

BUSINESS FORECASTS 1978

A YEAR OF MODERATE ECONOMIC GROWTH

Sandra D. Baker and Bruce J. Summers

The views and opinions set forth in this article are those of the various forecasters. No agreement or endorsement by this Bank is implied.

Economic expansion will continue in 1978, albeit at a somewhat slower pace than last year. This is the basic consensus reached by a group of leading business analysts whose forecasts have been compiled by the Federal Reserve Bank of Richmond. Many of these forecasts are based on the following assumptions:

1. Continued uncertainty about national energy policy;
2. Reductions in personal and corporate taxes to take effect in the fourth quarter;
3. Economic growth abroad somewhat less than in the U. S.

On the basis of these assumptions, the forecasters collectively expect a 4.3 percent rate of real growth in real Gross National Product compared with 1977's estimated growth of 4.8 percent. This somewhat lower growth in output is expected to be accompanied by a 5.9 percent rate of increase in prices and a 6.7 percent average unemployment rate.

A consensus forecast is published by this Bank each year, together with the individual forecasters' comments on the economic outlook, in the booklet *Business Forecasts*. The purpose of this article is to briefly review the accuracy of the consensus forecast made a year ago for 1977 and to summarize the consensus forecast of business activity for this year. The 1978 consensus is derived by taking the median of 18 individual forecasts of the probable course of economic activity. Also summarized is a 1978 quarter-by-quarter consensus forecast derived by taking the median value of eight individual forecasts. Only five of these eight forecasts enter into the annual consensus. Readers interested in the detailed reasoning upon which the individual forecasts rest are referred to *Business Forecasts 1978*.¹

¹ The individual forecasts that comprise the consensus were all made last year. Given recent economic developments, it is not unlikely that some of these forecasts would be different if made today.

1977 CONSENSUS FORECAST REVIEWED

Data on 1977 GNP and its components are not yet final, but the accuracy of last year's forecast can be evaluated against preliminary statistics.

Last year's consensus proved quite accurate for both nominal and real GNP, the GNP price deflator, government purchases, and personal consumption expenditures. It was less accurate for private domestic investment. The only major forecasting error involved the net export sector.

The forecasters estimated that growth in nominal GNP would be 11.1 percent, only a little above the preliminary estimate for 1977 of 10.8 percent. Their estimate of the GNP implicit deflator was slightly low, 5.4 percent compared to the actual 5.6 percent. These two forecasting errors were partially offsetting, however. As a result, the 1977 forecasters only slightly overestimated the growth in real GNP. The consensus was for 5.0 percent while the latest estimate of actual growth is 4.9 percent.

Preliminary data show total personal consumption expenditures increased 10.6 percent in 1977 compared to a consensus prediction of 10.5 percent. Two components of personal consumption expenditures, consumer expenditures on durable goods and on services, were slightly underestimated. These underestimates were more than offset, however, by a substantial overestimation of consumer nondurable expenditures.

Gross private domestic investment, expected to rise by 16 percent in 1977, did significantly better than that and rose 21 percent, according to the latest estimate. Inventory accumulation, totaling \$18 billion according to preliminary data, occurred at a faster pace than the \$15.3 billion expected. Housing starts, another important factor explaining private investment, were forecast to increase 16.9 percent. This turned out to be a substantial underprediction of the actual rise of 28.6 percent. By contrast, the forecasters accurately projected that plant and equipment expenditures would increase 13.2 percent.

The consensus forecast of government purchases was 9.3 percent, identical to the estimated rise for the year.

One large exception to the forecasters predictive accuracy was their estimate of the level of net exports. They expected a 1977 export surplus of \$6.7 billion. In fact, however, preliminary data indicate that the net export sector showed a deficit of \$9 billion.

The industrial production index was predicted to increase 6.5 percent but actually grew 6.0 percent. The predicted average unemployment rate was 7.1 percent, very close to the actual 7.0 percent.

1978 CONSENSUS FORECAST IN BRIEF

Gross National Product Current dollar GNP, i.e., GNP unadjusted for the effects of inflation, is expected to increase by 10.4 percent in 1978. This expected change in the nominal value of goods and services produced is only slightly below that actually achieved in 1977. The rate of increase in the GNP implicit price deflator is expected to accelerate from last year's 5.6 percent to 5.9 percent. Accordingly, inflation absorbs over half of the predicted annual gain in 1978 nominal GNP. There is a widespread expectation among the forecasters that the year-over-year gain in real output for 1978 will come close to matching the solid record of 1977. Forecasters expect 1978 to be a year of moderate growth, with a consensus estimate that real GNP will increase 4.3 percent. This representative view, however, rests near the upper end of the range of forecasts from which it is derived. While the most optimistic forecast in the group sees real GNP increasing by only 4.7 percent, the most pessimistic sees it increasing by a low 2.9 percent. The consensus predictions of GNP and other key indicators in 1978, along with estimated results for 1977, are listed in Table I.

Personal consumption expenditures, the largest single component of GNP, are expected to grow by 9.3 percent, significantly less than the 10.6 percent gain for 1977. Moreover, important changes in consumption patterns for goods and services are expected to occur. The forecasters expect demand for consumer durable goods to rise by 6.7 percent, slightly greater than half the increase in 1977. An important factor underlying the predicted slower growth in expenditures on consumer durables is an anticipated weakening in domestic automobile sales. Unit automobile sales, which showed marked growth in the first two years of the current recovery, are expected to decline by 300 thousand units or 3.3 percent in 1978. Spending on nondurable goods, however, is expected to increase at a faster pace than last year and to compensate for the expected slowing

in durables spending. The nondurable component of personal consumption expenditures is seen as rising 8.6 percent, slightly greater than the growth that occurred in 1977. Projected growth in spending on services, on the other hand, is seen as falling below the actual percentage increase achieved during the past year.

The consensus forecast for gross private domestic investment calls for an 11.8 percent increase during 1978, a striking slowing from the estimated 21 percent gain recorded for 1977. Inventory investment is expected to remain unchanged, thereby making no contribution to the total expected rise in private investment. Also, after a vigorous increase during 1977, housing starts are expected to fall off slightly from the previous year's level. This suggests residential construction will make only a modest contribution to the overall increase in private investment. The 11.8 percent increase in private investment forecast for 1978, therefore, rests heavily on prospects for fixed investment by businesses. The consensus is that plant and equipment expenditures will increase 13.2 percent in 1978, the individual forecasts ranging from 14.1 percent to 5.5 percent.

Partially offsetting the forecast of slower growth in personal consumption and private investment is a predicted acceleration in the rate of government spending. Growth in purchases of goods and services by Federal, state, and local governments is expected to accelerate to 12.1 percent in 1978, well above the preliminary estimate of a 9.3 percent rise in 1977. Thus, it is anticipated that government spending will be an important factor in GNP growth in 1978.

According to the consensus forecast, net foreign spending should show a slight improvement in 1978 over 1977. In 1977, imports exceeded exports by an estimated \$9 billion on a national income accounts basis and thus exerted a drag on GNP growth. The consensus expectation is that this drag will continue in 1978 but will not be quite as great as last year. The distribution of individual forecasts making up this consensus, however, is unusually wide, ranging from a \$1 billion export surplus to a \$14 billion deficit. This suggests that there exists a good deal of uncertainty on the part of the forecasters about what to expect in the net foreign spending sector.

Corporate Profits Growth in before tax corporate profits is not expected to equal its 1977 pace. The individual forecasts unanimously predict that profit growth will be slower than the 8.8 percent registered in 1977. The forecasts range from increases of 1.7 percent to 8.5 percent, with the consensus calling for a 6.3 percent increase.

Industrial Production The Federal Reserve's industrial production index is expected to rise by 5.5 percent in 1978, somewhat below the 6.0 percent advance in 1977. This corresponds to the consensus forecast of a somewhat slower growth in real GNP in 1978 than in 1977. Individual estimates of the 1978 gain in the industrial production index range from 2.3 percent to 9.4 percent.

Unemployment Estimates of the average unemployment rate for 1978, which were made before the

December data and 1977 revisions were released, cluster closely around the consensus prediction of 6.7 percent. This would represent only a modest improvement over the 7.0 percent average for 1977.

Prices On the price front, individual forecasts for the wholesale price index range between 6.0 percent and 8.1 percent, with the consensus expectation at 6.0 percent. In 1977 this index rose 6.2 percent. The expected increase in the consumer price index, at 6.1 percent, is somewhat below the 1977 increase of

Table I
RESULTS FOR 1977 AND CONSENSUS FORECAST FOR 1978

	Unit or base ¹	Preliminary 1977 ²	Forecast 1978 ³	Annual Percentage Change	
				1976/1977	1977/1978
Gross national product	\$ billions	1890	2087	10.8	10.4
Personal consumption expenditures	\$ billions	1210	1323	10.6	9.3
Durables	\$ billions	179	191	12.9	6.7
Nondurables	\$ billions	480	521	8.4	8.6
Services	\$ billions	551	611	11.8	11.0
Gross private domestic investment	\$ billions	294	329	21.0	11.8
Change in business inventories	\$ billions	18	18	—	—
Government purchases	\$ billions	395	443	9.3	12.1
Net exports	\$ billions	-9	-8	—	—
Gross national product (1972 dollars)	\$ billions	1338	1396	4.9	4.3
Plant and equipment expenditures	\$ billions	136	154	13.2	13.2
Corporate profits before taxes	\$ billions	171	182	8.8	6.3
Private housing starts	millions	1.98	1.97	28.6	-0.3
Automobile sales (domestic)	millions	9.10	8.80	5.8	-3.3
Industrial production index	1967=100	137	145	6.0	5.5
Rate of unemployment	percent	7.0	6.7	—	—
Wholesale price index	1967=100	194	206	6.2	6.0
Consumer price index	1967=100	181	192	6.5	6.1
GNP implicit deflator	1972=100	141.3	149.6	5.6	5.9

¹ Dollar amounts are shown in nominal terms unless otherwise indicated.

