Volume Title: The American Business Cycle: Continuity and Change

Volume Author/Editor: Robert J. Gordon, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-30452-3

Volume URL: http://www.nber.org/books/gord86-1

Publication Date: 1986

Chapter Title: The Mechanisms of the Business Cycle in the Postwar Era

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Chapter URL: http://www.nber.org/chapters/c10020

Chapter pages in book: (p. 39 - 122)

# 1 The Mechanisms of the Business Cycle in the Postwar Era

Otto Eckstein and Allen Sinai

## 1.1 Introduction

The business cycle has persisted in the postwar period, producing eight separate episodes of systematic fluctuations. Although a depression of the 1930s variety has been avoided, more severe and frequent recessions have occurred in recent years, and the hope of cycleless prosperity generated in the long expansion of the 1960s has been disappointed by the record of the 1970s and early 1980s.

The experience of recent years has revived the scientific study of the business cycle. In this paper the point of departure is an analysis of historical events and processes, applying the ideas of the business cycle literature to draw what generalizations can legitimately be made about phenomena common to most or all cycles. First, the eight postwar cycles are surveyed for their key elements. Second, a set of business cycle phases are derived from this survey. Third, the types of mechanisms that can trigger cycles are summarized. Fourth, particular attention is paid to the financial side of the business cycle and its systematic patterns since the mid-1950s. Fifth, we run a set of large-

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We gratefully acknowledge the work of Russell Robins, of Data Resources, Incorporated, and Shearson Lehman Brothers, and Peter Rathjens, of Shearson Lehman Brothers, in performing the computer simulations and in related support. We are also grateful to Robert Gross, of Data Resources, Incorporated, for his research assistance and to Kathleen Chapman and Debra Jenkins for producing the manuscript. Robert E. Hall, Robert J. Gordon, and Lawrence R. Klein made helpful suggestions on an earlier draft. The discussants of this paper, Michael Lovell and Kenneth Singleton, made valuable suggestions, and we thank Cary Leahey and Victor Zarnowitz for their comments.

scale econometric model simulations to estimate more precisely the relative role of several possible business cycle mechanisms. Finally, we draw some conclusions from our work on the main causes of cyclicality in the postwar period and the nature of any changes that have occurred. Throughout, the exposition focuses on the cycle both in real activity and in financial conditions, emphasizing the interactions.

## 1.2 An Overview of the Eight Postwar Business Cycles

There appear to have been five distinct phases of business cycle behavior in the postwar era: (1) from the end of World War II to the outbreak of the Korean War; (2) from the Korean War to 1961; (3) from 1961 to 1969; (4) from 1969 to 1979; and (5) from 1979 to 1983. The first phase was a period of adjustment from an economy in wartime mobilization to peacetime normality. The second phase contained several cycles and ended with considerable slack in the economy. In particular, three recessions occurred in the eight years from 1953 to 1961, a by-product of the boom in the mid-1950s and concern over inflation on the part of the Federal Reserve and the administration. From 1961 to 1969 there was a sustained business expansion, the longest in history, though two extended pauses in growth occurred in 1962 and 1967. Inflation rates were very low in the early 1960s, but in 1965 inflation began to accelerate. Between 1966 and 1979 the economy was characterized by a severe upward spiraling of inflation, with wide fluctuations in economic activity. In part these resulted from a series of demand, supply, and policy shocks and a worldwide boom. Then, between 1979 and 1982, two deep downturns occurred, primarily as the result of severely restrictive turns in monetary and fiscal policy to achieve lower inflation.

### 1.2.1 Business Cycle Events and Mechanisms

Without attempting to provide a complete historical account of the eight postwar business cycles, tables 1.1 and 1.2 highlight the events particular to each episode and summarize the major dimensions. Table 1.1 stresses the clearly identifiable special features, thereby allowing some common mechanisms to become visible as well. Table 1.2 provides the dimensions of length and amplitude for key parameters of performance in the postwar expansions and recessions.

The business cycle events can be classified into five types: (1) booms—periods in which aggregate demand rises much more rapidly than a balanced growth path and/or pushes the economy close to its productive ceiling; (2) negative demand shocks—sudden declines in aggregate demand that are a primary cause of cycle movements; (3) supply shocks—sudden curtailments in the supply of key materials or other disruptions

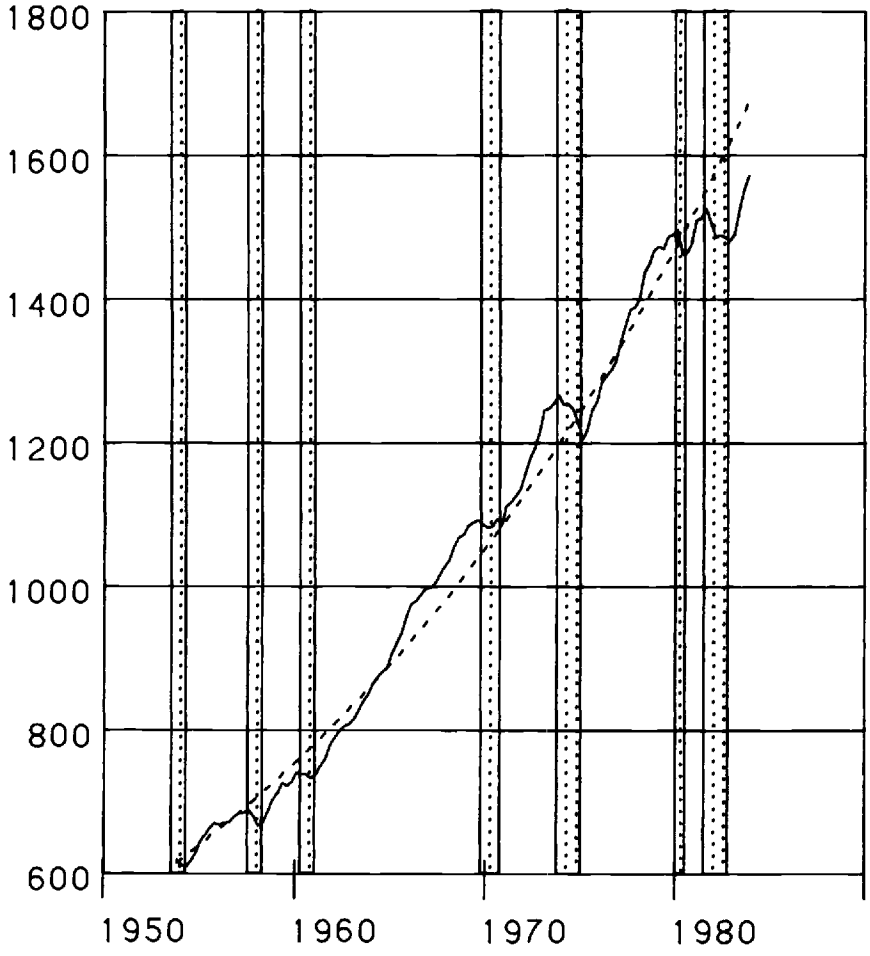


**Fig. 1.1** Real GNP relative to trend: postwar period (billions of 1972 dollars). Shaded areas are NBER recessions.

to production; (4) price shocks—sudden exogenous movements in the price level (such as the imposition and the ending of price controls); and (5) credit crunches—periods when financial distress produces sharp discontinuities in flows of funds and spending and when the financial strains include tight monetary policy, much lessened availability of money and credit, sharp rises of interest rates, and deteriorating balance sheets for households, businesses, and financial institutions.

