7

Transitions to New Policy Systems

Most modern macroeconomic research on policy rules has focused on their optimal design. The preceding chapter is an example of this research and illustrates the tremendous progress and potential of empirical macroeconomics in policy analysis. However, questions about making a transition from one policy rule to a new one have been given relatively little attention. It is as if policy systems, after being proposed and analyzed by researchers, are put on the shelf waiting for policymakers to come and help themselves when the time is ripe, with few guidelines on how to handle the transition from one system to the next. Since the ripe time usually turns out to be an unanticipated crisis, such guidelines can rarely be developed on the spot.

This situation is not unique to macroeconomics. In general, economists have been better at determining what type of system works best than at determining how to make a transition to that system. In public finance, for example, there are many good arguments in support of a consumption tax, but there is little research on the important problem of how one makes the transition from an income tax to a consumption tax. In international-trade theory, not much is known about the appropriate speed at which one should move to free trade. And, perhaps most important of all, economists have shown the benefits of a market economy over a centrally planned economy but have little to go on when giving advice about the transition from one system to another.

In this chapter, I look at the problems of transition to new policy rules. Because there has been relatively little research in this area and because the problems are more difficult, the framework is less formal than for the design of policy rules. Nevertheless, I believe that quantitative economic analysis has something to say.

7.1 Analysis of Policy Transitions

Perhaps the most dramatic change in macroeconomic policy systems involves changes in exchange-rate regimes, such as the creation of the Bretton Woods system, its demise, or its partial re-creation in the European Monetary System. But there are many other more elementary examples, and the nature of transitions to new policies can be best illustrated with these examples. Most are related to the policy rules in Chapter 6.

Examples of Transitions

Suppose that it becomes clear that a policy in operation is not performing well and that a new policy system would work better. The most elementary example—though not the easiest—is when it is recognized that the target in the policy rule in Equation (6.1), (6.2), or (6.3) is wrong (see Chapter 6). Rather than aim for a target price level P^* that grows at 10 percent per year, it is recognized that a target price level growing close to 0 percent per year would be better for long-run economic performance. In this example, only the "intercept" term in the policy rule must be changed. This transition problem is, of course, none other than the problem of disinflation, and there are many examples of more sizeable changes in the targets. This macroeconomic transition from high inflation to low inflation has been part of the problem of overall transition to market economies in the formerly centrally planned economies in Eastern Europe and in the former Soviet Union.

Another example involves changes in the response coefficients of the policy rule. The optimal size of these response coefficients was the subject of the last part of Chapter 6. Suppose, for example, that a nominal-income target had been in operation, but a number of new studies show that a monetary rule with a smaller response coefficient on real output than on the price level would be better than a nominal-income rule. That is, it is recognized that g_2, the coefficient on real output in Equation (6.3), should be less than g_1, the coefficient on the price level, whereas previously they had been equal.

Similar examples can be given for fiscal policy rules. Analogous to a change in the intercept in the monetary policy rule would be a recognition that the budget deficit should be balanced at full employment. Analogous to a change in the response coefficient would be a recognition that an increase in the response of the automatic stabilizers to economic conditions would be desirable. The latter might entail a change in the unemployment compensation system that determines at what unemployment rate long-term unemployment benefits are automatically paid.

Why do we need any special treatment of these transitions? If a thorough design analysis—based on the work of a number of different analysts using different approaches—suggests that particular targets and response coefficients in a policy rule are appropriate, would it not be best to simply start doing what the rule says, immediately? Probably not, and this, for two reasons.

Learning

First, the research that underlies the design of policy rules assumes that expectations are rational. As I have argued, this makes sense when a policy is in operation for a long time. People will have adjusted their behavior to the policy in place, and expectations of policy and other variables are most likely to be unbiased. However, in the period immediately after a new policy rule has been put in place, people are unlikely to either know about or understand the new policy or to believe that policymakers are serious about maintaining it for long. Simply assuming that, during this transition period, people have rational expectations and know the policy rule is probably stretching things. Instead, people may base their expectations partly on past policy in a Bayesian way, or they may try to anticipate the credibility of the new policy by carefully studying the personalities of the policymakers (or of their economic advisers) and their past records, or by trying to assess whether the policy will work as advertised.

Because expectations only gradually converge during this transition period, the impact of the policy rule on the economy may be quite different from what is projected by an analysis that assumes rational expectations.[1] In most cases, uncertainty and bias in expectation formation will make the new policy work less well during a transition. In these cases, efforts to make the new policy credible will reduce the costs associated with a transition, and this is the great value of credibility to policymakers.

This problem of learning about a new policy during a transition was worked out in the case of a change in the price level, or inflation, target in a very simple model in Taylor (1975). It is optimal to make the new policy as credible as possible if the initial inflation rate is above the long-run inflation rate, as in the disinflation examples given above. However, in the case where the inflation rate is initially lower than is optimal, a welfare function that includes both inflation and unemployment can be increased by only gradually informing the public about the plans to move to a new policy. In this unusual case, the precise amount of information to release each period can be computed by using optimal control theory.

Rigidities

A second reason for worrying about transitions is that there are natural rigidities in the economy that prevent people from changing their behavior instantly. People may have committed themselves to projects, plans, or contracts under the assumption that the old policy was in place. Moreover,

[1] That was the main point of Taylor (1975).

they may have assumed that other people they deal with have similar commitments. The long-term wage-setting commitments used throughout this book are primary examples, but there are many others, including long-term investment projects and loan contracts. Such rigidities usually suggest that the transition to a new policy rule should be gradual and announced publicly. This gives people a chance to unravel previous commitments without significant losses.

In the remainder of this chapter I look at these transition problems more explicitly for two important macroeconomic cases: (1) the transition to a monetary policy rule with a zero-inflation target, and (2) the transition toward a fiscal policy rule with a balanced full-employment government budget.