² Data available as of January 20, 1978.

³ The 1978 consensus forecast is the median of year-to-year percentage changes provided by eighteen individual forecasts. Not all of the individual forecasts provided the detail shown here. Some items, therefore, are derived from fewer than eighteen forecasts.

6.5 percent. Coupled with the expected 5.9 percent rise in the GNP implicit deflator for 1978, these predictions suggest little or no progress with the inflation problem for the year.

Quarterly Consensus A quarterly consensus forecast for 1978 based on eight individual quarterly forecasts is shown in Table II. The consensus for each item is the median of the individual forecasts of that item. The number of forecasters supplying quarterly predictions is considerably less than the number supplying average annual predictions. In this sense the quarterly consensus is less representative than the annual consensus, and the two forecasts, while similar, are nevertheless not directly comparable. The quarterly consensus is particularly useful, however, in giving some idea of the probable profile of the economy's growth during 1978.

The quarterly consensus calls for slower growth in nominal GNP during the second half of the year than during the first half. The rate of change in the GNP implicit deflator is expected to increase steadily from an annual rate of 5.4 percent in the first quarter to 6.6 percent in the fourth. Thus, the forecasters see inflation as accelerating as the end of the year approaches. The second quarter increase in real GNP is forecast as 4.5 percent at an annual rate, a moderate decline from the first quarter's expected 4.8 percent annual rate. Real GNP is predicted to grow at annual rates below 4 percent in the last two quarters of the year.

Growth in expenditures for personal consumption is expected to remain fairly steady in the first half of the year, accelerate in the third quarter, and decline in the fourth quarter. Predicted growth in expenditures on durables jumps markedly from a 5.4 percent annual rate in the first quarter to an 8.0 percent annual rate in the second quarter before falling back to a 7.1 percent annual rate in the fourth quarter. Predicted growth in expenditures on nondurables also rises in the second and third quarters but falls back in the fourth quarter. Expected growth in expenditures on services slows somewhat in the second quarter but accelerates in the third before slowing again in the fourth quarter.

Growth in gross private domestic investment is expected to rise in the second quarter but fall back sharply in the second half. The higher second quarter growth rate is explained by an increase in the growth of plant and equipment expenditures. Between the second and third quarters, growth in private domestic investment is expected to fall by 5.3 percentage points, even though inventory accumulation has a predicted increase. The explanation for the third

Table II
CONSENSUS QUARTERLY FORECAST FOR 1978

	Forecast 1978 ¹			
	I	II	III	IV
Gross national product (nominal dollar)	10.7	9.8	10.2	9.9
Personal consumption expenditures	9.1	9.0	9.6	8.9
Durables	5.4	8.0	7.7	7.1
Nondurables	8.8	9.6	9.9	9.0
Services	10.2	10.0	10.6	10.4
Gross private domestic investment	11.9	13.7	8.4	9.4
Change in business inventories ²	17	17	18	18
Government purchases	9.6	10.1	10.1	12.4
Net exports ³	-10	-10	-7	-5
Gross national product (constant dollar)	4.8	4.5	3.9	3.5
Plant and equipment expenditures	11.2	13.8	12.4	13.7
Corporate profits before taxes	0.9	6.7	13.4	11.3
Private housing starts	-4.4	-4.6	-6.0	-6.6
Automobile sales (domestic)	-2.4	2.2	-3.3	-10.4
Industrial production index	5.8	5.6	4.9	4.0
Rate of unemployment ⁴	6.8	6.7	6.6	6.6
Wholesale price index	6.2	5.5	6.0	6.3
Consumer price index	6.0	6.4	6.1	6.4
GNP implicit deflator	5.4	5.6	6.0	6.6

¹ The 1978 consensus forecast is the median of quarter-to-quarter percentage changes provided by eight individual forecasts. Not all of the individual forecasts provided the detail shown here. Some items, therefore, are derived from fewer than eight forecasts.

² Billions of dollars.

³ Levels, billions of dollars.

⁴ Levels, percent.

quarter decline seems to rest with weaker growth in plant and equipment expenditures and an accelerated rate of decline in housing starts. Between the third and fourth quarters, private domestic investment growth increases somewhat, from an 8.4 percent annual rate to a 9.4 percent annual rate, largely due to a faster rate of growth in plant and equipment expenditures.

According to the forecasters the drag on GNP due to the net export deficit weakens significantly in the second half of 1978. Moreover, government purchases are expected to grow very rapidly in the second half of the year relative to the first half.

The advance in the industrial production index, according to the quarterly consensus, slows through the year. While the expected slowing is moderate in the first half, it becomes more pronounced in the third quarter and drops significantly in the fourth quarter.

The quarterly forecasters expect the unemployment rate to ease slightly through 1978, falling from 6.8 percent in the first quarter to 6.6 percent in the fourth.

According to the quarterly consensus the wholesale price index will finish the year by growing at a 6.3 percent annual rate, only slightly above the 6.2 percent annual rate of the first quarter. Growth in the consumer price index is expected to increase substantially from 5.4 percent in the first quarter to 6.6 percent in the fourth quarter.

BUSINESS FORECASTS 1978

The Federal Reserve Bank of Richmond is pleased to announce the publication of *Business Forecasts 1978*, a compilation of representative business forecasts for the coming year. Copies may be obtained free of charge by writing to Bank and Public Relations, Federal Reserve Bank of Richmond, P. O. Box 27622, Richmond, Virginia 23261.

THE OUTLOOK FOR AGRICULTURE IN '78

Sada L. Clarke

The U. S. Department of Agriculture's leading economists recently analyzed this year's prospects for the nation's agriculture at the National Agricultural Outlook Conference.

The outlook, as they see it, shapes up this way.

The nation's farmers apparently face another year of relatively low prices and incomes in 1978 despite expanding domestic markets and strong exports. Consumers, however, seem assured of abundant supplies of food at prices only moderately higher than in 1977.

Barring adverse weather, crop output should be large again. And relatively low feed costs will likely encourage expanded production of fed beef, pork, poultry, and milk. Farm production costs will probably rise further but at a slower rate. Moreover, farmers can expect ample supplies of production inputs.

Many farmers began the year in a somewhat less favorable financial condition than they did a year ago. Many have been faced with repayment difficulties, but only a small proportion are reported to have become unsatisfactory credit risks and will find it difficult to obtain additional credit. Demand for credit is likely to be strong.

These prospects are some of the key features of forecasts made by the Department of Agriculture's analysts at the annual agricultural outlook conference in mid-November. These top level economists were faced with many uncertainties, however, as they prepared the outlook for 1978. These uncertainties, the outcome of which can have major impacts on farm incomes and food prices, centered on the strength of the expansion in domestic markets, prospects for U. S. agricultural exports, the weather and growing conditions both here at home and abroad, and the impact that the cattle cycle will have on meat supplies and prices.

Farm Income Picture Continues Weak Farmers' total net farm income, including change in inventory

values, dropped slightly below \$20 billion in 1977.¹ Net farm income has fallen more than 40 percent since the peak in 1973 and is now 18 percent under the level two years ago. The current situation points to little, if any, improvement in 1978, especially during the first half.

With the huge stocks of corn and wheat that have accumulated and with prospects that total crop production will be only slightly smaller despite the set-aside programs for wheat and feed grains, 1978 crop prices can be expected to average lower than in 1977. Moreover, with supplies of grain abundant and prices relatively low, production of livestock and livestock products will likely expand. Such expansion would probably dampen price gains for livestock products. Larger direct government payments from the new farm program should help maintain gross farm income, however.

Farm production expenses can be expected to continue to climb in 1978 but at a much more moderate rate than in recent years. In addition, supplies of production inputs, such as pesticides and fertilizer, will probably be ample. Lower feed prices, reduced crop inputs as the result of the set-aside programs, plus much slower increases in prices of most inputs and the likelihood of declining prices for some are the major forces that point to a moderating advance in production costs. But even though price gains for farm inputs are likely to slacken, the outlook for generally lower farm product prices means

¹ Because of the improvement in grain prices during the fourth quarter, USDA has revised its estimate of total net farm income for 1977. Now, instead of a slight decline, as indicated earlier, net farm income is estimated to have hit the \$20 billion mark for the second consecutive year.

that farmers—particularly crop farmers—will be facing a cost-price squeeze again in 1978.

Foreign Trade Outlook Uncertain Uncertainties surround the outlook for U. S. agricultural exports in fiscal 1978. How much grain the Soviets plan to import from the U. S. and the final output of 1977 crops around the world will undoubtedly have major impacts on exports.

The value of U. S. farm exports is currently expected to decline from a record \$24 billion in fiscal 1977 to about \$22 billion in fiscal 1978. Growth in world stocks of grains and oilseeds and the lower prices that have resulted will make it difficult to sustain exports at last year's level in the current fiscal year. What this situation means is that for the first time in eight years U. S. farm exports are not expected to show a gain in value. Among the major markets, increases in the value of U. S. agricultural exports to the USSR and Eastern Europe are indicated. And rapid growth in the Mideast markets for U. S. farm products is expected to continue. But declines in value are likely for shipments to the European Community and Japan.

Most of the drop in the overall value of U. S. agricultural exports will stem primarily from lower export prices for grains, soybeans, and oilseed products. The total volume of farm commodities exported in fiscal 1978 may reach a new high of about 110 million tons, 8 million tons above a year earlier. Grain export volume may rise almost one-tenth, with wheat likely to post the largest gain. The volume of soybean exports may also increase about one-tenth, and another banner year is anticipated for fruit and vegetable exports. Slight gains in shipments of oil-meal and poultry products are also likely.