It can be seen that six of the recessions were preceded by booms. The causes of these booms were varied: two involved wars, in Korea

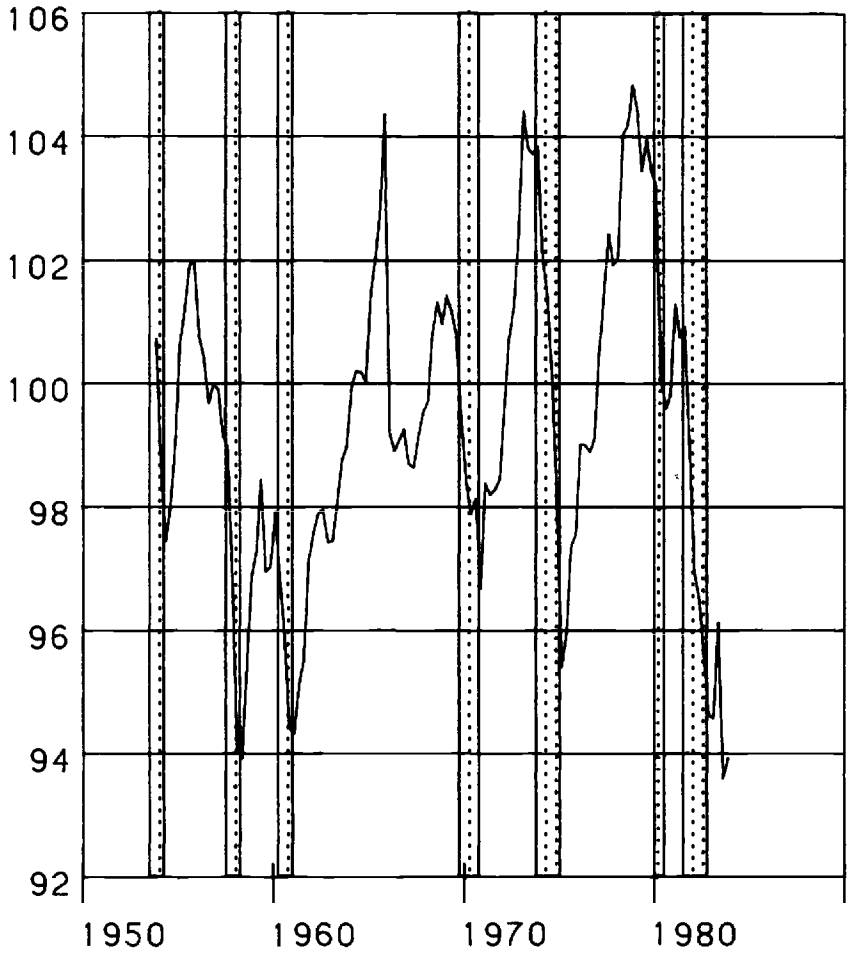


**Fig. 1.2** Changing cyclicality of real GNP in the postwar period (percentage of trend). Shaded areas are NBER recessions.

and Vietnam, two involved stock-flow adjustments of consumer durable goods, and one involved an unsustainable capital goods boom. One boom was worldwide, following the collapse of the fixed exchange rate regime in 1971. The most recent brief boom, in late 1978 and early 1979, was the result of excessively stimulative monetary and fiscal policies, negative real interest rates, and a sharp, if short-lived, decline of the dollar.

There were at least two exogenous negative demand shocks, both of which originated in the federal budget. The recession of 1948 was

**Table 1.1** **Summary of Business Cycle Events in the Postwar Era**

| Date of Onset of Recession | Preceding Booms | Demand Shocks | Supply Shocks | Price Shocks | Crunch, Including Precrunch Period | Recession Depth and Duration |
|---|---|---|---|---|---|---|
| November 1948 | Consumer durables boom | End of war economy | | | | Mild, brief |
| July 1953 | Korean War 6/50–3/51, 10/52–7/53 | | | | | Mild, brief |
| August 1957 | Auto boom Investment boom 3/55–12/55 | | | Break in raw materials prices | 1955:4 to 1957:4 | Severe, brief |
| April 1960 | | Swing to balanced federal budget, FY 1960 | Steel strike | | 1959:2 to 1960:2 | Mild, brief |
| December 1969 | Vietnam War 12/64–12/66, 12/67–11/69 | | Auto strike General Electric strike | Vietnam War inflation | 1966:1 to 1966:3 1969:1 to 1970:1 | Mild, brief |
| November 1973 | World boom, wage price controls and easier money 8/71–9/72; collapse of fixed exchange rate regime 6/72–4/73 | | OPEC I—fourfold oil price hike; world food supply shortages | OPEC I—fourfold oil price hike; end of price controls | 1973:1 to 1974:3 | Severe, extended |
| January 1980 | Small domestic boom 8/78–3/79 | | OPEC II—doubling crude oil prices; New Fed Policy 10/79 | OPEC II—doubling crude oil prices | 1978:2 to 1980:1 | Mild, brief |
| July 1981 | | | | | 1981:1 to 1981:4 | Severe, extended |

**Table 1.2 Dimensions of Postwar Business Cycles**

| Trough to Peak or Peak to Trough | Length of Expansion (months) | Length of Contraction (months) | Amplitude | | | |
|---|---|---|---|---|---|---|
| | | | Industrial Production (% change) | Real GNP (% change) | Inflation[a] (% change) | Unemployment Rate (%) |
| October 1945 (T) to November 1948 (P) | 37 | | n.a.[b] | n.a. | 0.0 (T); 6.9 (P) | 3.1 (T); 3.8 (P) |
| November 1948 (P) to October 1949 (T) | | 11 | −8.5 | −1.4 | −6.9 (P); −4.1 (T) | 3.8 (P); 7.9 (T) |
| October 1949 (T) to July 1953 (P) | 45 | | 50.1 | 27.2 | −4.1 (T); 0.6 (P) | 7.9 (T); 2.6 (P) |
| July 1953 (P) to May 1954 (T) | | 10 | −8.9 | −2.6 | 0.6 (P); 3.3 (T) | 2.6 (P); 5.9 (T) |
| May 1954 (T) to August 1957 (P) | 40 | | 21.8 | 13.2 | 3.3 (T); 3.9 (P) | 5.9 (T); 4.1 (P) |
| August 1957 (P) to April 1958 (T) | | 8 | −12.6 | −2.7 | 3.9 (P); 2.8 (T) | 4.1 (P); 7.4 (T) |
| April 1958 (T) to April 1960 (P) | 24 | | 22.7 | 10.2 | 2.8 (T); 5.7 (P) | 7.4 (T); 5.2 (P) |
| April 1960 (P) to February 1961 (T) | | 10 | −6.1 | −0.1 | 5.7 (P); 0.0 (T) | 5.2 (P); 6.9 (T) |
| February 1961 (T) to December 1969 (P) | 106 | | 76.8 | 47.2 | 0.0 (T); 7.7 (P) | 6.9 (T); 3.5 (P) |
| December 1969 (P) to November 1970 (T) | | 11 | −5.8 | −0.1 | 7.7 (P); 5.2 (T) | 3.5 (P); 5.9 (T) |
| November 1970 (T) to November 1973 (P) | 36 | | 25.6 | 16.7 | 5.2 (T); 10.1 (P) | 5.9 (T); 4.8 (P) |
| November 1973 (P) to March 1975 (T) | | 16 | −15.1 | −4.9 | 10.1 (P); 3.9 (T) | 4.8 (P); 8.6 (T) |
| March 1975 (T) to January 1980 (P) | 58 | | 37.0 | 24.3 | 3.9 (T); 19.2 (P) | 8.6 (T); 6.3 (P) |

