somehow) injected directly into spending streams of income earners and impinges in due course on (perceived and actual) wage rates. The directness of the capital-based analysis gives it a certain plausibility that is lacking in the labor-based analysis. The labor-based analysis has to incorporate some counterfactual method of injection money – such as Friedman's often invoked supposition that the money is dropped from a helicopter – in order to eliminate injection effects and focus attention on the differential perceptions of employers and employees, which, in turn, affect the supply and demand for labor. A full discussion of this and other relevant aspects of Monetarism is offered in Chapter 10.

Also significant is the fact that the capital-based analysis is more broadly applicable since the market process set in motion by credit expansion does not depend in any essential way on there being a change in the general level of prices. For instance, during the boom of the 1920s, the relatively constant price level was the net result of genuine growth, which put downward pressure on the price level, and credit expansion, which put upward pressure on the price level. The short-run/long-run Phillips curve analysis simply does not apply to this episode since there is no scope for expected inflation lagging behind actual inflation. There was no inflation. Our capital-based analysis, hinging as it does on relative price changes and not on changes in the general level of prices, does apply to the 1920s episode. In other words, the boom and bust of the inter-war years is an exception to the labor-based story but is a primary example of our capital-based story. Still other important differences – pertaining to the two theories' differing implications – will be identified below.

Figure 4.4 shows that the initial phase of the market process triggered by credit expansion is driven by the conflicting behavior of consumers and investors and involves the over-production of both categories of goods. The wedge between saving and investment shown in the loanable-funds market translates to the PPF as a tug-of-war (with a stretchable rope) between consumers and investors. Conflicting market forces are trying to pull the economy in opposite directions. Understanding subsequent phases of this process requires that we assess the relative strengths of the combatants in this tug-of-war. As the rope begins to stretch, the conflict is resolved initially in favor of investment spending – because the investment community has more to pull with, namely, the new money that was lent into existence at an attractive rate of interest. In the Austrian analysis, while an increased labor input – and a general over-production – is undoubtedly part of story, there is also a significant change in the pattern of the capital input. The movement beyond the frontier gives way to a clockwise movement; the unsustainable combination of consumption and investment takes on a distinct investment bias.

We have seen that a change in intertemporal preferences sets in motion a process of capital restructuring, as depicted by the Hayekian triangles of Figure 4.2. Credit expansion sets in motion two conflicting processes of capital restructuring, as depicted in Figure 4.4. The tug-of-war between investors and consumers that sends the economy beyond its PPF pulls the Hayekian triangle in two directions. Having access to investment funds at a lower rate of interest, investors find the longer-term investment projects to be relatively more attractive. A less steeply sloped hypotenuse illustrates the general pattern of reallocation in the early stages of the structure of production. Some resources are bid away from the intermediate and relatively late stages of production and into the early stages. At the same time, income earners, for whom that same lower interest rate discourages saving, spend more on consumption. A more steeply sloped hypotenuse illustrates the general pattern of reallocation in the final and late stages of production. Some resources are bid away from intermediate and relatively early stages into these late and final stages. Mises (1966: 559, 567, and 575) emphasizes the “malinvestment and over-consumption” that are characteristic of the boom. In effect, the Hayekian triangle is being pulled at both ends (by cheap credit and strong consumer demand) at the expense of the middle – a tell-tale sign of the boom’s unsustainability. Our two incomplete and differentially sloped hypotenuses bear a distinct relationship to the aggregate supply vector and aggregate demand vector suggested by Mark Skousen (1990: 297) and are consistent with the expositions provided by Lionel Robbins ([1934] 1971: 30–43) and Murray Rothbard ([1963] 1972: 11–39).

In sum, credit expansion sets into motion a process of capital restructuring that is at odds with the unchanged preferences and hence is ultimately ill-fated. The relative changes within the capital structure were appropriately termed malinvestment by Mises. The broken line in the upper reaches of the less steeply sloped hypotenuse indicates that the restructuring cannot actually be completed. The boom is unsustainable; the changes in the intertemporal structure of production are self-defeating. Resource scarcities and a continuing high demand for current consumption eventually turn boom into bust.