Agricultural Finance Outlook The nation's farmers were generally in a less favorable financial condition as they began 1978 than they were at the beginning of 1977. Total net farm income dropped moderately in 1977, farmland values continued to rise but gains were modest, and farm debt increased rapidly.² Renewals and extensions of farm loans were much more common, especially at banks. Many non-real-estate farm loans, in fact, were converted to loans secured by farmland to provide greater security for the lenders.

But since the market values of farmland have risen significantly in past years, many farm proprietors

have equities in their land that can be used as security for borrowings. Moreover, farm lenders reported that only about 5 percent of present borrowers—only a little larger than usual—have become unsatisfactory credit risks and will not be granted continued financing in 1978 if current conditions continue. Most lenders, it seems, are assisting farm borrowers who have developed repayment problems.

In making plans for 1978, farmers face prospects that net farm incomes will continue to stabilize and that farm real estate values will level off or rise less rapidly. Farmland values, which account for three-fourths of all farm assets, are projected to increase by 6 percent, substantially less than the gain of from 9 to 11 percent in 1977.

Demand for farm loans will likely continue strong, increasing as rapidly perhaps as in 1977. Farm real estate loans are expected to grow a little more rapidly than non-real-estate loans. The refinancing of short-term debt into real estate secured loans will account for some of the growth in real estate indebtedness, however. With the likelihood of increased production costs and relatively low farm product prices, farmers are likely to borrow more for operating purposes. But they will probably reduce their outlays on capital items, such as new tractors and other farm implements, and curtail personal consumption expenditures and other cash uses of funds.

Farm lenders will probably have more problems in making and servicing farm loans in 1978. Growing numbers of farm borrowers, for instance, can be expected to have repayment difficulties because of low farm income. The Farmers Home Administration may well receive a larger volume of loan requests because more farmers are likely to be unable to get financing from private lending sources. Moreover, many rural banks, particularly in cash-grain areas of the country, may find it necessary to curtail the expansion of their loan volume in 1978. The loan-to-deposit ratios of these banks at the beginning of the year were already at an all-time high, and the growth in their deposits probably will not keep pace with the demand for loans in a time of reduced farm income. Banks in this position may seek loan funds from other sources, however. Farm lenders in general can be expected to scrutinize loan applications more closely and be more conservative in making loans.

Moderate Rise in Food Prices Food shoppers can look for grocery store food prices in 1978 to average from 4 to 6 percent above a year earlier. Such an increase would be about the same or slightly

² See the revision in total net farm income in footnote 1.

lower than in 1977 when prices for food at home advanced about 6 percent. During the first half of the year, increases in grocery store food prices are expected to average in the neighborhood of 1 to 2 percent each quarter. Second half food price advances will be determined largely by increased marketing costs, progress of 1978 crops, and cyclical developments in the livestock industry that point to only modest reductions in total beef output and continued growth in pork supplies.

Most of the anticipated increase in retail food prices in 1978 can be expected to come from rising processing and marketing costs, particularly for labor. Unlike 1977, relatively less pressure on food prices will derive from imported foods and fish.

Major factors dominating the food outlook for 1978 are prospects for large food supplies, further increases in marketing costs, some moderation in retail prices for imported foods and fish, and uncertainties regarding the weather, energy costs, and the impact of recent or pending food legislation. Domestic demand for food will likely expand at about the same rate as in 1977. Small population increases are anticipated, and disposable personal income is expected to rise about 9 percent—nearly identical to the gain last year.

Consumers will probably spend around \$188.3 billion for U. S. farm-produced foods in 1978, up from around \$180 billion last year. The farm value of domestically produced foods is expected to continue at about \$56 billion as it has each year since 1974. The farm sector can thus be expected to continue to slow increases in retail food costs and to exert a moderating influence on general price inflation. While farm values have leveled off in recent years, the costs of labor in marketing U. S. produced farm foods have risen steadily. Labor costs, now the largest component of consumer food expenditures, took nearly a third of the consumer's food dollar last year and exceeded the farm value for the first time. This year labor costs for marketing foods originating on the nation's farms can be expected to top last year's \$58.8 billion, exceeding the farm value of these foods for the second year in a row.

Commodity Highlights Brief reviews of the Department of Agriculture's outlook for the principal money-making commodities produced by Fifth District farmers are presented below.

Tobacco: The uncertainty of possible legislative recommendations that may come from the U. S. Department of Agriculture's task force review of the

tobacco price support program highlights the tobacco outlook for 1978.

U. S. cigarette consumption rose to record levels in 1977, with sales of new brands of low tar and nicotine cigarettes more than offsetting declines for other brands. Prospects are that cigarette consumption will continue to rise slightly in 1978 and that the trend toward using low tar and nicotine cigarettes will continue. Declines in cigar and smoking tobacco consumption are likely to be offset by gains in the use of chewing tobacco and snuff, so total tobacco use will probably hold steady in 1977-78.

Unmanufactured tobacco export prospects in 1978 appear to be limited by the current high prices of U. S. leaf and the rising production of tobacco overseas. With the continued rise in U. S. tobacco prices and the short supply of better quality export grades, foreign buyers are increasing their efforts to find similar quality tobacco from other sources.

The 1978 national marketing quota for flue-cured tobacco has been set at 1,117 million pounds, virtually unchanged from the 1977 quota. Even though the total supply of flue-cured exceeds the reserve supply level, little change was made in the 1978 quota because of the very short supply of a number of key export grades. Officials felt that irreparable damage to this country's export markets might result from a reduction in the quota at this time. Individual flue-cured poundage quotas will reflect undermarketings and overmarketings of the 1977 crop. Under the legal formula used to determine price supports for eligible tobaccos, tobacco supports for 1978 will rise about 7 percent over 1977.

Cotton: The U. S. cotton outlook for 1978-79 points to the likelihood of a larger carryover next summer, possibly ranging from 5 to 6 million bales. A smaller 1978 crop is quite likely, however. Total disappearance may change little since larger domestic mill use may almost offset smaller prospective exports.

The loan rate for the 1978 cotton crop will be based on the world price and has been set at 44 cents per pound, compared with 44.63 cents for the 1977 crop. The target price will be around 52 cents versus 47.8 cents in 1977. Other features of the new farm program that pertain to the 1978 cotton crop include: (1) deficiency payments to cotton producers, as well as to wheat and feed grain farmers, have been increased from \$20,000 to \$40,000 per producer, and (2) disaster payments—those that represent compensation for a disaster loss—are not included in the total deficiency payments.

U. S. cotton will probably face increased competition from other exporting countries, so export prospects for the 1978-79 season are not as bright as they were in 1977-78. Foreign demand, as a result, may not match 1977-78's expected 4½ million bales.

What about production prospects for the 1978 crop? Since last spring, prices for both cotton and competing crops have declined, and cotton has experienced the sharpest drop. Should these current price relationships prevail at planting time, the nation's farmers may plant anywhere from 11 to 13 million acres of cotton, compared with 13.4 million in 1977.

Domestic mill use of cotton in 1978-79 may be as much as 0.5 million bales above last season's 6.7 million. The recent decline in cotton prices is expected to improve cotton's competitive position relative to manmade fibers. This price competitiveness will be of major importance to the domestic mill consumption of cotton in 1978-79, as will imports of textile goods, and general economic and textile activity.

Soybeans and Peanuts: Record large supplies dominate the outlook for soybeans in 1977-78. Last year's bumper crop plus carryover stocks pushed the 1977-78 soybean supply to 1.8 billion bushels, a new high nearly one-fifth above a year earlier. Both domestic use and exports are expected to rise during the year, but these gains are not likely to be as large as the increase in supply. As a result, the buildup in carryover stocks will more than double last September's low level. Total disappearance may reach 1.53 billion bushels, or some 10 percent above last season.

Soybean crushings this season are estimated at around 850 million bushels, up about 8 percent from 1976-77. This gain primarily reflects an increase in the feeding of soybean meal as a result of lower prices and rising livestock and poultry output.

Soybean exports may reach a new high of around 610 million bushels, around 5 percent above last season. Lower prices of U. S. soybeans and increased overseas demand for soybean meal are expected to provide the impetus for the larger exports.

Harvest prices for soybeans fell below year-ago levels last fall. Some price strengthening may occur following the harvest, but much will depend on farmers' willingness to store their soybeans and the competition from Brazil and other major foreign oilseed producers.

U. S. peanut supplies for 1977-78 total almost 4.0 billion pounds, about one-fifth below a year earlier. This reduction is due primarily to a 10 percent decline in output of the 1977 peanut crop and to a smaller carryover.

Domestic use of peanuts in edible products during the current season is expected to increase slightly and may total 1.85 billion pounds. This consumption would be equivalent to about 8½ pounds on a per capita basis. Peanut consumption per person has risen from around 6 pounds in the midfifties to the record level of about 9 pounds in the last few years. Use has increased in all major outlets—peanut butter, salted peanuts, peanut candy, and roasted in-the-shell peanuts.

Exports of peanuts are expected to be sizable this season, although they will probably not match last year's record of 0.8 billion pounds. Stiffer competition is expected to come from growing world production of oilseed crops.

In spite of smaller domestic production and expanded use, supplies of peanuts continue to be in excess of edible and farm use requirements. Thus, about one-fourth of the 1977 crop will probably be acquired by the Commodity Credit Corporation under the loan program.