| | | | | | | |
|---|---|---|---|---|---|---|
| January 1980 (P) to July 1980 (T) | | 6 | −8.3 | −2.2 | 19.2 (P); 1.0 (T) | 6.3 (P); 7.8 (T) |
| July 1980 (T) to July 1981 (P) | 12 | | 9.7 | 4.2 | 1.0 (T); 14.6 (P) | 7.8 (T); 7.3 (P) |
| July 1981 (P) to November 1982 (T) | | 16 | −12.3 | −3.0 | 14.6 (P); 0.0 (T) | 7.3 (P); 10.7 (T) |

Recessions:
- Average length: 11.0 months
- Median length: 10.5 months

Industrial production
- Average decline: 9.7% (peak to trough)
- Median decline: 8.7% (peak to trough)

Real GNP
- Average decline: 2.1% (peak to trough)
- Median decline: 2.4% (peak to trough)

Inflation (change in percentage points) (peak to trough)
- Average: −5.4
- Median: −4.8

Unemployment rate (change in percentage points) (peak to trough)
- Average: 2.9
- Median: 3.3

Expansions:
- Average length: 44.8 months
- Median length: 38.5 months

Industrial production
- Average rise: 34.8% (trough to peak)
- Median rise: 25.6% (trough to peak)

Real GNP
- Average rise: 20.4% (trough to peak)
- Median rise: 16.7% (trough to peak)

Inflation (change in percentage points) (trough to peak)
- Average: 5.4
- Median: 4.1

Unemployment rate (change in percentage points) (trough to peak)
- Average: −2.0
- Median: −2.0

[a]Consumer price index—all urban; annual rate at peak or trough.

[b]n.a. = not available.

an inevitable concomitant of the conversion of the American economy from war to a peacetime footing. The swing in the federal budget was so great that even though there was an early boom in civilian demand, industrial production declined sharply and an "official" recession did occur. The other shock of this type was President Eisenhower's achievement of a balanced federal budget in 1960, when the largest swing of the postwar period was registered in the full employment budget.

At least four supply shocks can be identified as having played a major contributing role in particular business cycles. The steel strike of 1959 was a major cause of the 1960 recession (and the auto strike of 1970 came close to aborting that recovery in its early stages). The two supply disruptions of world oil, in 1973 and again in 1979–80, the agricultural crisis created by the extraordinarily poor crops of 1972, and the United States–Russia wheat deal also had broad cyclical implications.

All but the first two of the recessions were preceded by credit crunches. In each case interest rates shot up to high, usually unfamiliar levels late in the upswing and began the process of diffusing recessionary forces through the entire economy. In all but the most recent two cases, the credit crunches also were characterized by sharply increased credit rationing created by the presence of interest rate ceilings that produced gross distortions in the flow of funds of the financial system. And in every situation, balance sheets deteriorated to the point where risks of bankruptcy and failure became costly. Sharp cutbacks in spending and borrowing were the consequence.

As a result of these events and the underlying business cycle mechanisms, the economy experienced six recessions that can be safely characterized as brief and mild, though they did not always feel that way at the time. Three of the recessions were more serious: the 1957–58, 1973–75, and 1981–82 episodes. The 1957–58 recession, which followed a major boom and prolonged period of a worsening credit crunch, was severe, with the unemployment rate rising from 4.1% to 7.4%. A worsening inflation, reaching 5.9% at the peak and largely caused by "wage-push" and bottleneck excess demands, made the Federal Reserve prolong its period of tightness and made the government reluctant to aid the economy with fiscal stimulus. The recovery from this recession was rather weak and ultimately proved incomplete.

The other severe recessions were longer and in each case represented a complicated interaction of supply shocks that first triggered double-digit inflation and then severe credit crunches. The recession of 1973–75 was complicated by the collapse of price controls that had been instituted in 1971–72 and by the synchronization of the business cycle across the industrial world. The recessions of 1980 and 1981–82 were worsened by the policy decision to accomplish a massive disinflation

by maintaining a condition of severe credit restraint deep into the recession.

This very brief survey of business cycle events makes clear that no single, simple feature of the economy's behavior can be the cause of the business cycle. Some ideas from the recent literature, such as asymmetric information, the misreading of absolute price changes as relative price changes, the serial correlation introduced by buffer inventory stocks in production, and lags in the wage/price process, may be part of reality, but even the most cursory look at actual history shows that they can be no more than a small part of it.

### 1.2.2 Has the Business Cycle Changed in the Postwar Era?

Tables 1.1 and 1.2 and figure 1.2 indicate some changing characteristics of the postwar business cycle, especially in recent years. First, the cyclicality of real GNP has increased. Real GNP underwent swings from 104% of trend in 1953 to just under 94% in 1958, from a little over 94% to 106% between the early 1960s and 1969, and then from over 106% in 1973 to under 92% in November 1982. Second, cyclical downturns have become more frequent and severe since 1969 (table 1.2, fig. 1.2). Three recessions have occurred in the past ten years, and two of them were the longest in the postwar period. Third, the business cycle in general has become increasingly volatile in the postwar era. Swings of industrial production, inflation, and the unemployment rate have exceeded the average for the complete postwar period, both in expansions and downturns, since the mid-1970s.

## 1.3 Stages of the Business Cycle in the Postwar Period

In a descriptive sense, there has been general agreement on the stages of the business cycle, as chronicled by the National Bureau of Economic Research.[1] These have been variously named the peak or upper turning point, contraction or downturn, trough or lower turning point, recovery, and expansion. The timing of these stages has been identified on the basis of the systematic behavior of numerous statistical series that primarily describe the real economic behavior of the United States economy. These stages do no more than separate periods of expansion from periods of contraction, however, and attach precise dates to the turning points.

The actual events of the postwar business cycles, real and financial, suggest a more elaborate set of "stages" in greater recognition of the processes that are intrinsic to the fluctuations in economic activity. The simultaneous and interrelated behavior of real and financial markets

1. See Burns and Mitchell 1946 and Mitchell 1927.

produces real and financial sides to the business cycle that should be described by the nomenclature.[2]

Thus, we propose the following stages: (1) recovery/expansion; (2) boom; (3) precrunch period/credit crunch; (4) recession/decline; and (5) reliquefication. This nomenclature recognizes and suggests that the business cycle is more than just an occasional reversal of direction, instead consisting of systematic real sector movements as well as associated financial phenomena.[3] An occasional cycle may omit one or another of the stages, and there will be some overlap in their timing. But the typical cycle seems to run through all five stages. Table 1.3 shows the chronology of these five stages in the eight business cycle episodes since 1950.