7.2 Transition to a Monetary Policy Rule with "Zero" Inflation

This section considers the problem of transition toward a zero-inflation monetary policy rule. The key objective is to devise a way to move to such a rule with the smallest possible costs to the economy. Here I explain how it is possible, at least under ideal circumstances, to devise a transition path with no loss of output. I focus on the United States and endeavor to make the calculations as precise as possible by introducing more detailed wage-setting equations than those used in either Chapter 2 (Equations [2.1] and [2.2]) or Chapter 3 (equations [3.1] or [3.2]). This permits the "calibration" of the equations by using micro data on long-term union labor contracts. Long-term labor contracts in the United States usually last for several years, although some contracts are indexed and some multiyear contracts entail deferred wage increases in the second and third year of the contract. This requires some modification of the contract equations that I first must explain.

Calibration of the Wage-Setting Equations

Let $x_j(t, s)$ be the log of the wage set in contracts of length j signed in quarter t to prevail in the sth quarter following quarter t. I assume that j equals either 4, 8, or 12 quarters, corresponding to one-, two-, and three-year contracts. I also assume that wage changes occur at yearly intervals; that is,

$$x_j(t, s) = x_j(t, 0), \quad s = 1, 2, 3, \quad j = 4, 8, 12 \tag{7.1}$$

$$x_j(t, 4 + s) = x_j(t, 4), \quad s = 1, 2, 3, \quad j = 8, 12 \tag{7.2}$$

$$x_{12}(t, 8 + s) = x_{12}(t, 8), \quad s = 1, 2, 3. \tag{7.3}$$

Equation (7.1) states that the wage level is constant during the first year of the one-, two-, and three-year contracts ($j = 4, 8, 12$) and equal to the value determined in the first quarter $x_j(t,0)$. Equation (7.2) states that the wage level is constant during the second year of the two- and three-year contracts $(j = 8, 12)$ and equal to the value set in the first quarter of the second year $x_j(t,4)$. Finally, Equation (7.3) states that the wage level is unchanged during the third year of three-year contracts $(j = 12)$.

During each quarter, six wage levels are determined; three current levels: $x_4(t,0)$, $x_8(t,0)$, and $x_{12}(t,0)$; and three deferred levels: $x_8(t,4)$, $x_{12}(t,4)$, and $x_{12}(t,8)$. Note that there is no presumption that the deferred wage levels are equal to the current levels, so that deferred increases are possible according to this setup.

The aggregate wage is a weighted average of the contract wages and is given by the expression

$$w(t) = \frac{\sum_j \sum_{s=0}^{j-1} n_j(t-s)x_j(t-s,s)}{\sum_j \sum_{s=0}^{j-1} n_j(t-s)}, \tag{7.4}$$

where $n_j(t)$ is the number of workers in contracts of length j in quarter t. Equation (7.4) should be interpreted as the log of a geometrically weighted index of contract wages. It is analogous to the average wage defined in Chapter 2.

Wage determination is analogous to Equation (2.1) of Chapter 2 or to Equation (3.1) of Chapter 3. In particular, I assume that, in the absence of a need for a change in relative wages, workers and firms attempt to keep their own wages as close as possible to the prevailing level of wages during the period of the contract, with adjustments for skill and other differentials. If wage adjustments are thought to be necessary because of a shift in labor-market demand or supply conditions, then these adjustments will be made relative to this prevailing wage.

Consider first the case of nonindexed contracts. Assume that one-year contracts call for a wage adjustment to equal the average wage expected to prevail during the contract period. Similarly, the first year of two- and three-year contracts will have a wage adjustment equal to the prevailing wage during that same one-year period. Algebraically, the current settlements are then given by

$$x_j(t,0) = \frac{1}{4}\sum_{s=0}^{3} \hat{w}(t+s), \qquad j = 4, 8, 12, \tag{7.5}$$

where $\hat{w}(t)$ is the expectation of $w(t)$, the average wage defined in Equation (7.4). For the deferred wage increases in the second year of two- and three-year contracts, assume that

$$x_j(t,4) = \frac{1}{4}\sum_{s=4}^{7} \hat{w}(t+s), \qquad j = 8, 12 \tag{7.6}$$

and finally, for the deferred increase in the third year of three-year contracts,

$$x_{12}(t,8) = \frac{1}{4}\sum_{s=8}^{11} \hat{w}(t+s). \tag{7.7}$$

Note that I do not add a measure of unemployment relative to the natural rate, or real output relative to potential output, to the right-hand side of these equations as was done in Chapters 2 and 3. By forcing these terms to equal zero, I ensure algebraically that the transition occurs in such a way that the pattern of wage settlements is consistent with full employment—disinflation without recession. Of course, it would be possible to modify the model by adding unemployment effects to the right-hand side of Equations (7.5) through (7.7) in order to examine how much unemployment might change for different transition paths.

When contracts are indexed, the contracted adjustment in wages will reflect the expected increase or decrease in wage rates that will arise because of changes in the price level. Consider the following example. In a steady inflation of 10 percent, the above contracting arrangements would imply that a three-year contract without indexing would have a 10-percent increase in the first year, followed by a 10-percent increase in each of the next two years $(10, 10, 10)$. Suppose, instead, that contracts are indexed at .3 in the second and third year, so that a 10-percent increase in the price level automatically adds 3 percent to the wage in the second and third year. Then, in a steady 10-percent inflation where prices and wages are increasing at the same rate, the set-wage increase would again be 10 percent in the first year but only 7 percent in the second and third years $(10, 7, 7)$. The remaining increase in wages of 3 percent in the second and third years would come from indexing; that is, $(10, 7, 7) + (0, 3, 3) = (10, 10, 10)$.

These effects are incorporated into the equations by adjusting down the set wage in Equations (7.6) and (7.7) by the amount of increase that is expected from indexing. The exact size of the indexing is assumed to be a constant fraction of the increase in the aggregate-price level during the previous four quarters. This constant is the same for all workers.[2] I assume that indexing reviews occur annually at the start of the second and third year of two- and three-year contracts. One-year contracts are not indexed. The real wage is assumed to be constant so that the indexing is assumed to be a fixed fraction of the increase in the aggregate wage. I will only simulate the model for paths for which the shocks to the equation system are equal to their expected values (zero) and for which real output is always equal to potential. The model, consisting of Equations (7.1) through (7.7) along

[2] Rather than assume that a fraction of workers have indexed contracts, I assume that all workers are indexed though at a lower rate. For example, if 50 percent of the workers have contracts indexed at .6, then this is treated in the model as if 100 percent of the workers have contracts indexed at .3.

with the full employment condition, is a linear (in the logarithms) rational expectations model. At each date, six wage levels are determined, and these depend on wage decisions made as far as eleven quarters in the past and on wage decisions to be made as far as eleven quarters in the future.