The Omnibus Farm Bill includes new peanut legislation that will attempt to bring production in line with market needs. The new peanut program is based on poundage quotas that are coupled with acreage allotments and two levels of price support. Introduction of the new program, scheduled for 1978, means that farmers will have to make decisions they've never faced before. Growers, for instance, must decide how many peanuts to plant and whether to produce peanuts strictly for quota or also for the additional market. (Peanuts produced in excess of a farmer's poundage quota but grown within his allotment are defined as "additional" peanuts.) Quota peanuts will be supported at an average of \$420 per ton on a national basis for the four years, 1978-81. No deductions will be made for inspection, handling, or storage. Price support on additional peanuts will reflect the expected price of peanuts for crushing and world market conditions for peanuts.

Poultry and Eggs: Larger production and lower market prices characterize prospects for the poultry and egg industries in 1978. But if, as now expected, feed costs average below a year ago in the first half, broiler and turkey producers may show a profit. Egg producers, however, may be caught in a cost-price squeeze by spring.

Because of last year's large grain and soybean crops, production costs for poultrymen are currently below a year ago and are likely to remain below that level at least through the first half of 1978. The lower costs of feed ingredients should more than offset the rise in the costs of other production items.

Expected growth in the general economy and gains in consumers' incomes will help to bolster the demand for poultry meat and eggs in 1978. Poultry products, however, will continue to face strong competition from large supplies of red meats.

Broiler prices are expected to average moderately below 1977 during most of 1978, probably averaging somewhat under the 40-cent level during the first half. The prospective increase in egg output in the first six months of 1978 is expected to cause egg prices to average well below a year earlier. Sharpest drops are likely in the first quarter. Despite a 10 percent increase in turkey output during January-June 1978, turkey supplies may rise only slightly because of reduced cold storage stocks. Turkey prices as a result may average slightly higher in the first half than the 51 cents a year earlier.

Dairy Products: Milk production moved above year-earlier levels in the fall of 1975 and has continued to expand since. The outlook points to further expansion in 1978, with production for the year likely to show an increase of 1 or 2 percent. Milk output early in 1978 will probably remain well above year-earlier levels, but production later in the year may stabilize at a slightly lower level.

Many of the forces that shaped last year's increased milk output—favorable milk-feed price relationships, heavier concentrate feeding, and larger output per cow—are expected to continue in 1978. Gains in output per cow will probably be strong, more than offsetting moderate declines in cow numbers. Some of the gains in output per cow later in the year could be offset by increased culling rates, however.

Farm milk prices in the early months of 1978 are expected to average well above a year earlier because of the higher support price. Milk prices later in the year will depend largely on the production of milk and the commercial sales of dairy products. For the entire year, however, dairymen can expect farm milk prices to average considerably above 1977.

Meat Animals: Consumers can expect to find large supplies of red meat in 1978. Indications point to continued growth in the supplies of pork and only modest declines in total beef production. The beef supply will consist of a larger proportion of fed beef and a smaller percentage of grass-fed beef. Larger supplies of poultry products will provide red meat supplies with strong competition for the consumer's dollar, however.

Hog producers will find feed costs in 1978 below the average of the past several years. Feeding costs will rise, however, as corn prices increase from their early fall lows. Should hog prices decline during the year as expected, hog producers will probably find their profits squeezed, especially in the second half. If farmers carry out their farrowing intentions, pork production could rise substantially in 1978, perhaps by 10 percent or more in the first half and probably by a larger magnitude in the second half.

Larger supplies of grain and soybeans will likely mean more favorable feeding costs for cattlemen in 1978 than in recent years. With the lower feed costs and ample quantities of feed grains, cattle feeding is expected to continue to expand in 1978. Through midyear, marketings of fed cattle may rise from 4 to 6 percent. But the gain in supplies of fed beef may not be large enough to offset probable reductions in grass-fed slaughter. Even so, the year-to-year decline in total beef production will likely be less than 2 percent. The large supplies of beef, plus large supplies of competing meats, suggest that there will be little improvement in fed cattle prices for much of 1978.

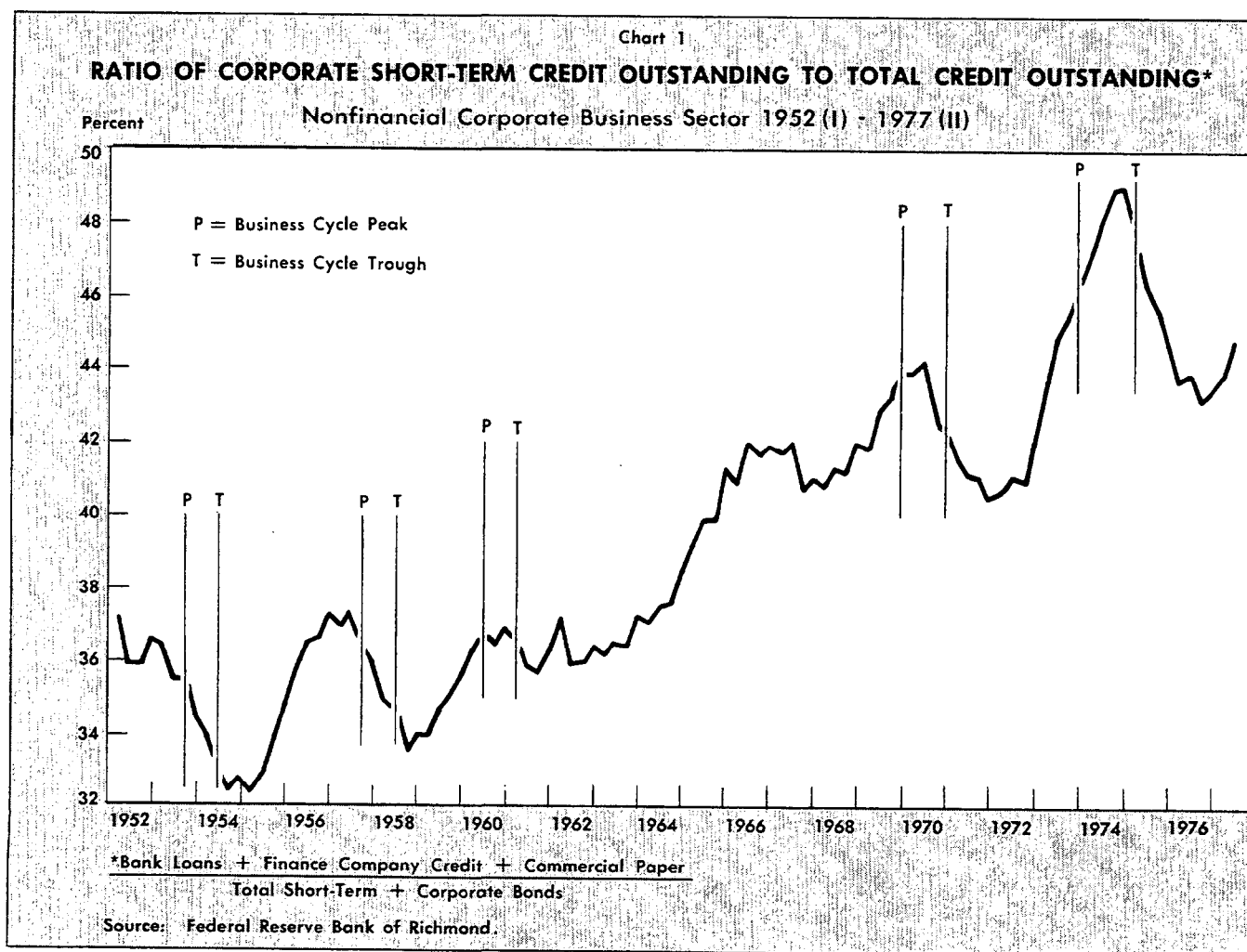
SHORT-TERM BUSINESS CREDIT IN THE RECOVERY