### 1.3.1 Recovery/Expansion

The lower turning point marks the beginning of recovery. The forces of contraction having run their course, or improvements being made in final demands, will cause an expansion to begin. Since the United States enjoys continuous technological progress, positive capital accumulation, and a continued increase of the working-age population, the normal condition for the economy is growth. No special theory, therefore, is required to "explain" expansion; indeed, only significant disruptive events can avoid it. Typically, however, certain catalytic events have helped to initiate the expansion, most often changes in policy that were designed to arrest and reverse the downturn.

In common usage, the recovery phase is usually defined to stretch from the lower turning point to the time when aggregate measures of physical activity such as real GNP or industrial production have returned to their previous peak levels. Once the economy is on new ground, recovery is said to be complete, though a more demanding set of definitions would call for a return to prerecession unemployment levels or a return to the neighborhood of the natural rate of operation of the economy. The expansion phase continues from the end of recovery until the upper turning point is reached. In the business cycle

2. Most theories of the business cycle have paid little attention to the financial factor, probably because of the difficulty of integrating "financial" with "real" theory. The Keynesian tradition spawned a host of real theories (multiplier/accelerator) of business fluctuations. Yet, clearly, events that are financial have played a major role in most cycles.

3. The notion here is that each stage in the "real" business cycle is accompanied by a stage in a "financial" or "flow of funds" cycle. A flow of funds cycle has been described as having stages named the precrunch period, crunch, reliquefication, and accumulation (Sinai 1978). The precrunch period overlaps with the expansion stage of standard business cycle nomenclature. The crunch corresponds to the upper turning point. Reliquefication occurs in recession and recovery. And the accumulation stage overlaps the expansion, especially the early stage. Since the accumulation phase essentially is the expansion, it was not separately identified in table 1.3.

**Table 1.3 Stages of Postwar Business Cycles**

| Episode | Recovery/Expansion | Boom | Recession | Precrunch Period/Crunch | Reliquefication |
|---|---|---|---|---|---|
| I | 1945:4 to 1948:4 | — | 1948:4 to 1949:4 | — | — |
| II | 1949:4 to 1953:2 | 1952:4 to 1953:2 | 1953:2 to 1954:2 | — | — |
| III | 1954:2 to 1957:3 | 1955:1 to 1955:4 | 1957:3 to 1958:2 | 1955:4 to 1957:4 | 1958:1 to 1958:2 |
| IV | 1958:2 to 1960:2 | — | 1960:2 to 1961:1 | 1959:2 to 1960:2 | 1960:3 to 1964:3 |
| V | 1961:1 to 1969:4 | 1964:4 to 1966:4 | — | 1966:1 to 1966:3 | 1966:4 to 1967:3 |
| | — | — | 1969:4 to 1970:4 | 1969:1 to 1970:1 | 1970:2 to 1971:2 |
| VI | 1970:4 to 1973:4 | 1972:2 to 1973:4 | 1973:4 to 1975:1 | 1973:1 to 1974:3 | 1974:4 to 1976:2 |
| VII | 1975:1 to 1980:1 | 1978:3 to 1979:1 | 1980:1 to 1980:3 | 1978:2 to 1980:1 | 1980:2 to 1980:3 |
| VIII | 1980:3 to 1981:3 | — | 1981:3 to 1982:4 | 1981:1 to 1981:4 | 1982:1 to 1983:2 |
| IX | 1982:4– | — | — | — | — |

*Sources:* National Bureau of Economic Research; Eckstein 1976; Conner and Eckstein 1978; "Boom Monitor," *Data Resources Review,* various issues; Sinai 1978.

timing of table 1.3, we accept the National Bureau of Economic Research approach and the United States Bureau of the Census implementation of the definitions of this stage in each business cycle.

### 1.3.2 Boom

A boom is a period of an unsustainable rapid rate of advance of economic activity, with the major sectors growing at rates that are clearly temporary. In this stage the economy as a whole is often significantly above its trend growth path and usually is near its ceiling of potential output. There have been six booms since 1945, with five of them soon succeeded by recessions and one (1964 to 1966) followed by a growth recession. Only two of the recessions were not preceded by booms, and both are easily explained by other circumstances. The recession of 1960 was due to the negative demand shock of a suddenly balanced budget and credit crunch, with recovery kept incomplete by restrictive demand management policies. The recession of 1981–82 was part of a longer downturn that began in 1980. The brief expansion of 1980–81 can be viewed as little more than a short disruption of a recession caused by a severely restrictive monetary policy, in a temporary deviation from the basic goal of disinflation. Industrial production only briefly surpassed its previous peak, but by enough for the National Bureau of Economic Research to declare a business cycle expansion.

The boom episodes are defined by the Data Resources, Incorporated (DRI) composite boom index, a list of eight time series analogous to the NBER leading indicator indexes but designed to identify the presence of a boom rather than the imminence of a downturn (fig. 1.3 and table 1.4). This index was originally constructed because recessions usually develop so quickly that even the best leading indicator indexes barely give warning. If the boom could be identified instead, then advance notice with longer, though imprecisely known lead times should become possible. The eight series are: (1) change in the ratio of consumer credit outstanding to disposable income, (2) ratio of car sales to driving-age population, (3) ratio of housing starts to population age twenty years and older, (4) the DRI index of labor market tightness, (5) eighteen-month growth in the real monetary base, (6) Federal Reserve Board capacity utilization rate for materials industries, (7) ratio of capital spending to real trend line GNP, and (8) vendor performance.

The eight series fall into two types. Items 1, 2, 3, and 7 are measures of sectoral final demands that show disequilibrium from sustainable trend values. Items 4, 6, and 8 measure the degree of resource utilization, that is, the tightness of markets. Item 5 measures deviations of monetary policy from its sustainable trend: when the real monetary base has grown too fast for eighteen months, a boom is likely to be under way.