The model can be calibrated with data on the number of workers involved in contracts of different lengths, as shown in Table 7-1. For the calculations of the transition path, the number of workers was taken to follow the same pattern as for the three years from 1978 through 1980. To calculate the transition paths,[3] the model was solved by using the extended path algorithm discussed in Chapter 1. Deterministic simulations are appropriate for this transitional analysis, because a one-time move to a new policy is being investigated. In other words, we are not contemplating a megapolicy rule in which there is a probability of a switch to a new policy each period or a gradual move from one policy to another over time.

Consider a situation where the rate of wage inflation has been steady at about 10 percent per year. Then, according to the equations of the model, the current wage adjustment and deferred wage adjustments would all be equal to 10 percent per year. There would be a considerable overhang of deferred pay increases in future years. It is this overhang that makes it necessary for wage adjustments in other contracts to be gradual.

Suppose that, in the first quarter of a year, a general disinflation from 10 to 3 percent—measured in terms of wage inflation—begins and is thereafter expected to continue. With labor productivity growth of between 1 and 2 percent, wage inflation of 3 percent per year implies inflation in terms of the overall price level of between 1 and 2 percent per year. This is usually the range taken to be effectively zero inflation, recognizing various biases in measuring inflation. How such a disinflation is engineered through monetary policy depends greatly on how union wage settlements might develop. Table 7-2 shows the settlement pattern consistent with the equations of the model and therefore with full employment. The first six columns of Table 7-2 show the contract wage settlements in percentage terms. The column labeled "One-Year Contracts" shows the current settlement for workers signing one-year contracts in that quarter. Similarly the columns labeled "Year 1," in "Two-Year," and "Three-Year Contracts" show the percentage change in the current settlement for those cohorts. The columns labeled "Year 2" and "Year 3" show the deferred increase in the longer-term contracts. The effective wage change is simply the first difference of the log of the aggregate wage $w(t)$ from quarter to quarter $(w(t) - w(t-1))$. Because of the

[3]The details of the solution procedure can be explained as follows. I added a term $z(t) - w(t)$ to the right-hand side of the three contract equations and solved the model for a given $z(t)$ path. The variable $z(t)$ is defined so that actual output equals potential output when $z(t)$ equals $w(t)$. Such a $z(t)$ exists and is a function of the money supply for each country in the multicountry model (taking as given the money supplies of the other countries). I then summed up the squared differences in $[z(t) - w(t)]^2$ over the solution period and searched over $z(t)$ paths using a numerical algorithm to minimize the sum of these squares. The minimum value was always zero. By construction when $z(t) - w(t) = 0$, full-employment conditions hold.

Table 7-1 Number of Workers in Major Union Settlements by Contract Length, 1974:1–1987:4 (thousands of workers)

	Contract Length			
Quarter	*1 Year*	*2 Years*	*3 Years*	*Total*
1974:1	116	114	263	493
2	379	373	850	1,602
3	233	269	1,477	1,979
4	157	177	692	1,026
1975:1	67	86	395	548
2	172	326	264	762
3	325	215	529	1,069
4	77	84	231	392
1976:1	29	67	158	254
2	109	259	1,044	1,412
3	163	159	673	995
4	82	78	1,104	1,264
1977:1	43	98	226	367
2	215	138	950	1,303
3	125	121	1,325	1,571
4	52	60	400	512
1978:1	19	29	338	386
2	104	195	380	679
3	70	238	599	907
4	58	97	378	533
1979:1	45	31	186	262
2	107	164	836	1,107
3	39	49	1,166	1,254
4	29	135	667	831
1980:1	10	60	299	369
2	80	167	693	940
3	99	203	1,325	1,627
4	25	177	652	854

Source: Current Wage Developments (Washington, D.C.: Bureau of Labor Statistics). Major Settlements are those involving 1,000 or more workers. The numbers in the table are computed from cumulative totals published quarterly for each year. Before 1983:1, "1 Year" refers to contracts less than 18 months, "2 Years" refers to contracts between 18 and 30 months, and "3 Years" refers to contracts longer than 30 months. Starting in 1983:1, 1-year contracts are less than or equal to 12 months, 2-year contracts are between 12 and 24 months, and 3-year contracts are greater than 24 months. This change causes a break in the series in 1982:4.

seasonal pattern of workers negotiating each quarter, it is more informative to look at the change of $w(t)$ over four quarters.

The simulation begins in quarter 1 of year 1. Prior to this first quarter, the entries in Table 7-2 would have been 10 percent in all columns with the exception of the quarterly effective wage change that fluctuates seasonally.

Table 7-1 *(Continued)*

	Contract Length			
Quarter	*1 Year*	*2 Years*	*3 Years*	*Total*
1981:1	12	23	167	202
2	83	220	423	726
3	49	125	364	538
4	296	153	426	875
1982:1	34	79	530	643
2	94	651	491	1,236
3	119	146	564	829
4	—	—	—	—
1983:1	16	54	477	547
2	152	120	407	679
3	90	143	438	671
4	30	72	1,090	1,192
1984:1	20	73	229	322
2	92	138	282	512
3	61	141	410	612
4	43	42	776	861
1985:1	35	6	132	173
2	110	93	473	676
3	99	93	574	766
4	93	78	408	579
1986:1	35	49	199	283
2	46	122	521	689
3	36	44	795	875
4	28	86	525	639
1987:1	14	37	180	231
2	61	78	361	500
3	10	59	456	525
4	42	29	722	793

The entries in this last column were fluctuating seasonally according to the steady quarterly pattern 1.06, 2.66, 3.92, and 2.31, before the disinflation began.