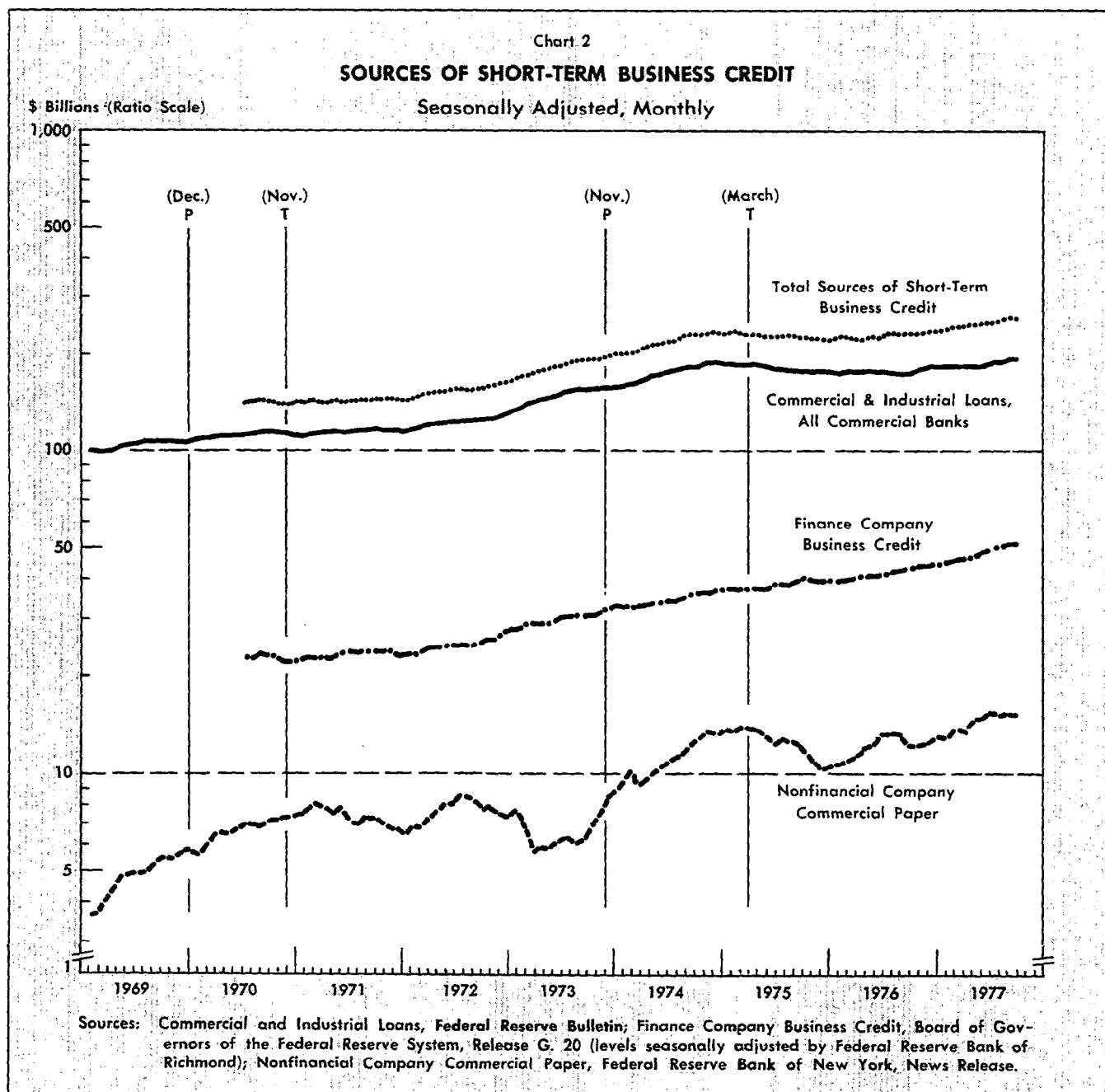
Bruce J. Summers

Short-term business credit is watched both as a financial indicator and as a gauge of business activity. Traditionally, attention has been focused on large commercial banks and the commercial paper market as the primary sources of such credit. This narrow view, however, neglects the role of smaller banks and finance companies—both significant suppliers. A comprehensive measure of short-term credit must include (1) commercial and industrial (C&I) loans of *all* commercial banks (2) finance company business credit and (3) nonfinancial company commercial paper.¹

¹ Significant amounts of C&I loans and finance company business credit have intermediate and long-term maturities. This should be kept in mind as a qualification whenever these series are used as part of a short-term credit proxy.

The pattern of debt financing followed by nonfinancial companies is closely related to the business cycle. Short-term credit grows in importance relative to long-term credit in business recoveries, while the opposite is generally true during recessions. This pattern is evident in Chart 1, which plots the ratio of bank loans, finance company credit, and commercial paper to total short-term and long-term borrowings. As the chart illustrates, however, the recent experience is somewhat unusual. In the latest business cycle, short-term sources of credit were favored until late in the recession. The short-term to total debt ratio reached a peak of 49.0 percent in the fourth quarter of 1974, a year after the business slide had begun. It then declined sharply, the decline continuing through the first five quarters of the recovery.





Demand for short-term business credit has been increasing since March 1976, and has been brisk since late in that year. This is shown in the top line of Chart 2, which is the sum of the three components of a comprehensive measure of short-term credit. Analysts looking only at large banks and the commercial paper market would have overlooked this expansion in its early stages, and would now be underestimating its strength. A narrowly defined monthly proxy including only C&I loans of large weekly reporting banks and nonfinancial company commercial paper indicates that short-term business credit peaked in December 1974, fell through September 1976, and then rose \$13.5 billion between

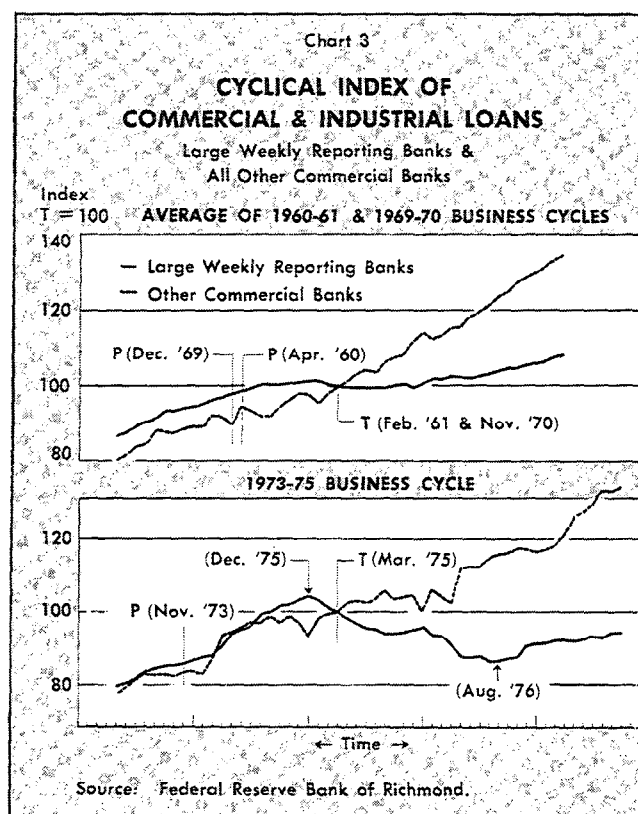
September 1976 and October 1977. The more comprehensive measure that includes the three components shown on Chart 2 indicates, by comparison, a peak in January 1975 and a trough in March 1976. From March through September 1976 this comprehensive measure increased \$5.4 billion. From September 1976 to October 1977 it has increased \$35.6 billion, over two and a half times the increase in the narrowly defined proxy. This increase is close to the \$34.0 billion raised in 1974, the largest yearly increase on record. The behavior of the comprehensive proxy of course reflects the behavior of its individual components, as discussed below.

Commercial and Industrial Loans In the past two cycles, C&I loans of all commercial banks have shown strength prior to the peak in economic activity, temporarily paused at the peak, and then increased well into the recession period before dropping off. The degree and timing of these swings, however, vary greatly by bank size and location. For example, business loans at large banks in financial centers, such as New York City, experience the greatest cyclical variation. Also, the turning points for loans at large money center banks lag those for loans at large regional banks [3].

Business lending for the large weekly reporting banks taken as a group behaves quite differently than that at the smaller banks, as shown in Chart 3. Over the past three cycles, declines in C&I loans were concentrated entirely at large weekly reporting banks. Continuously increasing lending at the smaller, non-weekly reporting banks has tended to dampen the C&I loan cycle shown on Chart 2. For example, from December 1975 to August 1976—the peak and trough months respectively for the large weekly reporting bank index plotted at the bottom of Chart 3—C&I loans fell \$11.3 billion. This decline was substantially offset by an \$8.4 billion increase at smaller commercial banks.

Finance Company Credit Finance companies specialize in several types of business financing, including commercial vehicle and retail equipment financing, accounts receivable financing, factoring, and most importantly, wholesale financing of vehicle dealer inventories. Their primary customers have traditionally been medium and small sized firms [1]. Business credit outstanding at finance companies increased during the recent recession through January 1975. It then leveled off before resuming its rise in April. Since January 1976 finance company business credit has expanded very rapidly, led by gains in retail equipment and commercial vehicle, and wholesale automobile, financing. The gain from January 1976 to October 1977 has been \$14.1 billion.

Commercial Paper The outstanding volume of nonfinancial company commercial paper, while relatively small, is subject to wide cyclical variation. For the nearly 500 nonfinancial companies that are active in the market, commercial paper issues meet the same types of needs as do bank loans. In both cases, credit demand is a function of seasonal credit requirements, as well as credit market conditions that make long-term financing temporarily unattractive. Commercial paper issues and bank loans are substi-



tutes, and relative interest costs help determine their relative utilization. Generally, the prime rate moves more sluggishly than does the paper rate, and consequently commercial paper becomes an attractive substitute for bank loans in periods of declining interest rates. This helps explain why commercial paper reaches cyclical peaks later than C&I loans [2], as is shown in Chart 2.

Nonfinancial company commercial paper outstanding declined from a peak of \$14.0 billion in March 1975 to a cyclical low of \$10.4 billion in November 1975. A favorable rate differential relative to bank loans has subsequently encouraged growth in commercial paper, the outstanding volume rising to \$15.1 billion by October 1977.

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SOME RECENT DEVELOPMENTS IN PHILLIPS CURVE ANALYSIS

Thomas M. Humphrey

Economists' views of the Phillips curve concept have changed drastically in recent years. The original interpretation of the Phillips curve as a stable trade-off relationship between inflation and unemployment has given way to the view that no such trade-off exists for policymakers to exploit. As a result, some economists now argue that economic stabilization policies are incapable of influencing output and employment, even in the short-run.

Instrumental to this change were several key developments in Phillips curve analysis, most notably the so-called *natural rate* and *rational expectations* hypotheses. The purpose of this article is to explain these developments and their policy implications and to show how they altered economists' perceptions of the Phillips curve. Accordingly, the first half of the article traces the evolution of Phillips curve analysis focusing particularly on the natural rate hypothesis. The second half concentrates on the rational expectations idea, currently the most hotly-debated aspect of Phillips curve analysis.