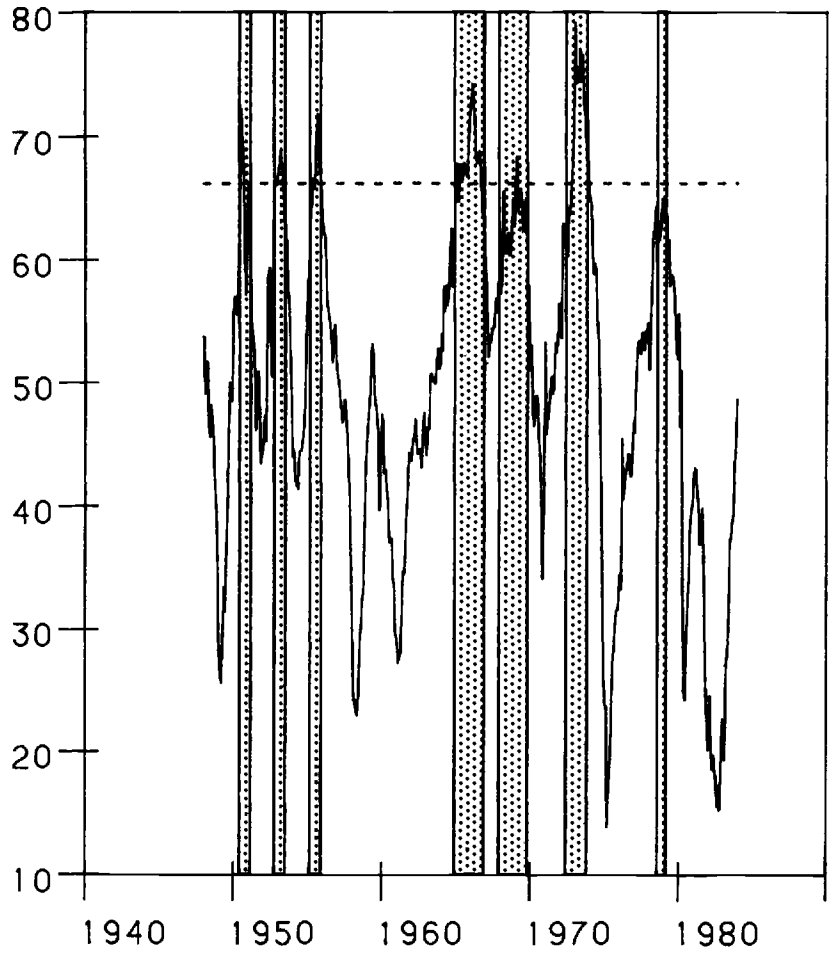


**Fig. 1.3** The DRI composite boom index. Horizontal line denotes boom average; shaded areas indicate boom periods.

### 1.3.3 Precrunch Period/Credit Crunch

Because every recession since the mid-1950s was preceded and triggered by a credit crunch, this experience can be included in the standard stages of the business cycle. Late in the expansion, the demand for credit expands beyond the ability of businesses, households, and governments to finance still expanding commitments out of internally generated funds. Accelerating inflation may also intensify the demand for credit. At some point the supply of credit ceases to keep pace, usually because the central bank becomes increasingly perturbed by visible signs of a boom. As the Federal Reserve curtails the growth of bank

**Table 1.4 The DRI Boom Monitor**

| | Three Boom Periods, Average Values | | | All Boom Periods, Average | Historical Average | Third Quarter 1983 | October 1983 | November 1983 | December 1983 |
|---|---|---|---|---|---|---|---|---|---|
| | 67:12 to 69:11 | 72:6 to 73:11 | 78:8 to 79:3 | | | | | | |
| The DRI composite boom index | 62.65 | 70.69 | 63.19 | 66.210 | 50.00 | 38.31 | 42.03 | 43.57 | 45.34 |
| Ratio of change in consumer credit to disposable income | 0.015 | 0.023 | 0.028 | 0.018 | 0.013 | 0.018 | 0.024 | 0.023 | |
| Index[a] (weight = 0.107) | 52.08 | 67.67 | 74.63 | 60.29 | 50.00 | 52.30 | 65.57 | 62.94 | |
| Per capita car sales | 0.072 | 0.078 | 0.069 | 0.070 | 0.059 | 0.053 | 0.056 | 0.054 | 0.060 |
| Index[a] (weight = 0.107) | 72.19 | 79.25 | 57.99 | 70.87 | 50.00 | 24.75 | 30.22 | 27.02 | 37.36 |
| Ratio of housing starts to adult population | 0.013 | 0.017 | 0.013 | 0.014 | 0.013 | 0.011 | 0.010 | 0.011 | 0.010 |
| Index (weight = 0.098) | 47.82 | 76.41 | 49.84 | 58.81 | 50.00 | 39.12 | 33.29 | 37.36 | 33.64 |
| DRI index of labor market tightness | 70.49 | 64.69 | 62.24 | 66.320 | 50.06 | 30.11 | 34.26 | 35.50 | 37.00 |
| Index (weight = 0.152) | 75.34 | 68.14 | 65.11 | 70.17 | 50.00 | 25.27 | 30.42 | 31.95 | 33.82 |
| Real monetary base growth | 2.674 | 4.399 | 1.793 | 2.494 | 0.922 | 6.379 | 6.645 | 6.695 | 6.130 |
| Index (weight = 0.096) | 61.64 | 73.09 | 55.78 | 60.44 | 50.00 | 86.24 | 88.01 | 88.34 | 84.59 |
| Capacity utilizations/ materials | 0.878 | 0.904 | 0.880 | 0.887 | 0.830 | 0.775 | 0.794 | 0.798 | 0.801 |
| Index (weight = 0.147) | 66.68 | 75.68 | 67.40 | 69.86 | 50.00 | 31.12 | 37.70 | 39.09 | 40.12 |
| Ratio of capital spending to trend GNP | 0.108 | 0.106 | 0.108 | 0.111 | 0.104 | 0.090 | 0.089 | 0.093 | |
| Index (weight = 0.191) | 60.27 | 54.43 | 60.67 | 66.30 | 50.00 | 18.81 | 16.78 | 26.67 | |
| Vendor performance | 0.58 | 0.80 | 0.70 | 0.671 | 0.51 | 0.58 | 0.64 | 0.59 | 0.67 |
| Index (weight = 0.102 | 58.74 | 84.21 | 72.12 | 69.12 | 50.00 | 58.10 | 65.52 | 59.66 | 69.04 |

[a]Index reflects trend adjustment of base series.

reserves and seeks to limit the money supply, interest rates rise sharply and credit rationing becomes widespread. The period over which these processes occur can be identified as the precrunch period, when the preconditions of a financial crisis are laid.

More recently, with the deregulation of deposit and loan rates at financial institutions and new deposit innovations, rising interest rates have become the focus of adjustment through affordability and debt service effects. Excessive monthly loan payments on big-ticket items and onerous debt service charges relative to income or cash flows were a principal mechanism of financial restraint in 1980 and 1981–82, although some traditional credit strains also occurred.

In the credit crunch itself, households, businesses, and financial institutions find that the expectations upon which spending plans are based become falsified as balance sheets deteriorate, with loan repayments, debt burdens, and costs of financing all becoming surprisingly burdensome. Interest rates move sharply higher, rising in nonlinear fashion from a combination of strong private sector credit demands, reduced liquidity in the commercial banking system, sales of financial assets to raise funds or prevent large capital losses, and a monetary squeeze by the Federal Reserve. As rising interest rates, credit rationing, and the financial risk associated with deteriorated balance sheets reduce the total level of spending, market activities grow less than expected, curtailing internal cash flows and adding further to the needs for external financing. Households reduce outlays and become extremely cautious. Firms cease to hire new workers and attempt to reduce inventories. Business plant and equipment outlays are sharply cut. As a new perception of the state of the economy spreads, business demand for the factors of production shrinks. Changes in inventory policy amplify the production cutbacks of the more basic industries.

The crunch is at the heart of the business cycle mechanism, particularly the upper turning point, and is discussed more fully in section 1.5. The timing of both the precrunch period and crunches since the mid-1950s is shown in table 1.3.

### 1.3.4 Contraction/Recession

According to the NBER methodology, a recession covers the period beginning with the upper turning point and continuing through the interval of absolute decline in physical activity. Once the decline begins, business has to adjust its inventories to the lower current volume of sales and curtail its total spending commitments to reflect the reduced availability of internal capital. Depending on the extent of revision of business expectations between the months before the upper turning point and the period of recession, the adjustment will be large or small.

The severity of the financial disturbance associated with the credit crunch and the speed with which fiscal and monetary policies switch from restraint to stimulus also affects the length and severity of the recession.

The lower turning point is reached when business spending commitments have moved closer to the new, lower equilibrium and stock adjustment processes set up for a reversal. Exogenous forces, such as stimulative changes in monetary and fiscal policy, also can accelerate or delay the lower turning point.