What is most striking about Table 7-2 is the gradual decline in the inflation rate, especially in the early periods of the disinflation. The effective wage-change decline is barely noticeable for a full year. The decline is about 1 percentage point in the second year, a large 5 percentage points in the third year, and about 1 more percentage point in the fourth year. It is only after the new negotiations are well beyond the overhang of past deferred wage increases that noticeable declines in the inflation rate occur. Note, however, that in long-term contracts there is a definite sign that disinflation is underway: the third-year deferred increases in three-year contracts

Table 7-2 Current and Deferred Wage Changes during Disinflation (No indexing)

Year/ Quarter	One-Year Contracts	Two-Year Contracts		Three-Year Contracts			Effective Wage Change	
		Year 1	Year 2	Year 1	Year 2	Year 3	Quarter	Year
1:1	10.0	10.0	9.6	10.0	9.6	6.4	1.06	10.00
1:2	10.0	10.0	9.3	10.0	9.3	5.1	2.66	10.00
1:3	9.9	9.9	8.7	9.9	8.7	4.0	3.92	9.98
1:4	9.8	9.8	7.7	9.8	7.7	3.4	2.31	9.96
2:1	9.6	9.6	6.4	9.6	6.4	3.2	1.02	9.93
2:2	9.3	9.3	5.1	9.3	5.1	3.0	2.54	9.81
2:3	8.7	8.6	4.0	8.6	4.0	3.0	3.61	9.48
2:4	7.7	7.5	3.4	7.5	3.4	3.0	1.96	9.13
3:1	6.4	6.4	3.2	6.0	3.2	3.0	0.67	8.77
3:2	5.1	5.1	3.0	4.4	3.0	3.0	1.29	7.52
3:3	4.0	4.0	3.0	2.7	3.0	3.0	1.40	5.32
3:4	3.4	3.4	3.0	.9	3.0	3.0	0.60	3.97
4:1	3.2	3.2	3.0	3.2	3.0	3.0	0.34	3.64
4:2	3.0	3.0	3.0	3.0	3.0	3.0	0.81	3.15
4:3	3.0	3.0	3.0	3.0	3.0	3.0	1.18	2.93
4:4	3.0	3.0	3.0	3.0	3.0	3.0	0.70	3.02
5:1	3.0	3.0	3.0	3.0	3.0	3.0	0.32	3.00
5:2	3.0	3.0	3.0	3.0	3.0	3.0	0.80	3.00
5:3	3.0	3.0	3.0	3.0	3.0	3.0	1.18	3.00
5:4	3.0	3.0	3.0	3.0	3.0	3.0	0.70	3.00

are down substantially relative to the previous settlement. The third-year deferred increase in the settlement negotiated in quarter 2 is about half the previous third-year deferred increase.

Table 7-3 shows the results of a similar disinflation in the case where the contracts are indexed according to the assumptions of the model. It is assumed that on average, contracts have a 30-percent escalation. As one would expect, the actual effective wage change occurs more rapidly in this case as the indexing formulas permit some change in the wage levels determined in previous contracts. However, the difference is very small. Recall that there is no indexing in the first year and that indexing reviews occur only annually.

The transition is considerably slower than what is implied by rational expectations models with perfectly flexible prices. The simulations of this model indicate in quantitative terms how large the difference in speed might be if the U.S. union wage contracting is the source of stickiness. On the other hand, the speed of disinflation is faster than what is implied by conventional expectations-augmented Phillips curve models that imply that the rate of inflation cannot be reduced at all by aggregate-demand policy without an increase in unemployment. These models predict that inflation

TABLE 7-3 Current and Deferred Wage Changes during Disinflation (30-percent indexing)

Year/	One-Year	*Two-Year Contracts*		*Three-Year Contracts*			*Effective Wage Change*	
Quarter	Contracts	*Year 1*	*Year 2*	*Year 1*	*Year 2*	*Year 3*	*Quarter*	*Year*
1:1	10.0	10.0	6.6	10.0	6.6	3.6	1.06	10.00
1:2	10.0	10.0	6.3	10.0	6.3	2.5	2.66	10.00
1:3	9.9	9.9	5.7	9.9	5.7	1.8	3.93	9.98
1:4	9.8	9.8	4.8	9.8	4.8	1.8	2.31	9.96
2:1	9.6	9.5	3.6	9.5	3.6	2.0	1.02	9.92
2:2	9.3	9.2	2.5	9.2	2.5	1.9	2.53	9.79
2:3	8.7	8.6	1.8	8.6	1.8	2.0	3.58	9.44
2:4	7.6	7.4	1.8	7.4	1.8	2.1	1.93	9.07
3:1	6.3	6.3	2.0	5.9	2.0	2.1	0.66	8.71
3:2	5.1	5.1	2.0	4.3	1.9	2.1	1.28	7.46
3:3	4.0	4.0	2.0	2.6	2.0	2.1	1.40	5.27
3:4	3.4	3.4	2.1	1.0	2.1	2.1	0.61	3.94
4:1	3.2	3.2	2.1	3.2	2.1	2.1	0.34	3.62
4:2	3.0	3.0	2.1	3.0	2.1	2.1	0.81	3.15
4:3	3.0	3.0	2.1	3.0	2.1	2.1	1.18	2.93
4:4	3.0	3.0	2.1	3.0	2.1	2.1	0.70	3.02
5:1	3.0	3.0	2.1	3.0	2.1	2.1	0.32	3.00
5:2	3.0	3.0	2.1	3.0	2.1	2.1	0.80	3.00
5:3	3.0	3.0	2.1	3.0	2.1	2.1	1.18	3.00
5:4	3.0	3.0	2.1	3.0	2.1	2.1	0.70	3.00

would remain at 10 percent if unemployment does not rise above the natural rate.