At some point in the process beyond what is shown in Figure 4.4, entrepreneurs encounter resource scarcities that are more constraining than was implied by the pattern of wages, prices, and interest rates that characterized the early phase of the boom. Here, changing expectations are clearly endogenous to the process. The bidding for increasingly scarce resources and the accompanying increased demands for credit put upward pressure on the interest rate (not shown in Figure 4.4). The unusually high (real) interest rates on the eve of the bust is accounted for in capital-based macroeconomics in terms of Hayek’s ([1937] 1975c) “Investment that Raises the Demand for Capital.” The “investment” in the title of this neglected article refers to the allocation of resources to the early stages of production; the



“demand for capital” (and hence the demand for loanable funds) refers to *complementary* resources needed in the later stages of production. The inadvisability of theorizing in terms of *the* demand for investment goods – and hence of assuming that the components of investment are related to one another primarily in terms of their substitutability – is the central message of Hayek’s article. Though without reference to Hayek or the Austrian School, Milton Friedman coined the term “distress borrowing” (Brimelow, 1982: 6) and linked the high real rates of interest on the eve of the bust to “commitments” made by the business community during the preceding monetary expansion. While Friedman sees the distress borrowing as only incidental to a particular cyclical episode (correspondence), capital-based macroeconomics shows it to be integral to the market process set in motion by credit expansion. These issues are raised again in Chapters 10 and 11.

Inevitably, the unsustainability of the production process manifests itself as the abandonment or curtailment of some production projects. The consequent unemployment of labor and other resources impinge directly and negatively on incomes and expenditures. The period of unsustainably high level of output comes to an end as the economy falls back in the direction of the PPF. Significantly, the economy does not simply retrace its path back to its original location on the frontier. During the period of over-production, investment decisions were biased by an artificially low rate of interest in the direction of long-term undertakings. Hence, the path crosses the frontier at a point that involves more investment and less consumption than the original mix.

Had investors been wholly triumphant in the tug-of-war, the economy would have been pulled clockwise along the frontier to the hollow point, fully reflecting the increase in loanable funds. The vertical component of this movement along the PPF would represent the upper limits of forced saving. That is, contrary to the demands of consumers, resources would be bid away from the late and final stage and reallocated in the earlier stages. The horizontal component of the movement along the PPF represents the over-investment that corresponds to this level of forced saving. (Had consumers been wholly triumphant in the tug-of-war, the economy would have been pulled counter-clockwise along the frontier, fully reflecting the policy-induced decrease in saving. The vertical component of this movement along the PPF represents the upper limits of the corresponding over-consumption.)

Since the counterforces in the form of consumer spending are at work from the beginning of the credit expansion, the actual forced saving and over-investment associated with a credit expansion are considerably less than the genuine saving and sustainable investment associated with a change in intertemporal preferences. (Notice also that the actual forced saving is not inconsistent with the actual over-consumption that characterized an earlier part of the process.) The path of consumption and investment shown in Figure 4.4 has the economy experiencing about half the movement along

the PPF as was experienced in the case of an intertemporal preference change. The only substantive claims suggested by our depiction is that the direction of the movement will be the same (in Figure 4.4 as in Figure 4.2) and that the magnitude will be attenuated by the counterforces. Alternatively stated, our construction suggests that the counterforces are at work but do not work so quickly and so completely as to prevent the economy from ever moving away from its original location on the PPF. This is only to say that a market economy, in which the medium of exchange loosens the relationships that must hold in a barter economy, does not and cannot experience instantaneous adjustments.

Although the point at which the adjustment path crosses the PPF is a sustainable level of output, it is not a sustainable mix. Here, capital-based macroeconomics highlights a dimension of the analysis of an unsustainable boom that is simply missing in short-run/long-run Phillips curve analysis. With its exclusive focus on labor markets and its wholesale neglect of injection effects, the economy's return to its natural rate of unemployment leaves the mix of output unaltered. In these circumstances, prospects for a "soft landing" at the natural rate seem good. Considerations of the economy's capital structure, however, cause those prospects to dim. There is no market process that can limit the problem of *malinvestment* to the period of *overinvestment*. We could not expect – or even quite imagine – that the economy's adjustment path would entail a sharp right turn at the PPF. Almost inevitably, some of the malinvestment in early stages of production would involve capital that is sufficiently durable and sufficiently specific to preclude such a quick resolution. Here, a key difference between the effects of a change in technology and the effects of a cheap-credit policy are worth noting. In the case of technological innovation, we argued that the drawing down of inventories in the late stages can convert some stage-specific change in technology into greater consumption without the particulars of the technological change having a dominating effect on the time pattern of consumption. By contrast, the general reallocation of resources towards long-term projects during a period of decreased saving can result in a structure of production that has limited scope for accommodating current and near-future consumption demands. The specificity and durability of the long-term capital does not allow for a general and timely reversal. The limitations on a timely recovery are stressed by Hayek (1945a) and more recently by McCulloch (1981: 112–14) with specific reference to movements off and along the PPF.