### 1.3.5 Reliquefication

Reliquefication is a stage of financial restructuring that occurs during recession and early recovery. During the period leading up to a crunch, business and household balance sheets become more and more strained, remaining troublesome through the crunch itself and even in the early stages of recession. Financial commitments can be reduced only so fast, and sources of funds usually shrink even more quickly when the economy turns down. Business adjusts to this situation by an "undershoot" on spending commitments, including hiring freezes or even layoffs, drastic deferrals on capital budgets, and a dumping of inventories through sales at distress prices, all in order to quickly improve cash flow and strengthen balance sheets. A rebuilding of balance sheets through the accumulation of financial assets, other than transactions money, and a decumulation of liabilities then takes place to help set the stage for further expansion.

The process of reliquefication has taken anywhere from two to sixteen quarters, according to table 1.5. Until a minimum degree of reliquefication is accomplished, a business cycle upturn is difficult to achieve or sustain.

## 1.4 The Generic Cyclical Mechanisms

The analytical minimum requirements of a macro model capable of producing cycles have long been understood.[4] The cycles can originate in a two-period, second-order linear difference equation model in which the parameters on the endogenous variables are of sufficiently destabilizing magnitudes. If the coefficients are very large and destabilizing, the economy takes on an explosive character. If the coefficients are smaller, the cycles are quickly damped. Intervening values will generate a self-sustaining cycle in linear systems, without random shocks.

4. For an exposition of this business cycle mechanism, see Samuelson 1939, and Baumol 1959.

A model with intrinsically damped properties can generate cycles if it is combined with a shock mechanism that reinforces the cyclical movements. Such shocks can be systematic, with their own periodicity—for example, a cyclicality in fiscal or monetary policy that is created by politics or lagged responses to business conditions in the private sector. Or the shocks can appear to be random in nature—occasional strikes, droughts, or even events such as the OPEC oil price hikes.

The business cycle literature has proposed many mechanisms that stem from the analytics of the basic dynamic second-order linear difference equation. The multiplier/accelerator model is the best known, with its linear consumption function and an investment equation based on the rate of change of output one quarter earlier. Hicks (1950) concluded that the accelerator coefficient in such a system was sufficiently large to make the cycle intrinsically explosive. A ceiling and a floor therefore were used to contain the economy to a stable cyclical path.

The accelerator model, or its more flexible variant the capital stock adjustment model, has been applied to various components of final demands. The stock of business fixed capital is the archetypal example, of course. Adjustment of the inventory stock to expected sales was proposed by Metzler (1941). Consumer durable goods purchases can be governed by a stock adjustment mechanism, with changes in permanent income producing changes in the desired stock of consumer durables.

Financial behavior also contains a large element of stock adjustment mechanisms. Individuals and businesses desire certain portfolios of assets and liabilities. If there are changes in the target stocks, the flows necessary to accomplish the desired stock adjustments can be highly volatile and cyclical.

The dynamics of adjustments in wages and prices can reinforce the cyclical mechanisms, or provide an impetus of their own, so long as they are not of the market clearing type. If it takes a considerable interval for wages to fully adjust to changes in the inflation rate, whether for reasons of contracts or gradual learning processes, cyclical mechanisms may be reinforced because the inflationary effects of a strong expansion will not be fully felt for some time. Consequently, the reaction of policy or of consumers may coincide in timing with the downturn in the real cycle.

The dynamics of the production process accentuate cycles.[5] Producers often misperceive the strength of final demand because they are removed by several stages of production from end markets; they find

5. See Zarnowitz 1973.

it difficult to distinguish inventory changes at intermediate stages of production from swings in final demands. Optimal buying policy responds to actual delivery periods and short-term price behavior, and these buying policies in turn lengthen order books, thereby intensifying supply shortages, triggering further inventory buying, and raising prices of factors and intermediate goods.

The business cycle mechanism also can be reinforced by external developments. Whereas foreign markets and foreign sources of supply usually serve as stabilizers of the business cycle, the international monetary system and changes in such factors as world oil prices can help create a synchronization of cycles in real demands that intensify the instability of material and product markets of internationally traded goods.

Expectations have long been recognized as a source of potential instability and fluctuations in economic activity (see appendix 1.2). Keynes stressed the importance of expectations as a source of instability in the investment and liquidity preference functions. Autonomous shifts in investment demand and in the demand for money provided impulses for cyclical movements, affecting the amplitudes of expansions and declines. The consumption function also was subject to autonomous shifts.

Subsequently, there was a general acceptance of expectations phenomena as a determinant of economic behavior. Stock adjustment and adaptive expectations models became widespread, though characterized by a backward look at actual behavior. In Hicks (1950), distributed lags in the adjustment of consumption and investment contributed to the dynamics of the trade cycle that was analyzed. In more recent years, surveys of expectations and notions of rationally formed expectations have replaced extrapolative or adaptive expectations in much of theory, as a more forward looking means of incorporating expectations into the analysis of economic behavior.

As a generic mechanism, expectations can affect the business cycle in several ways. First, the manner by which expected values are formed can have an impact—in particular on business cycle dynamics through the lags involved in expectations formation. Second, deviations of actual from expected behavior in the form of surprises or disappointments affect economic and financial market behavior. Third, expectations of movements toward equilibrium are based on notions that derive from theoretical constructs or practical knowledge of processes and affect behavior. Finally, waves of optimism or pessimism influence both the amplitude and the time lags of economic activities.

Expectations are formed rationally, through adaptive behavior or learning from past errors or by extrapolation of past behavior. Financial markets generally come closest to exhibiting rationally formed expec-

tations. There is an early discounting of potential future events and, in particular, expectations on policy. Information is used efficiently, and decisions are made quickly. One exception is in the formation of expected inflation, where a slow process of adjustment seems to characterize the reactions of fixed income investors to changes in the actual rate of inflation.

Other markets, whether for reasons of adjustment lags, slow changes in perceptions, delivery lags, contractual time lags, surprises, or unexpected shocks, exhibit extrapolative or adaptive expectations. The labor market is characterized by slower reactions in expectations through instances of money illusion and considerable extrapolative behavior based on past inflation. Cost-of-living agreements, for example, perpetuate past changes of inflation into wages, which in turn affect future inflation through unit labor costs.

Finally, the element of surprise or disappointment can be important for the business cycle. When the sales expectations of business are disappointed on more than a random basis, capital outlays and inventories are cut back, imparting cyclicality to the economy. Tighter than expected Federal Reserve policy can bring worse than expected debt service charges and unexpected reductions in spending and borrowing. The quantification of expectations in models of the United States economy remains fairly primitive but still contributes to explaining cyclical behavior.[6]

The list of generic business cycle mechanisms can be extended and presented in a more elaborate classification (table 1.5). There are factors that principally affect the amplitude of the business cycle: the impulse mechanisms. Impulses can stem from autonomous shifts in exogenous variables having to do with stabilization policy, wars, strikes, new institutional arrangements, financial deregulation, and technological advances. "Endogenous" contributions to the amplitude of the business cycle include shifts in sentiment, swings of inflation and interest rates, and deviations of actual events from expectations, among others. These factors have seemed to affect the amplitude of the business cycle but themselves occur in response to other inputs.