For these calculations, the rational expectations assumption is essential. Not only do people have to act as if they know the model, they have to know about the change in policy and about the exact transition path. In other words, the learning problems discussed are very real. However, it is not clear that a simple passive model of Bayesian or least-squares learning would be very helpful here. The difficulty is that wage negotiators have to be convinced that a deceleration of inflation will come later even though it is not occurring today. People who use a Bayesian analysis to adjust their expectations depending on what happened in the past will not change their priors much at all for the first two years of disinflation. This credibility problem is perhaps the central source of difficulty encountered during a period of disinflation.

At the heart of this credibility problem is a time-inconsistency problem that takes a particularly explicit form in this model on union wage settlements: if policymakers argue that it is optimal to ratify the overhang of past deferred wage increases with high-money growth, they will find it difficult to convince wage setters that it is not optimal to ratify the deferred wage increases in the future if such increases take place.

7.3 Transition to a New Fiscal Policy

In this section I consider the transition of fiscal policy from structural budget deficit to structural budget balance. In particular I examine the effects of a change in fiscal policy in the United States, in which the growth of government purchases is cut so as to reduce the structural government budget deficit. It was this type of change that was the purpose of the 1990 budget summit agreement in the United States—although taxes were also changed in the agreement. The rationale for budget-deficit reduction was that this would increase national saving, raise domestic investment, and lower the trade deficit.

In 1990 policymakers aimed to reduce the structural budget deficit gradually over a five-year period. One of the reasons for gradual reduction was the type of transitional issue discussed in this chapter. Trying to make the budget-deficit reductions gradual and credible, the aim was that future budget-deficit reductions would have favorable effects on long-term interest rates and thereby reduce the negative short-run impacts that a decline in government spending might otherwise have. Credibility was to be enhanced by placing various new rules on the budget that I will describe in the discussion of policy operation in Chapter 8. These rules allowed the budget deficit to expand if a recession occurred (which it did) and focused on reducing the structural deficit.

The appropriate transition path for budget-deficit reduction can be calculated quantitatively. Because of the multiyear aspects of the strategy, it is important to use a rational expectations approach. This is the only formal way to estimate the effects on interest rates of expected future declines in the deficit. To illustrate how such an estimation might be done, I consider several transition paths in this section. They differ in the stance of monetary policy in the United States and of fiscal policy abroad, differences that are quite relevant to the question of transition.

Credible Multiyear Budget-Deficit Reduction

Suppose that real U.S. government purchases of goods and services grow less rapidly for a five-year period starting in the first quarter of 1991.[4] In

[4]The following calculations are performed using the multicountry model of Chapter 3. As already mentioned, for that model the size of the percentage impacts of policy changes does not depend much on the level of the variables or the period of the simulation. The estimates reported here are therefore essentially time-invariant. To focus on a particular example, I report them as if they apply to the 1991–1995 period to which the 1990 budget summit agreement applied. In fact, they were simulated for a period four years earlier.

particular, I assume that by the first quarter of 1996, this cut results in real government purchases lower than in reality by an amount equal to 3 percent of real output. However, the full amount of the cut does not occur immediately. It is phased in gradually from the first quarter of 1991 through the fourth quarter of 1996 in equal percentage increments: 0.6 percent of real output in the first year, another 0.6 in the second year, and so on adding up to 3 percent by the end of five years. The gradual phase-in is meant to mitigate the real output effects of a cut in government purchases. No changes in tax rates or in other components of government expenditure are assumed.

With a forward-looking model, it is important to describe the expectations assumption that underlies the change in government spending. The implicit assumption made here is that, as of the first quarter of the simulation, people become aware of the planned cut in government spending. They know, starting in that quarter, that real government spending will be eventually lowered by 3 percent of real GDP, and they know that the cut will be phased in gradually. As we will see, this expectation begins to have immediate and large effects on interest rates and exchange rates as soon as the cut is announced and before most of the cut takes place.

The simulation results are reported in Table 7-4. This is a single deterministic simulation, which is appropriate given that a one-time shift to a balanced structural deficit is being investigated. As in the case of a transition to zero inflation, we are not contemplating a megarule in which such shifts in policy occur randomly from year to year.

Of a very large amount of information that can be obtained from a simulation of the multicountry model, only the most relevant facts are shown in Table 7-4. For example, only the first quarter of each of the years is reported. The first quarter is more relevant than the yearly average for assessing the impacts of changes in expectations. Moreover, the table looks at a limited set of key variables in three of the seven countries: the United States, Germany, and Japan.

Recall first the long-run effects of a cut in government purchases of 3 percent of real output. The multicountry model satisfies the natural-rate property so that there are no long-run demand effects on output; that is, output returns to potential output, even if potential output is higher as a result of the "crowding-in" of investment. Hence, the decreased share of government purchases leads to an increased share of the sum of everything else: consumption, investment, net exports (recall that durable consumption depends on interest rates in this model). In the long run, prices and exchange rates will have settled down to new equilibrium paths so that real interest rates in all countries must be equal. Thus, the amount by which investment, consumption, and net exports change depends on how much the world real rate of interest declines, on the interest-rate elasticities of investment and consumption, and on the elasticities of import and export demand. In theory, real net exports could rise by the full amount of the cut in government expenditures (3 percent of real output), domestic

TABLE 7-4 Effects of a Reduction in U.S. Government Purchases, 1991–1996

The counterfactural decline in real government purchases is equal to 3 percent of real GNP. The decline is phased in gradually in equal percentage increments each quarter starting in 1991:1 and finishing in 1996:1. Figures are in percentage differences from historical values (or percentage point differences for interest rates and ratios).