Further, the conventionally understood interaction between incomes and expenditures that initially propelled the economy beyond the PPF and then brought it back to the PPF would still be working in its downward mode as the adjustment path crosses the frontier. There would be nothing to prevent the spiraling downward of both incomes and expenditures from taking the economy well inside its PPF. And leftward shifts in the supply and demand of loanable funds can compound themselves as savers begin to

hold their savings liquid and as investors lose confidence in the economy. That is, self-reversing changes in the capital structure give way to a self-aggravating downward spiral in both income and spending. This increase in liquidity preference – or even a seemingly fetishistic attitude toward liquidity – is not to be linked to some deep-seated psychological trait of mankind but rather is to be understood as risk aversion in the face of an economy-wide crisis. The spiraling downward, which is the primary focus of conventionally interpreted Keynesianism, was described by Hayek as the “secondary deflation” – in recognition that the primary problem was something else: the intertemporal misallocation of resources, or, to use Mises’s term, malinvestment.

Through relative and absolute adjustments in the prices of final output, labor, and other resources, the economy can eventually recover, but there will be inevitable losses of wealth as a result of the boom–bust episode. A fuller discussion of depression and recovery must await the treatment of labor-based macroeconomics in Part III.

The Austrian theory of the business cycle is sometimes criticized for being too specific, for not applying generally to monetary disturbances whatever their particular nature (Cowen, 1997: 11). We can certainly acknowledge that the bias in the direction of investment is directly related to the particular manner in which the new money is injected. Credit expansion implies an investment bias. Lending money into existence, as we have already noted, accords with much historical experience. We can certainly imagine alternative scenarios. Suppose, for instance the new money makes its initial appearance as transfer payments to consumers. The story of a transfer expansion (Bellante and Garrison, 1988) has a strong family resemblance to the story of a credit expansion, but it differs in many of the particulars.

The output mix during a transfer expansion would exhibit a consumption bias. The initial increase in consumer spending would favor the reallocation of resources from early stages to late stages of production, but considerations of capital specificity would limit the scope for such reallocations. Thus the temporary premium on consumption goods would result in an increase in the demand for investment funds to expand late-stage investment activities. Both consumption and, to a lesser extent, investment would rise. The economy would move beyond its production possibilities frontier, and the rate of interest would be artificially high. Subsequent spending patterns and production decisions would eventually bring the economy back to its frontier. As in the case of credit expansion, the intertemporal discoordination could give way to a spiraling downward into recession. The recovery phase would differ in at least one important respect. Excessive late-stage investments are by their very nature more readily liquidated than excessive early-stage investments. If only for this reason, we would expect a transfer expansion to be less disruptive than a credit expansion.

Figure 4.5, “A generalization of the Austrian theory,” shows three possible cases of monetary expansion: credit, credit-and-transfer, and transfer. The

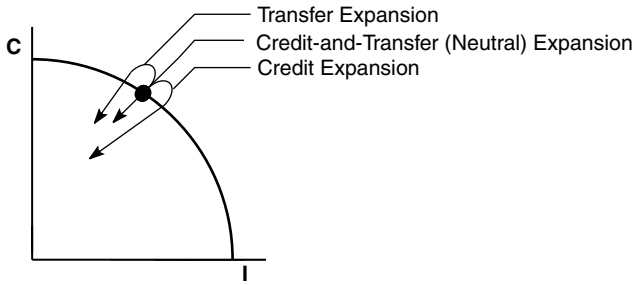


Figure 4.5 A generalization of the Austrian theory.

family of cases exhibits both symmetry and asymmetry. The general adjustment paths of the credit expansion and the transfer expansion are largely symmetrical about the path of the neutral (credit-and-transfer) expansion. But the potential for a severe depression as gauged by the kind and extent of intertemporal discoordination translates into an asymmetry. It is undoubtedly greatest for a credit expansion (because early-stage capital can take more time to liquidate) and least for a neutral expansion (because there is no systematic intertemporal discoordination).