Propagation mechanisms affect the oscillations, phase, and duration characteristics of the business cycle. The internal diffusion of business cycle responses often occurs through the signal mechanisms (prices, wages, interest rates, etc.) of the economic system and distributed lag reactions to them. Adjustment lags, in both real and financial processes, propagate various impulses through the system. Stock adjustments and expectations formation are major generic propagation mechanisms, oc-

6. See Eckstein 1983, 40–49, and Brimmer and Sinai 1981 for a discussion of how expectations influence the economy in the DRI model.

**Table 1.5 The Mechanisms of the Business Cycle**

| Impulse Mechanisms (amplitude) | Propagation Mechanisms (oscillations, phase, duration) |
|---|---|
| "Exogenous"<br>Policy/monetary and fiscal<br>Rest of the world<br>"Autonomous" spending<br>Sentiment<br>Wealth<br>"Shocks"<br>Wars<br>Strikes<br>OPEC<br>Legislation/taxes, spending, financial<br>Institutional change<br>Technological change | Flow-stock adjustments: real<br>Consumer durables—autos, furniture, etc.<br>Investment<br>Residential construction<br>Inventories<br>Business fixed investment<br>Public construction<br>Flow-stock adjustments: financial and balance sheet<br>Debt and financial asset accumulation<br>Debt service burdens<br>Loan deposit ratios<br>Financial risk<br>Failure, bankruptcy, and default |
| "Endogenous"<br>Inflation<br>Interest rates<br>Balance sheets and liquidity<br>Availability of funds<br>Stock prices<br>Expectations<br>Surprises or disappointments relative to expectations | Expectations formation<br>Consumption<br>Investment<br>Residential construction<br>Plant and equipment<br>Inventories<br>Inflation—wages and prices<br>Policy responses to the economy, inflation, unemployment, and monetary growth |

*Note:* Many of the mechanisms are not mutually exclusive, overlapping between providing an impulse to the system and acting as a propagation mechanism.

curring in durable goods spending by households and business, inventory accumulation, debt and financial asset accumulation, and derivative factors such as debt service relative to cash flow, loan repayment burdens, and even cataclysmic disturbances like bankruptcies or default. Finally, certain elements of policy enter into the propagation of impulses, for example, the response of monetary policy to changes in inflation engendered by the quadrupling of crude oil prices in October 1973. Though the endogenous response of policy may operate only with long lags, it must be regarded as an essential part of the propagation mechanism.

The postwar period has seen instances when each of the mechanisms in table 1.5 played a role. How important have these mechanisms been, on average? Which of them are really central to the persistence of the business cycle? And, have they changed over the postwar era? In section 1.6 below, the results of some simulations with the large-scale

DRI econometric model of the United States economy provide some perspective on these questions. But since many of the mechanisms of the business cycle are financial, we present a more detailed examination of the role for money and finance in the business cycle before turning to these results.

## 1.5 The Financial Factor in the Postwar Business Cycle

In the 1930s, 1940s, and 1950s, formal theories of the business cycle typically paid scant attention to the role of money, credit, and interest rates, concentrating instead on "real" explanations, principally multiplier/accelerator interactions.[7] The availability of finance was recognized as a constraint and critical ingredient in the upper turning point. Interest rates were thought to have only a minor role, operating through the cost of finance and with inelastic response coefficients for spending.

These limited views did not capture the essence of how financial factors condition the pattern of business fluctuations, however. Virtually every major recession or depression has contained financial events as critical ingredients.[8] And expansions and booms have been affected by the financial factor as well—in particular through a high elasticity of supply.

In the postwar era a newer phenomenon, although having many characteristics similar to other episodes throughout history, has emerged as a systematic element in the business cycle. This is the credit crunch experience.[9] The financial events of the crunch and interactions with housing activity, consumer spending, business outlays, and state and local government spending have served as both impulse and propagation mechanisms. Periods of major financial disturbances are generally agreed to have occurred in the form of credit crunches in 1966, 1970, 1974, 1980, and 1982.[10] Less obvious has been the expansiveness of the financial system during the early stages of business expansions. All of this suggests a financial side to the business cycle, just as systematic in its effects as real phenomena but not widely analyzed.

The financial side of fluctuations in business activity can be termed a "flow of funds" or "credit" cycle.[11] The notion of a flow of funds

7. Haberler 1937 provides a discussion of the place of the monetary factor in the overinvestment theories of the business cycle.

8. See the various discussions in Hawtrey 1926, Fisher 1933, Haberler 1936, Hicks 1950, Minsky 1977, and Sinai 1976, who highlight the "financial factor" as a key element in the mechanism of the business cycle.

9. Credit crunches or financial crises have been discussed and analyzed in Fisher 1933, Minsky 1977, Sinai 1976, 1978, 1980, and Wojnilower 1980. To Fisher, Minsky, and Sinai the process is endogenous, a by-product of the real cycle that simultaneously occurs.

10. The Great Depression also has been viewed as arising from financial processes. See Friedman and Schwartz 1963 and Bernanke 1981.

11. Sinai 1976, 1978, 1980; Eckstein 1983, chap. 4.

cycle is based on the fully simultaneous nature of "real" and "financial" activities and the feedback effects on spending of balance sheet positions and the liquidity of various sectors as the business cycle evolves.

Changes in spending and employment are accompanied by financial activities such as borrowing or debt repayment and sales or purchases of financial assets that affect interest rates, balance sheets, and liquidity. This in turn brings fluctuations in spending through both flow and stock adjustment effects. Since every expenditure or use of funds must be financed by a source of funds, systematic patterns of financial behavior accompany the real outlays for households, businesses, and government.[12] Financial institutions such as banks and thrifts show analogous patterns of behavior, except they use funds to make loans and investments and obtain funds from deposits and loan repayments. In addition to the flows of money, credit, and assets that accompany real side activities, flow-stock cumulations and decumulations of debts and assets occur, altering the state of sectoral balance sheets.

Along with interest rates and cash flows, the balance sheets determine the financial risk associated with each sector. At the crunch stage of the business cycle, the degree of financial risk that is present constrains sectoral spending, limits the availability of credit, can result in bankruptcies, default, and failures, and intensifies the downturn in the economy. Monetary policy and interest rates play an important role in this process, setting limits on the availability of funds, affecting debt service burdens, and acting as determinants of financial risk.

Most prominent in the flow of funds cycle is the crunch, which has appeared late in expansion to help bring about a turning point and to intensify the ensuing downturn. Less well documented and not so obvious has been the processes of repair and rebuilding of balance sheets and liquidity that have systematically occurred in recovery and expansion, along with the real side characteristics of the business cycle. These, in fact, have been every bit as systematic as the financial crisis or crunches. This stage is called reliquefication.

12. In a flow of funds cycle, uses of funds include acquisitions of financial or physical assets. Sources of funds comprise the borrowing necessary to finance acquisitions of physical assets and the "new money" flows that become available to each sector period by period. These new money flows are current sources of funds such as disposable income (households): cash flow (corporations); deposit inflows, adjusted for reserve requirements, and loan repayments (financial institutions); and tax receipts (federal, state, and local governments). The new money flows can be used for spending on goods and services, accumulating financial assets, or reducing outstanding liabilities. When they are insufficient to at least cover the uses of funds, external financing is necessary. The balance sheet and liquidity positions of different sectors of the economy change and evolve during the flow of funds cycle as well, providing yet another source of fluctuations in the business cycle.