Early Versions of the Phillips Curve Phillips curve analysis has evolved through at least five major stages since its inception in 1958. The first stage involved the formulation of a simple, stable trade-off relation between inflation and unemployment. The initial Phillips curve depicted a relationship between money wage changes and unemployment. But the assumption that product prices are set by applying a constant mark-up to unit labor costs permitted the Phillips relationship to be transformed into a price-change equation of the form¹

$$(1) \quad p = ax$$

where p is the percentage rate of price inflation, x is overall excess demand in labor and hence product markets—this excess demand being proxied by the inverse of the unemployment rate—and a is a coefficient

expressing the numerical value of the trade-off between inflation and excess demand.

This equation expresses the early view of the Phillips curve as a stable, enduring trade-off permitting the authorities to obtain permanently lower rates of unemployment in exchange for permanently higher rates of inflation or vice-versa. Put differently, the equation was popularly interpreted as offering a menu of alternative inflation-unemployment combinations from which the authorities could choose. Being stable, the menu never changed.

Economists soon discovered, however, that the menu was not as stable as originally thought and that the Phillips curve had a tendency to shift over time.² Accordingly, the equation was augmented with additional variables to account for such movements.

Introduction of Shift Variables The addition of shift variables to the trade-off equation marked the second stage of Phillips curve analysis. The inclusion of these variables meant that the Phillips equation could now be written as

$$(2) \quad p = ax + z$$

where z is a vector of variables—productivity, profits, trade union effects, unemployment dispersion and the like—capable of shifting the inflation-excess demand trade-off. Absent at this stage were variables representing price expectations. Although the past rate of price change was sometimes used as a shift variable, it was rarely interpreted as a proxy for anticipated inflation. Not until the late 1960's were expectational variables fully incorporated into Phillips curve equations. By then, of course, inflationary expectations had become too prominent to ignore and many analysts were perceiving them as the dominant cause of observed shifts in the Phillips curve.

The Expectations-Augmented Phillips Curve and the Adaptive-Expectations Mechanism Three innovations ushered in the next stage of Phillips curve

¹ For simplicity, the additive constant term contained in most empirical Phillips curve equations is disregarded in equation 1.

² Indeed, Phillips himself in his 1958 article had recognized the possibility of such shifts.

analysis. The first was the respecification of the excess demand variable. Originally defined as the inverse of the unemployment rate, excess demand was redefined as the discrepancy between actual and normal capacity real output or, equivalently, as the gap between the actual and the natural rates of unemployment. The natural rate of unemployment itself was defined as the rate that, given the frictions and structural characteristics of the economy, is just consistent with demand-supply equilibrium in labor and product markets. This innovation effectively identified full-employment equilibrium (i.e., zero excess demand) with normal capacity output and the natural rate of unemployment.

The second innovation was the introduction of price anticipations into Phillips curve analysis resulting in the expectations-augmented equation

$$(3) \quad p = ax + p^e$$

where p^e is the price expectations variable representing the anticipated rate of inflation. This expectations variable entered the equation with a coefficient of unity, reflecting the assumption that price expectations are completely incorporated in actual price changes. The unit expectations coefficient implies the absence of money illusion, i.e., it implies that sellers are concerned with the expected real purchasing power of the prices they receive and so take anticipated inflation into account. As will be shown later, the unit expectations coefficient also implies the complete absence of a trade-off between inflation and unemployment in the long-run when expectations are fully realized. Note also that the expectations variable is the sole shift variable in the equation. All other shift variables have been omitted, reflecting the view, prevalent in the early 1970's, that changing price expectations were the predominant cause of observed shifts in the Phillips curve.

The third innovation was the incorporation of an expectations-generating mechanism into Phillips curve analysis to explain how the price expectations variable itself is determined. Generally a simple *adaptive expectations* or *error-learning* mechanism was used. According to this mechanism, expectations are adjusted (adapted) by some fraction of the error that occurs when inflation turns out to be different than expected. In symbols

$$(4) \quad \dot{p}^e = b(p - p^e)$$

where the dot over the expectations variable indicates the rate of change (time derivative) of that variable,

$p - p^e$ is the expectations error (i.e., the difference between actual and expected price inflation), and b is the adjustment fraction. Assuming, for example, an adjustment fraction of $1/2$, equation 4 says that if the actual and expected rates of inflation are 10 percent and 4 percent, respectively—i.e., the expectational error is 6 percent—then the expected rate of inflation will be revised upward by an amount equal to half the error, or 3 percent. Such revision will continue until the expectational error is eliminated. It can also be shown that equation 4 is equivalent to the proposition that expected inflation is a geometrically-weighted average of all past rates of inflation with the weights summing to one. Therefore, the error-learning mechanism can also be expressed as

$$(5) \quad p^e = \sum w_i p_{-i}$$

where \sum indicates the operation of summing the weighted past rates of inflation, i represents past time periods, and w_i stands for the weights attached to past rates of inflation. These weights decline geometrically as time recedes, i.e., people are assumed to give more attention to recent than to older price experience when forming expectations. How fast the weights fall depends on the strength of people's memories of inflationary history. Rapidly declining weights indicate that people have short memories so that price expectations depend primarily on recent price experience. By contrast, slowly declining weights imply long memories so that expectations are influenced significantly by inflation rates of the more distant past. Both versions of the adaptive expectations mechanism (i.e., equations 4 and 5) were combined with the expectations-augmented Phillips equation to explain the mutual interaction of actual inflation, expected inflation, and excess demand.

The Natural Rate Hypothesis These three innovations—the redefined excess demand variable, the expectations-augmented trade-off, and the adaptive-expectations mechanism—formed the basis of the so-called natural rate and accelerationist hypotheses that radically altered economists' views of the Phillips curve. According to the natural rate hypothesis, there exists no permanent trade-off between unemployment and inflation since real economic variables tend to be independent of nominal ones in long-run equilibrium. To be sure, trade-offs may exist in the short-run. But they are inherently transitory phenomena that stem from unexpected inflation and that vanish when expectations adjust to inflationary ex-

perience. In the long-run, when inflationary surprises disappear and expectations are realized, unemployment returns to its natural (equilibrium) rate. This rate is consistent with all fully-anticipated steady-state rates of inflation, implying that the long-run Phillips curve is a vertical line at the natural rate of unemployment.

Equation 3 embodies these conclusions. That equation, when rearranged to read $\dot{p} - \dot{p}^e = ax$, states that the trade-off is between *unexpected* inflation (the difference between actual and expected inflation $\dot{p} - \dot{p}^e$) and excess demand. The equation also says that the trade-off disappears when inflation is fully anticipated, i.e., when $\dot{p} - \dot{p}^e$ is zero. Moreover, if the equation is correct, excess demand must also be zero at this point, which implies that unemployment is at its natural rate. Zero excess demand and the natural rate of unemployment are therefore compatible with *any* rate of inflation provided it is fully anticipated. In short, equation 3 asserts that if inflation is fully anticipated there will be no relationship between inflation and unemployment, contrary to the original Phillips hypothesis.

The Accelerationist Hypothesis Equation 3, when combined with equation 4, also yields the accelerationist hypothesis. The latter, a corollary of the natural rate hypothesis, states that since there exists no long-run trade-off between unemployment and inflation, attempts to peg the former variable below its natural (equilibrium) level must produce ever-accelerating inflation. Such acceleration will keep actual inflation always running ahead of expected inflation, thereby perpetuating the inflationary surprises that prevent unemployment from returning to its equilibrium level.

These conclusions are easily demonstrated. As previously mentioned, equation 3 states that excess demand can differ from zero only as long as actual inflation deviates from expected inflation. But equation 4 says that, by the very nature of the error-learning mechanism, such deviations cannot persist unless inflation is continually accelerated so that it always stays ahead of expected inflation. If inflation is not accelerated, but instead stays constant, then the gap between actual and expected inflation will eventually be closed. Therefore acceleration is required to keep the gap open if excess demand is to be maintained above its natural equilibrium level of zero. In other words, the long-run trade-off implied by the accelerationist hypothesis is between excess demand and the rate of acceleration of the inflation rate, in contrast to the conventional trade-off be-

tween excess demand and the inflation rate itself as implied by the original Phillips curve.³

Policy Implications of the Natural Rate and Accelerationist Hypotheses Two policy implications stem from the natural rate and accelerationist propositions. First, the authorities can either peg unemployment or stabilize inflation but not both. If they peg unemployment, they will ultimately lose control of inflation since the latter eventually accelerates when unemployment is held below its natural level. Alternatively, if they stabilize the inflation rate, they will lose control of unemployment since the latter will return to its natural level at any steady rate of inflation. Thus, contrary to the original Phillips hypothesis, they cannot peg unemployment at any constant rate of inflation.

A second policy implication stemming from equations 3 and 4 is that the authorities can choose from among alternative transitional adjustment paths to the desired steady-state rate of inflation. Suppose the authorities wish to move to a lower target inflation rate. To do so they must lower inflationary expectations, a major component of the inflation rate. But equations 3 and 4 state that the only way to do this is to create slack capacity (excess supply) in the economy, thus causing the actual rate of inflation to fall below the expected rate, inducing a downward revision of the latter. The equations also indicate that the speed of adjustment depends on the amount of slack created. Much slack means fast adjustment and a relatively rapid attainment of the inflation target. Conversely, little slack means sluggish adjustment and relatively slow attainment of the inflation target. Thus the policy choice is between adjustment paths offering high unemployment for a short time or lower unemployment for a long time.

Statistical Tests of the Natural Rate Hypothesis The fourth stage of Phillips curve analysis involved statistical testing of the natural rate hypothesis.