The earliest treatment of the intertemporal effects of monetary expansion (by Mises and Hayek) was offered not as a completely general account but rather as the most relevant account. The very terminology used here to make the distinction between the different kinds of monetary expansion – the relatively familiar “credit expansion” and the relatively unfamiliar “transfer expansion” – suggest that the former is still the more relevant. And though specific, the case of credit expansion is readily generalizable in a way that the alternative theories in which the possibility of a bias favoring investment or consumption is simply assumed away at the outset are not.

We turn now to retrace some of the key issues about the Austrian theory of the business cycle in the context of some critical assessments of the theory.

### Elasticity of expectations and lag structure

In the previous section, we tracked the economy through the artificial boom and subsequent bust without much explicit reference to entrepreneurial expectations. However, there are strong implications about the consequences of entrepreneurial behavior in the very notion of a market process: the market works, but it does not work instantaneously. In the present section, we make our views on the role of the entrepreneur explicit by focusing on the issue of expectations in the context of early and ongoing criticism of the Austrian theory. The focus will be on Hicks (1967), although similar criticism can be found in Cowen (1997). Our response to Hicks, which

makes use of the boom–bust dynamics depicted in Figure 4.4, is fully consistent with the response offered by Hayek ([1969] 1978).

In Chapter 2 we identified the two assumptions – or more accurately, the two understandings – about expectations that are consistent with the Austrian theory: (1) prices, wages, and interest rates do convey information about underlying economic realities; and (2) market participants do not already have enough information about those realities to make the conveyed information irrelevant. Together, these two propositions leave much scope for the interpretation of the market's reporting on changes in the particular circumstances of time and place. This is only to say that price changes are market signals, not marching orders. Market participants do not react mechanistically to a price change. Their reactions will depend upon their expectations about future changes in this and other prices.

Ludwig Lachmann has taught us that expectations cannot legitimately be included in our list of givens. We must allow for price changes – and changes in market conditions generally – to affect expectations. And in some if not most applications, not even the direction of the effect is determinate. As mentioned in Chapter 2, Keynes was notorious for using this particular indeterminacy as something of a wild card to turn his argument in one direction or the other depending upon where, in his judgment, the argument needed to go. The Austrians use this same indeterminacy to establish the critical importance of the entrepreneur and the market process.

It was John Hicks (1939: 204–6) who provided the terminology for discussing the effect that a change in a price (or in a wage rate or interest rate) has on the expectations about future movements in that price. If the interest rate is forced down (by increased saving or by monetary expansion), will it stay down, fall even further, or rebound towards its previous level? We can ask this same question using Hicks's terminology: Is the elasticity of expectations unity (stay down), greater than unity (fall further), or less than unity (rebound)? The answer hinges critically upon the entrepreneurs' perceptions – or, more generally, the market participants' perceptions – of the nature of the reduced interest rate: Is it widely perceived that the new rate reflects new underlying economic realities? Is it widely perceived that the new rate is a contrivance of the monetary authority? Or, are perceptions mixed and ill-formed?

For the market to be able to accommodate a permanent change in intertemporal preferences, the manifestation of which is a saving-induced increase in loanable funds, the elasticity of expectations with respect to the interest rate has to be much greater than zero. The closer the elasticity of expectations is to unity, the more fully and quickly the market will adjust. (Actually, an elasticity of expectations greater than unity during the period in which the loan market itself is still adjusting to the increased savings would speed up the overall adjustment.)

For the market *not* to be misled at all by a monetary expansion, whose initial manifestation is a bank-induced increase in loanable funds, the

elasticity of expectations with respect to the interest rate would have to be zero. An initial rate of, say, 8 percent would be accompanied, even under the downward pressure of monetary expansion by the central bank, by the expectation of an enduring 8 percent (real) interest rate. If the interest were actually to fall as a result of the downward pressure, it would revert to its initial level very quickly as speculators traded on the basis of their inelastic expectations. In the limiting case, in which the market is not misled at all, the lag between the fall and the reversion would itself have to be zero. The downward pressure on the interest rate would be pressure only, the (real) interest rate would remain at 8 percent, and the only effects of credit expansion would be those associated with excessive cash balances: the general price level would rise and the nominal interest rate would include an appropriate inflation premium.