	91:1	*92:1*	*93:1*	*94:1*	*95:1*	*96:1*
Short-Term Rates						
U.S.—federal funds	−.45	−1.67	−2.12	−2.40	−2.48	−2.35
Germany—call money	.15	−.65	−.79	−.80	−.70	−.58
Japan—call money	−.05	−.55	−.99	−1.19	−1.10	−.84
Exchange Rates						
D-mark	13.10	12.50	11.20	9.61	7.80	5.92
Yen	11.10	10.30	9.08	7.85	6.48	4.96
Long-Term Rates						
U.S.—government bonds	−1.10	−1.93	−2.26	−2.43	−2.41	−2.31
Germany—government bonds	−.38	−.71	−.79	−.77	−.66	−.54
Japan—government bonds	−.34	−.80	−1.09	−1.12	−.94	−.69
Real Spending						
U.S. consumption	−0.05	−0.21	−0.38	−0.54	−0.57	−0.51
U.S. investment	0.00	0.48	1.00	1.56	2.38	3.89
German investment	−0.19	0.10	0.98	2.10	2.86	2.88
Japan investment	−0.13	−0.43	0.05	1.18	2.38	3.42
U.S. exports	0.13	1.58	3.61	5.47	6.87	7.73
U.S. imports	−0.47	−3.86	−6.27	−8.13	−9.34	−8.77
U.S. real GNP	0.03	−0.26	−0.39	−0.72	−0.97	−0.58
German real GNP	−0.20	−0.44	−0.39	−0.25	−0.06	0.07
Japan real GNP	−0.10	−0.48	−0.51	−0.24	0.16	0.38
Prices						
U.S. GNP deflator	−0.10	−1.12	−2.50	−3.85	−5.02	−5.95
German GNP deflator	−0.02	−0.51	−0.95	−1.24	−1.37	−1.35
Japan GNP deflator	−0.01	−0.42	−1.10	−1.72	−2.02	−1.93
U.S. import price	1.21	4.72	6.38	6.73	6.24	5.26
U.S. export price	−0.04	−0.78	−2.06	−3.41	−4.65	−5.65
Ratios to Real GNP						
U.S. real national saving	0.06	0.67	1.42	2.01	2.58	2.85
U.S. real investment	−0.00	0.10	0.26	0.42	0.63	0.78
U.S. real exports	0.06	0.57	1.16	1.59	1.94	2.07
Ratio to GNP						
U.S. net exports	−0.07	0.03	0.15	0.35	0.48	0.46

saving could rise by 3 percent of real output (if the interest-rate elasticity of consumption was zero), and investment could remain unchanged (if the interest-rate elasticity of investment was zero). With high interest-rate elasticities, there might be a very small increase in net exports. Hence, even in the long run, the theoretical implications are ambiguous and quantitative estimates are needed.

Table 7-4 shows how real output and prices would fall in the United States relative to their baseline values. Note that the negative effects of the government spending cut on real output are very small. The government spending multiplier is at the most one-third. This small effect is a result of the spending cut being largely anticipated: it is known to be phased in gradually. In fact, the simulation in Chapter 5 shows that the output effects of a fully *unanticipated* 3-percent decrease in government spending would be very much larger. In this simulation, long-term interest rates fall immediately with the start of the budget cuts, and this begins to stimulate investment and consumer durable purchases. Note how long-term rates drop more than short-term rates in the first years of the simulation. This is due to the forward-looking term structure assumptions of the model. In addition, the dollar exchange rate depreciates by a fairly large amount in the first quarter, and this stimulates net exports. After its initial fall, the dollar appreciates, slowly permitting a differential to exist between U.S. interest rates and foreign interest rates. Prices fall relative to the baseline—that is, inflation declines—throughout the simulation, forcing nominal interest rates to fall. Because of rigidities, due largely to the staggered wage contracts, however, wages and prices do not adjust instantaneously and real output falls as described. This rigidity is the main reason for considering a gradual transition.

The output effects in Germany and Japan are larger than in the United States in the first few years of the simulation. Again, this is because of the anticipated aspects of the policy change: the exchange rates in Japan and Germany appreciate by a large amount, and this reduces exports and increases imports in these countries. The trade deficit falls in the United States as does the surplus in Japan and Germany. Moreover, with the dollar expected to appreciate after the initial fall, interest rates do not fall as much abroad as in the United States. Recall from Chapter 5 that an *unanticipated* increase in government spending in the United States has much larger effects on U.S. output than on foreign output.

Consider briefly the long-run effects. Five years after the start of the cut in government purchases, real net exports have risen by 2.1 percentage points as a fraction of real GNP. This improvement in the real trade deficit has resulted in an increase in saving (real output less real consumption less real government purchases—$Y - C - G$) of 2.9 percentage points and a rise in real investment of .8 percentage points. Stated differently, the cut in government purchases results in a nearly equal rise in saving, and about three-fourths of this rise in saving has been an increase in net exports. The government spending cut has crowded in much more real net exports than real investment. Note, however, that the long-run effects of the government-spending change have not fully been reached in five years. The real long-term interest rate in the United States is still lower than the real long-term interest rate in Japan and Germany, because the real dollar exchange rate is still appreciating. In real terms, the U.S. long-term interest rate is about 1.5 percentage points below what it would otherwise have been, and the long-term yen interest rate is about .8 percentage points below what it otherwise would have been, leaving a differential of about .7 percent. After a further period of time, the U.S. interest rate will rise a bit, and the Japanese interest rate will fall a bit, until they reach equality (in terms of deviations from the baseline). This will tend to raise the measured saving rate (as consumption falls) and to lower the investment ratio.

The Role of Monetary Policy in the Transition

In the months preceding the 1990 budget summit agreement in the United States, there was considerable discussion about the role of the Federal Reserve. In principle monetary policy could be used to help cushion any real output effects associated with a reduction in the budget deficit. Monetary ease brought about by an increase in the money supply could stimulate output in the short run so as to offset the decline in output brought about by the cutback in government spending. With a credible agreement to reduce the budget deficit in the future, people would figure that interest rates in the future would decline, and this would cause a decline in long-term rates that would increase the demand for investment and thereby offset the contractionary effects of fiscal policy right away. The decline in short-term interest rates brought on by the Federal Reserve would be smaller than if the contractionary fiscal policy were unanticipated. In fact, the Federal Reserve has indicated that an adjustment of monetary policy would be appropriate if such an agreement on fiscal policy could be worked out and was credible. But what was the "right amount" of adjustment of monetary policy?

To answer this question, consider what happens if the simulated change in government purchases is matched by an increase in the money supply in the United States. Suppose, for example, that the increase in the money supply is approximately of the same order of magnitude as the decline in prices in Table 7-4. The results are shown in Table 7-5.