³ The proof is simple. Equation 3 states a relationship among actual inflation, expected inflation, and excess demand. From that equation it follows that the relationship among the **rates of change** of those variables is given by the expression $\dot{p} = ax + \dot{p}^e$ where the dots indicate rates of change (time derivatives) of the attached variables. Substituting equation 4 into this expression yields $\dot{p} = ax + b(\dot{p} - \dot{p}^e)$, which, by equation 3's assertion that the expectational error $\dot{p} - \dot{p}^e$ is equal to ax , further simplifies to $\dot{p} = ax + bax$. Finally, if excess demand is unchanging so that x is zero—as would be the case if the authorities were pegging x at some desired level—this last expression reduces to $\dot{p} = bax$ showing a trade-off relation between the rate of acceleration of inflation \dot{p} and excess demand x .

These tests led to criticisms of the adaptive-expectations or error-learning model of inflationary expectations and thus helped prepare the way for the introduction of the alternative rational-expectations idea into Phillips curve analysis.

The tests themselves were mainly concerned with estimating the numerical value of the coefficient on the price-expectations variable in the expectations-augmented Phillips curve equation. If the coefficient is one, as in equation 3, then the natural rate hypothesis is valid and no long-run inflation-unemployment trade-off exists for the policymakers to exploit. But if the coefficient is less than one, the natural rate hypothesis is refuted and a long-run trade-off exists. This can be seen by writing the expectations-augmented equation as

$$(6) \quad p = ax + \phi p^e$$

where ϕ is the coefficient attached to the price expectations variable. In long-run equilibrium, of course, expected inflation equals actual inflation, i.e., $p^e = p$. Setting expected inflation equal to actual inflation as required for long-run equilibrium and solving for the actual rate of inflation yields

$$(7) \quad p(1 - \phi) = ax.$$

This shows that a long-run trade-off exists only if the expectations coefficient is less than one. If the coefficient is one, however, the trade-off vanishes.

Many of the empirical tests estimated the coefficient to be less than unity and concluded that the natural rate hypothesis was invalid. But this conclusion was sharply challenged by economists who contended that the tests contained statistical bias that tended to work against the natural rate hypothesis. These critics pointed out that the tests invariably used adaptive-expectations schemes as empirical proxies for the unobservable price expectations variable. They further showed that if these proxies were inappropriate measures of expectations then estimates of the expectations coefficient could well be biased downward. If so, then estimated coefficients of less than one constituted no disproof of the natural rate hypothesis.

Finally, the critics argued that the adaptive-expectations scheme is a grossly inaccurate representation of how people formulate price expectations. They pointed out that it postulates naive expectational behavior, holding as it does that people form anticipations solely from a weighted average of past price experience with weights that are fixed and independent of economic conditions and policy actions. This implies that people look only at past price

changes and ignore all other pertinent information—e.g., money growth rate changes, exchange rate movements, announced policy intentions and the like—that could be used to reduce expectational errors. It seems implausible that people would fail to exploit information that would improve expectational accuracy. In short, the critics contended that adaptive expectations are not wholly rational if other information besides past price changes can improve predictions.

Many economists have since pointed out that it is hard to accept the notion that individuals would form price anticipations from *any* scheme that is inconsistent with the way inflation is actually generated in the economy. Being different from the true inflation-generating mechanism, such schemes will produce expectations that are systematically wrong. If so, rational agents will cease to use them. For example, suppose inflation were actually accelerating or decelerating. According to equation 4, the adaptive expectations model would systematically underestimate the inflation rate in the former case and overestimate it in the latter. Perceiving these persistent expectational mistakes, rational agents would quickly abandon the error-learning model for more accurate expectations-generating schemes. Once again, the adaptive-expectations mechanism is implausible because of its incompatibility with rational behavior.

From Adaptive Expectations to Rational Expectations The shortcomings of the adaptive expectations approach to the modeling of expectations led to the incorporation of the so-called rational expectations approach into Phillips curve analysis. According to the rational expectations hypothesis, individuals will tend to exploit *all* the pertinent information about the inflationary process when making their price forecasts. If true, this means that forecasting errors ultimately could arise only from random (unforeseen) shocks occurring to the economy. At first, of course, forecasting errors could also arise because individuals initially possess limited or incomplete information about the inflationary mechanism. But it is unlikely that this latter condition would persist. For if the public is truly rational, it will quickly learn from these inflationary surprises and incorporate the new information into its forecasting procedures, i.e., the sources of forecasting mistakes will be swiftly perceived and systematically eradicated. As knowledge of the inflationary process improves, forecasting models will be continually revised to produce more accurate predictions. Eventually all systematic (predictable) elements influencing the rate of inflation will become known and fully understood,

and individuals' price expectations will constitute the most accurate (unbiased) forecast consistent with that knowledge.⁴ When this happens people's price expectations will be the same as those implied by the actual inflation-generating mechanism. As incorporated in natural-rate Phillips curve models, the rational-expectations hypothesis implies that thereafter, except for unavoidable surprises due to purely random shocks, price expectations will always be correct and the economy will always be at its long-run steady-state equilibrium.

Policy Implications of Rational Expectations

The strict rational-expectations approach has some radical policy implications. It implies that systematic policies—i.e., those based on feedback control rules defining the authorities' response to changes in the economy—cannot influence real variables even in the short-run, since people would have already anticipated what the policies are going to be and acted upon those anticipations. To have an impact on output and employment the authorities must be able to create a divergence between actual and expected inflation. This follows from the proposition that inflation influences real variables only when it is unanticipated. The authorities must be able to alter the actual rate of inflation without simultaneously causing an identical change in the expected future rate. This may be impossible if the public can predict policy actions.

Policy actions, to the extent they are systematic, are predictable. Systematic policies are simply rules or response functions relating policy variables to lagged values of other variables. These policy response functions can be estimated and incorporated into forecasters' price predictions. In other words, rational agents can use past observations on the behavior of the authorities to predict future policy moves. Then, on the basis of these predictions, they can correct for the effect of anticipated policies beforehand by making appropriate adjustments to nominal wages and prices. Consequently, when stabilization actions do occur, they will have no impact on real variables since they will have been discounted and neutralized in advance. The only conceivable way that policy can have even a short-run influence on real variables is for it to be unexpected, i.e., the

⁴ Put differently, rationality implies that current expectational errors are uncorrelated with past errors and all other known information, such correlations already having been perceived and eliminated in the process of improving price forecasts.

policymakers must either act in an unpredictable random fashion or secretly change the policy reaction function. Apart from such tactics, which are incompatible with most notions of the proper conduct of public policy, there is no way the authorities can influence real variables. They can, however, influence a nominal variable, namely the inflation rate, and should concentrate their efforts on doing so if some particular rate is desired.

To summarize, the rationality hypothesis denies the existence of exploitable Phillips curve trade-offs in the short-run as well as the long. In so doing it differs from the adaptive expectations version of natural-rate Phillips curve models. Under adaptive expectations, short-run trade-offs exist because expectations do not adjust instantaneously to policy-engineered changes in the inflation rate. With expectations adapting to actual inflation with a lag, monetary policy can generate unexpected inflation and consequently influence real variables in the short-run. This cannot happen under rational expectations where both actual and expected inflation adjust identically and instantaneously to anticipated policy changes. In short, under rational expectations, systematic policy cannot induce the expectational errors that generate short-run Phillips curves.

A Simple Illustrative Model The preceding arguments can be clarified with the aid of a simple illustrative model. The model contains five relationships including an expectations-augmented Phillips curve equation, an inflation-generating mechanism, a policy reaction function, a rational price expectations equation, and finally a rational money-growth expectations equation. Taken together, these equations show that deterministic policies, by virtue of their very predictability, cannot induce the expectational errors that generate short-run Phillips curves. Phillips curves may exist, to be sure. But they are entirely the result of unpredictable random shocks and cannot be exploited by policies based on rules. In sum, the model shows that, given expectational rationality and the natural rate hypothesis, systematic trade-offs are impossible in the short-run as well as the long.⁵

⁵ Note that the rational expectations hypothesis also rules out the accelerationist notion of a stable trade-off between excess demand and the rate of acceleration of the inflation rate. If expectations are formed consistent with the way inflation is actually generated, the authorities will not be able to fool people by accelerating inflation or by accelerating the rate of acceleration, etc. Indeed, no systematic policy will work if expectations are formed consistently with the way inflation is actually generated in the economy.

Phillips Curve Equation The first component of the model is the expectations-augmented Phillips curve equation

$$(8) \quad p - p^e = ax$$

that expresses a trade-off relationship between unexpected inflation and real excess demand. In the rational expectations literature this equation is often treated as an aggregate supply function stating that firms produce the normal capacity level of output when actual and expected inflation are equal but produce in excess of that level when fooled by unexpected inflation. This view holds that firms mistake unanticipated general price increases for rises in the particular (relative) price of their own products. Surprised by inflation, they treat the price increase as special to themselves and so expand output.

An alternative interpretation of the equation treats it as a price-setting relation according to which businessmen raise their prices at the rate at which they expect other businessmen to be raising theirs and then adjust that rate upward if excess demand appears. Either interpretation yields the same result. Expectational errors cause real economic activity to deviate from its normal capacity level. The deviations disappear when the errors vanish.

Inflation-Generating Mechanism The next relationship describes how inflation is generated in the model. Written as follows

$$(9) \quad p = m + \epsilon$$

it expresses the rate of inflation as the sum of the growth rate of money m per unit of capacity real output and a random shock variable ϵ , the latter assumed to have a mean (expected) value of zero. The capacity-adjusted money growth rate is simply the difference between the respective growth rates of the nominal money stock and capacity real output, the latter variable serving as a proxy for the trend rate of growth of the real demand for money. In essence, equation 9 says that while the rate of inflation is determined basically by the growth rate of money per unit of capacity output, it is also influenced by transitory disturbances unrelated to money growth. For convenience, it is assumed in what follows that the growth rate of capacity output is zero so that the capacity-adjusted money growth rate is identical to the growth rate of the nominal money stock itself.