The notion that the central bank cannot, even for a short period, reduce the rate of interest is as implausible as the notion that it can completely fool the economy – permanently – into behaving *as if* market participants were more future-oriented than they actually are. Like back scratchers in a New Classical construction, who cannot determine instantly whether a price change is a local (real) or a global (nominal) phenomenon, market participants in the Austrian construction cannot determine instantly whether a reduction in the interest rate will prove to be a lasting (saving-induced) change or a temporary (money-induced) change. The New Classical/Austrian parallel is stated in terms of a *reduced* rate of interest rather than in terms of (ineffective) downward pressure on the interest rate, implying that the relevant elasticities are greater than zero for both schools. We might even posit a “Hayek Demand Curve” that relates to the markets for inputs in early stages of production in the same way that the “Lucas Supply Curve” relates to the market for output in New Classical constructions.

Market participants can be fooled by the central bank. Expectations about the interest rate are, at best, mixed and ill-formed. The only questions open for discussion, then, are: Just what are they fooled into doing? And to what extent? And for how long?

Expectations here are endogenous in a way the business cycle theorist cannot afford to ignore. That is, expectations about the interest rate, which are mixed and ill-formed at the time that the interest rate falls, will change with the cumulative market experience that flows from the consequences of the lower rate. Changes in the pattern of prices and wages, as well as the more direct interest-related changes in the pattern of capital assets will increasingly favor one interpretation over another. Expectations will change accordingly. The economy will find itself well on its way along a new growth path, or it will find itself dealing with a cyclical downturn. The critical issue can be expressed in terms of lags. How long will it take for the new – or possibly unchanged – economic realities to become fully reflected in expectations? If the lag is sufficiently short, then artificial booms and subsequent crises are of little significance, and all prolonged interest-

rate reductions are real and give rise to an increased growth rate. If the lag is sufficiently long, then the distinction between artificial and genuine booms is itself an artificial distinction. The central concern of business cycle theory is one that entails an intermediate lag, one long enough to allow a boom to get under way but short enough to prevent it from maturing into real growth.

In some critical assessments of the Austrian theory of the business cycle, such as in Hicks's telling of "The Hayek Story" (1967), the question "What about expectations?" morphs into the question "What about lags?" And here, as with expectations, the question is typically posed anachronistically. Dating from the Keynesian revolution and the breakaway of macroeconomics (discussed in Chapter 2), lags have been treated as amendments to a theory that is otherwise formulated in terms of contemporaneous macroeconomic magnitudes. Many of the thematic variations of modern labor-based macroeconomics derive from the "adding" of some lag structure. Hicks considered alternative lag structures to see if he could save Hayek, who – mysteriously, or so it seemed to Hicks – had failed to specify just what supposedly lags what: Does the inflation premium built into the market rate of interest supposedly lag behind the current rate of inflation? No, Hayek's theory does not hinge in any important way on changes in the general purchasing power of money. Do prices and/or wages supposedly lag behind nominal demands for output and/or labor? No. These features would be distinctly un-Hayekian. In fact, as Hicks recognizes, all such attempts to shore up the Austrian theory by guessing at the supposed lag structure have the effect not of saving Hayek from himself but of making Hayek look like Keynes.

As with expectations, lags are not added to Austrian theory but rather are embedded in it from the outset. Capital-based macroeconomics gives us a lag-infused theory of the business cycle. The means-ends framework of the Austrian School features the time element between the employment of means and the achievement of ends. In Hayek's formulation, as depicted by the Hayekian triangle, the time element manifests itself as the temporal sequence of stages of production. Hicks might have asked: Does the selling of automobiles supposedly lag behind the mining of the iron ore that constitutes one of the inputs in the automobile production? Yes, it supposedly does. But it would be misleading simply to answer in the affirmative and declare that we have at long last discovered the Hayekian lag. What we have discovered is the fundamental difference between Keynes-inspired labor-based macroeconomics, which fails to incorporate in any direct way the idea that production takes time, and the capital-based macroeconomics of the Austrian School, for which production time is a central feature.