With such a monetary policy, relative to baseline, real output in the United States expands rather than contracts. The main channel of monetary policy is the real interest rate. According to the simulations, the nominal interest rates—both short- and long-term—are about 1 percentage point higher with the easier monetary policy. Real rates, however, are lower. Prices are expected to rise by 1 percent over the first year relative to the baseline rather than fall by 1 percent, and this raises the expected rate of inflation by about 2 percentage points. On net, therefore, the real rate of interest falls by 1 percent, and this stimulates investment demand and durable-consumption demand.

TABLE 7-5 Effects of a Reduction in Government Purchases with an Increase in the Money Supply, 1991–1996

The decline in purchases is 3 percent of real output and is phased in gradually starting in 1991:1 and ending in 1996:1. The money increase is 8 percent, phased in the same way. Figures are in percentage differences from historical values (or percentage point differences for interest rates and ratios).

	91:1	*92:1*	*93:1*	*94:1*	*95:1*	*96:1*
Short-Term Rates						
U.S.—federal funds	0.63	−0.30	−1.19	−0.23	−3.41	−1.79
Germany—call money	−0.11	−0.52	−0.61	−0.61	−0.55	−0.49
Japan—call money	−0.05	−0.54	−0.87	−1.01	−0.90	−0.01
Exchange Rates						
D-mark	19.80	19.90	19.90	18.70	16.20	14.40
Yen	17.50	17.60	17.70	16.90	14.80	13.40
Long-Term Rates						
U.S.—government bonds	−0.27	−0.80	−1.84	−2.54	−2.17	−1.90
Germany—government bonds	−3.19	−0.56	−0.61	−0.59	−0.53	−0.46
Japan—government bonds	0.00	−0.01	−0.01	−0.01	−0.01	−0.01
Real Spending						
U.S. consumption	0.55	1.53	1.56	1.21	0.74	0.42
U.S. investment	4.96	13.30	9.77	9.85	7.45	6.22
German investment	−0.23	0.07	0.87	1.80	2.41	2.39
Japan investment	−0.13	−0.35	0.17	1.19	2.17	2.96
U.S. exports	0.22	2.14	4.15	5.69	6.72	7.24
U.S. imports	0.80	1.43	−0.50	−2.79	−5.43	−6.46
U.S. real GNP	1.02	2.12	1.84	1.25	0.29	0.05
German real GNP	−0.16	−0.25	−0.21	−0.12	−0.03	0.01
Japan real GNP	−0.10	−0.43	−0.40	−0.14	0.18	0.30
Prices						
U.S. GNP deflator	0.10	1.40	2.48	2.83	2.60	2.06
German GNP deflator	−0.01	−0.52	−0.86	−1.06	−1.12	−1.08
Japan GNP deflator	−0.01	−0.43	−1.03	−1.53	−1.72	−1.61
U.S. import price	1.83	7.49	11.10	13.00	13.50	13.00
U.S. export price	1.03	1.05	1.08	1.14	1.18	1.18
Ratios to Real GNP						
U.S. real national saving	0.50	1.54	1.99	2.49	2.76	2.76
U.S. real investment	0.57	1.47	1.47	1.53	1.34	1.06
U.S. real net exports	−0.07	0.07	0.53	0.96	1.42	1.70
Ratio to GNP						
U.S. net exports	−0.27	−0.56	−0.47	−0.19	0.10	0.25

In this case, the dollar depreciates by about 20 percent against the deutsche mark and by 18 percent against the yen. The reason is that the rise in prices in the United States requires a depreciation of the dollar. The increase in net exports in the short run is much smaller than without the money increase because the expansionary effects of money on U.S. demand increase imports more than the depreciation of the dollar decreases imports. Note that this is an example where a depreciation of the dollar is associated with a short-term worsening of the trade deficit. Eventually the short-run output effects wear off, however, and the effects on the trade deficit are much like in the earlier case. In the very long run the effects should be the same because money is completely neutral in the long run in this model.

Can we say which of the two scenarios is better on policy grounds? In terms of domestic price stability, the monetary expansion is better in that the price level does not fluctuate as much. Moreover, in terms of output, the monetary expansion seems better. The decline in output is less in Germany and Japan, and there is no output decline in the United States. In terms of nominal exchange-rate stability, the second scenario is worse, however, in that the nominal exchange rate has fluctuated more. However, this fluctuation in the nominal exchange rate has relatively small effects on the economy. This seems to be a case where one would prefer to see the nominal exchange rate, rather than the domestic price level, absorb the burden of adjusting the composition of output when the government spending share declines.

Internationally Coordinated Transitions

Table 7-6 attempts to look at the transition to a lower budget deficit in the United States when fiscal policy expands abroad. This situation is similar to what the United States and Japan endeavored to accomplish as part of the Structural Impediments talks in 1990 and 1991. By reducing government spending in the United States, the U.S. trade deficit would be expected to come down. By increasing government spending in Japan, the Japanese trade surplus would be expected to come down. It was hoped that this would reduce trade frictions between the two countries.

Table 7-6 shows the effects of a simultaneous reduction in government spending in the United States and an increase in foreign government spending, not only in Japan but also in Germany. The foreign expansion is gradually phased in just as in the United States. The increase in government spending in these two countries is 2 percent of their real output.

The gradual increase in government spending in Japan and Germany has very small effects on real output in these two countries. The depreciation of the dollar is larger than in the case where the United States alone contracts, and this reduces net exports in both Germany and Japan—one of the purposes of a coordinated change. Eventually, long-term interest rates in both Germany and Japan rise relative to the baseline so that there is some crowding-out of net investment in those countries, but most of the

TABLE 7-6 Effects of a Simultaneous Reduction in U.S. Government Purchases and a Rise in German and Japanese Government Purchases, 1991–1996

The decline in U.S. purchases is 3 percent of real output. The increase in Germany and Japan is 2 percent of output. All are phased in gradually starting in 1991:1 and ending in 1996:1. Figures are in percentage differences from historical values (or percentage point differences for interest rates and ratios).