Policy Reaction Function The third ingredient of the model is a policy-reaction function stating how the monetary authorities respond to changes in the level of economic activity. Written as follows

$$(10) \quad m = m(x_{-1}) + u$$

it states that the current rate of money growth is a function of last period's excess demand x_{-1} and a random disturbance term u , the latter assumed to have a mean value of zero. The interpretation of the equation is straightforward. The authorities attempt to adjust money growth in the current period to correct real excess demand or supply occurring in the preceding period according to the feedback control rule $m = m(x_{-1})$. Money growth cannot be controlled perfectly by the feedback rule, however, and the slippage is represented by the random term u that causes money growth to deviate unpredictably from the path intended by the authorities. Note that the disturbance term u can also represent deliberate monetary surprises engineered by the policy authorities.

Price Expectations Equation The fourth element of the model is a price-expectations equation describing how rational inflationary anticipations are formed. By definition, rational expectations are the same as the predictions yielded by the actual inflation-generating process, represented in the model by equation 9. And since that equation states that the actual rate of inflation is equal to the actual money growth rate plus a random variable, it follows that the expected rate of inflation predicted by the equation is equal to the expected money growth rate plus the expected value of the random term. The latter, however, is zero and thus drops out, leaving anticipated inflation equal to expected money growth. In symbols

$$(11) \quad p^e = m^e$$

Note that these symbols now have a dual interpretation. They represent anticipations formulated by the public. They also represent mathematical expectations—i.e., expected (mean) values of the stochastic inflation and money growth variables—calculated from a model that, in principle at least, is a true representation of the inflationary process. Here is the essence of the notion that people's expectations are rational when they are the same as those implied by the relevant economic model.⁶

⁶ Analysts often stress this point by expressing anticipated inflation formally as the mathematical expected value of the actual inflation rate, conditional on information available when the expectation was formed. Symbolically, $p^e = E(p|I)$ where E is the mathematical expectation and I is known information. Since this information includes the inflation-generating mechanism summarized by equation 9, it follows that anticipated inflation will be equal to the mathematical expectation of that mechanism, i.e., to the sum of the expected values of the money growth rate and the random term, respectively.

Anticipated Money Growth Equation Finally, rational expectations are employed to determine the anticipated rate of monetary growth. Here rational expectations are the same as the predictions of the actual money growth generating mechanism, represented in the model by equation 10 (the policy-reaction function). Put differently, the expected value of the reaction function constitutes the rational expectation of money growth. And since the function contains a systematic (predictable) component whose expected value is simply itself and a random term with an expected value of zero, that expectation is

$$(12) \quad m^e = m(x_{-1}).$$

In short, the anticipated rate of monetary growth is given by the predictable component of the policy-reaction function. Rational agents know everything in the policy-reaction function except the random element. They know the constant terms, the coefficients, and the predetermined variable. They use all this information in formulating expectations of the rate of monetary growth, expectations which are given by equation 12.

The Reduced Form Equation Equations 8-12 constitute the fundamental relationships of the rational-expectations model. The model can be condensed to a single reduced-form expression by substituting equations 9-12 into equation 8 to yield

$$(13) \quad \epsilon + u = ax$$

which states that Phillips curve trade-offs result solely from inflationary surprises caused by random shocks. Note in particular that only that part of monetary growth arising from unpredictable random disturbances enters equation 13. The systematic component is absent. This means that systematic monetary policy cannot affect real economic activity (as represented by excess demand x). Only unexpected money growth matters.

The foregoing implies that the authorities can influence economic activity in only two ways. First, they can pursue a random policy, altering monetary growth in a haphazard unpredictable manner. That is to say they can manipulate the disturbance term u in the policy reaction function in a totally unpredictable way. Second, they can secretly change the feedback control rule, thereby affecting output and employment during the time people are learning about the new rule. It is unlikely, however, that this latter policy would prove effective for very long since rational agents would learn to predict rule

changes just as they predict the rule. This leaves random policy as the only way to affect economic activity. But randomness seems hardly a proper basis for public policy.

To summarize, the strict rational-expectations approach implies that expectational errors are the only source of departure from steady-state equilibrium, that such errors are short-lived and random, and that systematic policy rules will have no impact on real variables since those rules will already be fully embodied in rational price expectations. Thus, except for unpredictable random shocks, steady-state equilibrium always prevails and systematic monetary changes produce no surprises, no disappointed expectations, no transitory impacts on real economic activity. Trade-offs are totally adventitious phenomena that cannot be exploited by systematic policy even in the short-run. In short, no role remains for countercyclical stabilization policy. The only thing such policy can influence is the rate of inflation, which adjusts immediately to expected changes in money growth. The full effect of anticipated policy actions will be on the inflation rate. It follows that the authorities should concentrate their efforts on controlling this variable if it is desirable to do so since they cannot systematically influence real variables.

Evaluation of Rational Expectations The preceding paragraphs have shown what happens when rational expectations are incorporated into a model containing feedback policy rules, an inflation-generating mechanism, and an expectations-augmented Phillips curve or aggregate supply function embodying the natural rate hypothesis. An evaluation of the rational-expectations approach is now in order.

One advantage of the rational-expectations hypothesis is that it treats expectations formation as a part of optimizing behavior. By so doing, it brings the theory of price anticipations into accord with the rest of economic analysis. The latter assumes that people behave as rational optimizers in the production and purchase of goods, in the choice of jobs, and in making investment decisions. For consistency, it should assume the same regarding expectational behavior.

In this sense, the rational-expectations theory is superior to rival explanations, all of which imply that expectations are always consistently wrong. It is the only theory that denies that people make systematic expectation errors. Note that it does not claim that people possess perfect foresight or that their expectations are always accurate. What it does claim is that they perceive and eliminate *regularities*

in their forecasting mistakes. In this way they discover the actual inflation-generating process and use it in forming price expectations. And with rational expectations the same as the mean value of the inflation-generating process, those expectations cannot be wrong on *average*. Any errors will be random, not systematic. The same cannot be said for other expectations schemes, however. Not being identical to the expected value of true inflation-generating process, those schemes will produce biased expectations that are systematically wrong.

Biased expectations schemes are difficult to justify theoretically. Systematic mistakes are harder to explain than is rational behavior. True, nobody really knows how expectations are actually formed. But a theory that says that forecasters don't continually make the same mistakes seems intuitively more plausible than theories that imply the opposite. Considering the profits to be made from improved forecasts, it seems inconceivable that systematic expectational errors would persist. Somebody would surely note the errors, correct them, and profit by the correction. Other forecasters would make similar corrections. Together, the profit motive and competition would reduce forecasting errors to randomness.

Criticism of the Rational-Expectations Approach

Despite its logic, the rational-expectations approach has many critics. Some still maintain that expectations are basically nonrational, i.e., that people are too stupid, naive, or uninformed to formulate unbiased price expectations. A variant of this argument is that expectational rationality will be attained only after a long learning period during which expectations will be nonrational.

Most of the criticism, however, is directed not at the rationality assumption *per se* but rather at three other assumptions underlying the rational-expectations approach, namely the assumptions of (1) costless information, (2) no policymaker information advantage, and (3) price flexibility. The first states that information used to form rational expectations can be obtained and processed costlessly. The second holds that private forecasters possess exactly the same information as the authorities regarding the inflationary process. The third assumption states that prices and the rate of inflation respond fully and immediately to anticipated changes in monetary growth and other events. In effect, this last assumption denies that prices are sticky and costly to adjust.

Critics maintain that all of these assumptions are implausible and that if any are violated then the strong conclusions of the rational-expectations ap-

proach cease to hold. In particular, if the assumptions are violated then activist policies can have systematic effects on real variables. Indeed, the critics have demonstrated as much by incorporating constraints representing information costs, policymaker informational advantages, and sluggish price adjustment into rational-expectations models similar to the one outlined above.

Proponents of the rational-expectations approach readily admit that such constraints can restore the potency of activist policies. But they still insist that such policies are inappropriate and that the proper role for policy is not to systematically influence real activity but rather to neutralize the constraints. Thus if people form biased price forecasts, then the policymakers should publish unbiased forecasts. If information is costly to collect and process, then a central authority should gather it and make it available. If the policy authorities have informational advantages over private individuals, they should make that information public rather than attempting to exploit the advantage. Finally, if prices are sticky and costly to adjust, then the authorities should minimize these price adjustment costs by following policies that stabilize the general price level.

In short, advocates of the rational expectations approach argue that feasibility alone constitutes insufficient justification for activist policies. Policies should also be *desirable*. Activist policies hardly satisfy this latter criterion since their effectiveness is based on deceiving people into making expectational errors. The proper role for policy is not to influence real activity via deception but rather to reduce information deficiencies and perhaps also to minimize the costs of adjusting prices.

Conclusion This article has examined some recent developments in Phillips curve analysis. The chief conclusions can be stated succinctly. The Phillips curve concept has changed radically over the past 20 years as the notion of a stable enduring trade-off has given way to the view that no such trade-off exists for the policymakers to exploit. Instrumental to this change were the natural-rate and rational-expectations hypotheses, respectively. The former attributes trade-offs solely to expectational errors while the latter holds that systematic policies, by virtue of their very predictability, cannot possibly generate such errors. Taken together, the two hypotheses imply that systematic policies are incapable of influencing output and employment, contrary to the claims of policy activists. True, critics of the rational-expectations model have shown that relaxation of its more stringent assumptions restores the

short-run potency of stabilization policy. But members of the rational-expectations school reply that activist policies are undesirable in any case since those policies must rely on deception. Whatever the

verdict on the rational expectations approach, one must at least agree that it has posed a provocative challenge to proponents of activist stabilization policies.

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