Hicks actually considers the possibility that Hayek's theory of the business cycle is based on the "production lag (of outputs behind inputs)." He rejects this avenue of interpretation on the grounds that as long as there are no lags in market adjustment, the time-structure of production is irrelevant.

Here, Hicks is implicitly assuming that, in the face of a monetary expansion, an elasticity of expectations of zero applies, if not directly to interest rates, then to each of the individual inputs and outputs that define the temporal sequence of stages of production. Or rather, he is suggesting that if these elasticities of expectations are not all zero, then it is incumbent upon Hayek to explain just why not. The explanation, of course, which typically goes without saying in the Austrian literature, is that market participants do not know, cannot know, and cannot behave as if they know the true nature of a change in market conditions at the moment of change. It is, in fact, the market process itself, as guided by the new market conditions, that reveals the nature of the change. If the process plays itself out as an increased growth rate, then the initiating change was a preference change; if rather than play itself out, the process does itself in, then the initiating change was a policy change.

Superior expectations or good guesses on the part of some will allow them to avoid losses or even to make profits during the time that the process is revealing its true nature. A creative reading of the yield curve (the pattern of interest rates across securities of varying maturities) will provide clues about the market's interest-rate forecasts. But only the attribution of the most extreme and implausibly "rational" expectations to entrepreneurs and to market participants generally would convert this otherwise time-consuming process into an instant revelation about the nature of its results.

The Austrian lag structure, then, mirrors the structure of production. Still, there is some explaining to do to link the cycle-relevant lag with the production-relevant lag. Overly simple expositions of the Austrian business cycle theory tend to play into the hands of critics such as Hicks. Untenable expositions have the economy moving *along* the PPF in the direction of greater investment and then (when?) moving back. Consider the following capsulization of the theory: a policy-induced decrease in the rate of interest causes entrepreneurs to initiate new long-term projects, bidding labor and other resources away from consumer-goods industries and paying for them with the cheap credit. But these workers and resource owners have not changed their attitudes toward thriftiness. They want to spend their incomes in the same pattern as before the interest rate was reduced. Demand in the consumer-goods industries, then, would remain unchanged. Consumer spending will sooner or later (why not immediately?) reverse the process of capital restructuring, turning the artificial boom into a bust.

It would seem (to Hicks and many others) that labor and other resources would be bid back almost immediately, reversing the process or, most likely, preventing the process of capital restructuring from getting under way. Hicks (1967: 208) insists that the spending first by borrowers of the new money and then by the subsequent income earners would be almost instantaneous – within a "Robertsonian week." To believe otherwise would seem to imply that the income earners, inexplicably, are holding unusually large



cash balances for a considerable period of time. Was Hicks right after all? Is there some spending lag here that gives duration to the period of malinvestment – some systematic lag between the earning of income made possible by cheap credit and the spending of that income on the economy's output? We think not. But while there is no lag between earning and spending, there is some scope, as we have already depicted in Figure 4.4, for the expansion of output in *all* stages of production. Here, Hayek's concept of money as a loose joint in an otherwise self-equilibrating system is critical. His theory of the business cycle, after all, is a monetary theory. The injection of money through credit markets serves as the trigger, or impulse, that initiates the artificial boom. The use of money throughout the system loosens the otherwise tight joints in the economic process and allows the artificial boom to perpetuate itself well beyond the Robertsonian week.

As indicated in the previous section, the idea that an increased output can be experienced in all stages of production has its counterpart in modern labor-based macroeconomics. Unsustainably high levels of output characterize both the Austrian story and the long-run/short-run Phillips curve story as told by Milton Friedman and Edmund Phelps. In the Friedman–Phelps analysis, however, too much labor and too much output is the whole story. In the Austrian analysis, the (limited) scope for increased output at all stages translates into scope (i.e. time) for misallocations *among* stages. During the upswing, then, the changes in output levels throughout the structure of production have both an absolute and a relative dimension to them. In terms of the PPF in Figure 4.4, the path away from the initial equilibrium goes beyond – rather than along – the frontier.