	91:1	*92:1*	*93:1*	*94:1*	*95:1*	*96:1*
Short-Term Rates						
U.S.—federal funds	−0.30	−1.02	−1.37	−1.63	−1.73	−1.66
Germany—call money	−0.09	−0.24	0.00	0.25	0.52	0.54
Japan—call money	−0.04	−0.41	−0.37	−0.05	0.42	0.57
Exchange Rates						
D-mark	19.40	19.00	17.80	16.00	13.60	11.10
Yen	18.60	18.20	17.30	15.90	13.80	11.30
Long-Term Rates						
U.S.—government bonds	−0.67	−1.22	−1.51	−1.68	−1.69	−1.67
Germany—government bonds	−0.20	−0.14	0.11	0.35	0.52	0.53
Japan—government bonds	−0.24	−0.37	−0.17	0.20	0.50	0.54
Real Spending						
U.S. consumption	−0.01	−0.09	−0.22	−0.35	−0.36	−0.30
U.S. investment	0.16	0.40	0.67	0.94	1.56	2.80
German investment	−0.16	0.37	0.82	0.80	0.13	−0.58
Japan investment	−0.11	−0.07	0.56	1.19	1.18	0.59
U.S. exports	0.20	2.21	4.80	7.09	8.78	9.69
U.S. imports	−0.49	−4.04	−6.58	−8.58	−9.93	−9.48
U.S. real GNP	0.09	−0.11	−0.19	−0.49	−0.71	−0.32
German real GNP	−0.18	−0.05	0.14	0.27	0.44	0.27
Japan real GNP	−0.14	−0.26	−0.04	0.32	0.69	0.25
Prices						
U.S. GNP deflator	−0.07	−0.68	−1.58	−2.51	−3.37	−4.07
German GNP deflator	0.01	−0.35	−0.29	−0.01	0.33	0.64
Japan GNP deflator	0.00	−0.36	−0.58	−0.44	0.05	0.59
U.S. import price	1.51	6.10	8.77	10.00	10.20	9.70
U.S. export price	−0.03	−0.47	−1.29	−2.21	−3.09	−3.84
Ratios to Real GNP						
U.S. real national saving	0.08	0.72	1.48	2.08	2.65	2.93
U.S. real investment	0.01	0.07	0.16	0.26	0.43	0.54
U.S. real net exports	0.07	0.65	1.32	1.82	2.22	2.39
Ratio to GNP						
U.S. net exports	−0.09	0.01	0.15	0.37	0.50	0.47

adjustment in the composition of output is in net exports. As is clear in Table 7-6, the direct impact of the fiscal contraction in these two countries on U.S. net exports is very small. Comparing Tables 7-4 and 7-5 shows how a fiscal expansion of this magnitude in Japan and Germany improves the U.S. trade balance by only a few tenths of a percentage point and that it does cause a significant reduction on the trade surplus in those countries.

I have focused entirely on real net exports. Also shown in the tables are the changes in nominal net exports, as well as changes in export prices and import prices, which are the source of the difference between real and current dollar measures of net exports. As is clear in the tables, the change in current dollar net exports (measured as a fraction of nominal GNP) is very small for all the scenarios when compared with real net exports. The reason for this is that for all scenarios, import prices rise more than export prices. The fall in the ratio of export prices to import prices is about 11 percent after five years. The fall in the terms of trade is, of course, what stimulates real net exports, but this same fall offsets this increase when computing current dollar net exports. The offset is made worse in this scenario by the fact that for the historical values, imports are much larger than exports.

7.4 Conclusion

The purpose of this chapter has been to explore the problems associated with the transition from one policy rule to a new and, it is hoped, better policy rule. The problem of transition is frequently encountered but has been given relatively less emphasis in research than policy design as defined in this book. In this chapter I focused on two specific transition problems in macroeconomics: disinflation and structural budget-deficit reduction.

Transition problems arise because it takes time for people to learn about a new policy and how it works. Credibility on the part of the policymakers will reduce learning time and will frequently reduce the cost of a transition to a new policy. Bayesian or least-squares learning models are at best rough approximations of this learning process and present the disadvantage of not modeling the analysis of policymakers' credibility. This is an area where more research would be very useful.

Transition problems also arise because of rigidities in the economy, such as wage contracts, loan contracts, or other long-term commitments. These rigidities suggest a gradual implementation of new policies. By simulating estimated rational expectations models in a deterministic mode, one can estimate the appropriate speed of implementation of policy during a transition.

This chapter showed how these calculations can be made for two important policy-implementation problems, disinflation and budget-deficit reduction. In both examples, the new policy is different from the old policy only in the intercept coefficients of the policy rule. The same approach could be applied to more general transition problems.

Reference Notes

The literature on learning in rational expectations models expanded greatly in the 1980s. Bray (1983) and Frydman (1983), Marcet and Sargent (1989), for example, have considered the problem of convergence to a rational expectations equilibrium. Usually, learning is modeled by a Bayesian or least-squares mechanism. The problem of learning during a transition, as discussed in Section 7.1, pertains to the specific case where people must learn about a new policy, as presented in the paper on learning by Taylor (1975), which also assumed Bayesian learning.

The discussion of a transition to zero inflation discussed in Section 7.2 is drawn directly from Taylor (1983a). A refinement of those calculations that includes many one-year contracts in addition to the union labor contracts is reported in Taylor (1982). Phelps (1978) and Ball (1990) have studied analytically the problem of transition to a low inflation rule (disinflation) in staggered contract models.

The discussion of the transition to a lower budget deficit in Section 7.3 is based on simulations of the multicountry model reported in Taylor (1988) that pertained to simulations in the late 1980s. That paper focused on the trade deficit, the subject of the conference where it was presented.

McKinnon (1991) has considered the problem of transition to a market economy, addressing a broad range of economic issues beyond the macroeconomic transition questions that are the focus of this chapter. Lucas (1980) has briefly considered the problem of transitions to new policy rules in a paper on policy advising and policy rules, arguing that built-in institutional inertia and legislative lags would provide for a sufficiently gradual transition.