The Austrian theory has often been described as an over-investment theory of the business cycle. If this were the whole story, Mises–Hayek would simply be a variation of Friedman–Phelps. Defenders of the Austrian theory, including the present writer, have often argued that to categorize the theory as an over-investment theory is to miscategorize it. The Austrian theory is a malinvestment – rather than an over-investment – theory of the business cycle. It is certainly true that policy-induced malinvestment is the unique aspect of the theory. We now see, however, that while malinvestment – the misallocation of resources in the direction of stages remote from consumption – is rightly taken to be the unique and defining aspect of Austrian theory, over-investment is a critical enabling aspect of the theory. Without the over-investment, the malinvestment would be as short-lived as Hicks's critical remarks suggest.

If it is the over-investment that allows the boom to perpetuate itself beyond the Robertsonian week, it is the malinvestment that eventually brings the boom to an end. Here, again, the market process rather than some set of expectations or elasticities that existed at the beginning of the boom is what counts. On the specific issue of intertemporal malinvestments and their eventually being revealed as such, the Hayekian triangle has to be interpreted with great caution. It is all too easy for the Austrian macroeconomist to

become a not-so-Austrian geometrician. In response to a policy-induced reduction of the interest rate, one leg of the triangle (measuring the stage dimension of the structure of production) lengthens; the other leg (measuring the final output of the production process) shortens. The forced saving, i.e. the reduced output of consumption goods allows for expansion of the early stages of production. This is the pure malinvestment. In response to Hicks's critical assessment, we must superimpose this relative effect onto the absolute effect in the form of a general expansion of all stages.

It is not implied, however, that this compounding of over-investment with malinvestment applies to each business firm in a way that can be fully anticipated at the outset of the expansion. If this were the implication, then the analysis would, once again, be vulnerable to Hicks's critique. As soon as each entrepreneur learned of the cheap-credit policy, he could correct for the resulting distortions in input prices and output prices associated with his or her firm. For the individual entrepreneur, this correcting for distortions would constitute a hedge against losses in the coming crisis; for entrepreneurs collectively, this systematic correcting would cut the boom short, minimizing the crisis if not avoiding it altogether.

Such correcting for distortions, however, presupposes that each entrepreneur knows precisely where he or she is in the structure of production. In this connection, Hayek's triangle can be more misleading than enlightening. The entrepreneur is not supplied with – and cannot create for himself – a Hayekian triangle complete with a clearly marked sign that reads: YOU ARE HERE. Designed to emphasize the essential time element in the production process, the triangle abstracts from the actual complexities of the economy's capital structure. Feedback loops, multiple alternatives for inputs, and multiple uses of outputs, all of which destroy the strict linearity implied by the triangle, are not the exceptions but the rule. These complexities, emphasized by Lachmann, preclude the hedging against crisis and downturn on a sufficiently widespread basis as to actually nullify the process that would have led to the crisis. The idea that entrepreneurs know enough about their respective positions in the Hayekian triangle to hedge against the central bank is simply not plausible. It all but denies the existence of an economic problem that requires for its solution a market process.

But it is equally implausible that no entrepreneur has any idea where he or she is in the Hayekian triangle – or, more to the point, in the economy's complex structure of production. Entrepreneurs are not in total ignorance about the relationship between their own activities and the rest of the economic system. To claim that they are would be to deny even the possibility of a market solution to the economic problem. Many entrepreneurs can and will make some judgments in this direction and those judgments will be conveyed to others through the price system. Entrepreneurs who perceive their own judgments to be superior ones may even attempt to leverage their gains during the artificial boom before hedging against the inevitable crisis.

The intertemporal allocation of resources, like the allocation of resources even more broadly conceived, requires both (a) the knowledge and hunches of entrepreneurs, including their expectations about future changes in prices, wages, and interest rates, and their understanding of their relationship to the rest of the economy; and (b) the unfolding of the market process, during which price and quantity changes confirm or contradict the entrepreneur's knowledge, hunches, and understanding and provide a continuous basis for adjusting expectations. Accordingly, it is the process itself that translates a change in intertemporal preferences into a new growth rate and that translates a monetary disturbance into a crisis and downturn. The "lag" that Hicks and others have been looking for is nothing but the recognition that this market process takes time.