### 1.5.1 The Flow of Funds Cycle

The "flow of funds" or "credit cycle" can be divided into phases of accumulation, developing financial instability or the precrunch period, crunch, and reliquefication.[13]

In the *accumulation* stage, there is an upturn in the acquisitions of physical and financial assets corresponding to the expansion phase of the business cycle. Financial constraints are minimal, and previously restored liquidity is dissipated only slowly. Funds are available, affordability is not a major limiting factor, and the institutions that supply finance are eager to make funds available. A boom often develops during the accumulation phase and is an important ingredient in the crunch process that follows. New money flows rise most rapidly during accumulation, helping to keep sectoral external financing requirements to a minimum.

The *precrunch period* is characterized by an intensifying squeeze on liquidity where the credit demands of households, businesses, and government progressively outstrip the ability of the financial system to provide sufficient funding at affordable interest rates. Both internal and external sources of finance slowly, but continuously, diminish for each sector or become available only at high costs. New money flows become insufficient to finance the planned uses of funds and to cover rising debt burdens. During this stage, rising interest rates and increased debt worsen the balance sheets of the private sector, although not sufficiently to fully discourage spending.

The ensuing liquidity squeeze takes effect sector by sector until the uses of funds are curtailed, whether for expenditures on physical assets (households, business, and government), for hiring of labor (business and government), for the production of loans (financial institutions), or for the accumulation of financial assets (households, business, financial institutions). A sustained and increasingly tighter monetary policy also is an important characteristic of the precrunch period. Free reserves become highly negative, interest rates begin to rise sharply, and monetary growth eventually shows a decided slowing.

The *crunch* is the financial crisis that culminates a precrunch period. A crunch may be defined as a credit crisis stemming from the collision of an expanding economy with a financial system that has been depleted of liquidity. The crunch is characterized by extremely depressed li-

13. Sinai 1978. The accumulation stage corresponds to the expansion phase of the traditional business cycle. The precrunch period occurs in late expansion and boom. The crunch overlaps with the upper turning point or peak, and very early stages of a downturn. Reliquefication is at the same time as the downturn and early recovery. In recent years there has been more of an "open" side to the flow of funds cycle as the effects of United States financial phenomena spread to the rest of the world through flexible exchange rates and policy reactions to protect domestic currencies, with subsequent feedback effects on the United States economy.

quidity and deteriorated balance sheet positions for households, corporations, and financial institutions; sharply increased interest rates as all sectors scramble for remaining available funds; rising yield differentials as investors sell risky investments and switch to safe assets; a severely depressed stock market; and the inability of many borrowers to obtain funds at any cost. Increased failures of business and financial institutions are part of the picture, though only occasionally exceptionally severe. Rising delinquencies on loans and defaults also characterize the process. The crunch or crisis itself occurs as these factors reach a breaking point and are often accompanied by some cataclysmic financial event such as the bankruptcy of a major company or the surprising failure of a financial institution. With one exception during the Vietnam War, the outcome of each crunch has been a recession or pause in economic growth near or at the end of the episode.

No single factor has ever been solely responsible for the onset of a full-blown credit crunch. It has been caused by the prolonged presence of (1) the pressure from a strongly expanding real economy and the demand for funds, often a boom; (2) the shortage of lendable funds stemming from reduced savings flows, weak deposit inflows, diminished cash flows, and tighter bank reserves; and (3) a restrictive monetary policy.

The financial factor has affected the length, depth, amplitude, and intensity of the cyclical process. Indeed, along with evidence from the 1930s, the postwar experience suggests that the financial factor is a critical ingredient in the business cycle. Since, over time, monetary policy reactions are endogenous to the economy, their role as an integral part of the business cycle mechanism should be expected. But it is not just monetary policy that influences the business cycle process; the feedback effects from borrowing, lending, flow-stock processes in finance, balance sheets, changes in liquidity, and financial risk affect cyclical behavior as well.

### 1.5.2 The Crunch

The most salient financial events in the postwar business cycle have been the crunch and its aftermath, reliquefication. Four ingredients have typically characterized the credit crunch episodes: boom, inflation, tight money and disintermediation, and financial instability.[14] Sharply rising interest rates and depressed asset prices also have been characteristic. These factors have varied in their intensity and changed over the years with new legislation, evolving institutions, and changes in the practice of monetary policy.

14. Sinai 1978, 9–10.

*Boom*

The boom has been described (section 1.3.2) as a major stage in the generalized business cycle. Its role in the financial or flow of funds cycle is to drain liquidity from households and business as new money flows become inadequate to support a strong pace of spending and as financial assets are sold to provide funds. In the boom, savings rates decline and business cash flow diminishes relative to capital outlays. Loan demands rise sharply, first by consumers and then by business. The rising loan demands and declining savings flows squeeze banks and financial intermediaries into tight liquidity situations. The boom has usually preceded a precrunch period but also has overlapped the early stages of the crunch process (table 1.3).

*Inflation*

High and accelerating rates of inflation tend to intensify the crunch process. Household disposable income may not keep pace with the rising prices of goods and services, and the personal savings rate may fall. During an initial burst of inflation, the cash flow of business may actually be enhanced, but as rising inflation becomes increasingly cost based, nominal spending on plant, equipment, and inventories outpaces internally generated funds, and firms must borrow heavily. Inflation also erodes the value of outstanding financial assets, reducing the proceeds from any liquidation. Because of inflation, a greater volume of external financing is necessary to fill the gap between spending and internally available funds, both for households and for business. Borrowing requirements increase for these sectors, and deposit inflows to financial institutions are reduced as a result. The lessened new savings flows to financial institutions, in turn, restrict the availability of mortgage money, adding upward pressure to interest rates, limiting affordability, and restraining housing. Inflation may also raise the financing requirements of the government sector, since the rising costs of goods and services and higher interest rates may exceed tax receipts from higher prices. Finally, rising inflation increases long-term interest rates, through premiums related to expectations. The result is considerably increased pressure on the financial markets.

*Tight Money and Disintermediation*

Tight money and disintermediation have been essential ingredients of every credit crunch. A severely restrictive monetary policy has limited the reserves of the banking system and caused short-term interest rates to rise sharply. The commercial banking system has transmitted the changes in the policy related federal funds and treasury bill rates to other money market rates. Before 1980, as these rates moved

above the ceiling-constrained returns on deposits at banks and nonbank financial intermediaries, disintermediation became prevalent. Depleted bank liquidity from weakened inflows of deposits, and tight reserve positions caused banks to seek funds aggressively by issuing large CDs and Eurodollars and by borrowing at the Federal Reserve, bidding money market interest rates higher. Pressure exerted through increased borrowing at banks and issues of commercial paper also added to the upward thrust of interest rates. In these circumstances short-term interest rates rose at an accelerating rate, accompanied by credit rationing to channel bank lending to the more profitable commercial and industrial loan area.

With sharply rising interest rates, stock market declines occurred and the confidence of households and business weakened. The higher interest rates and lower stock prices increased borrowing costs to corporations and households and made existing debt service burdens more onerous. Savings and cash flows diminished further, extending the period of disintermediation and greatly reducing the supply of mortgage money. Typically an ongoing tight monetary policy intensified these effects. With some lags, significant effects on the real final demands of the economy have eventually caused sharp reductions in aggregate demand, production, and employment.

In the most recent episodes of 1980:2 and 1981:1 to 1981:4, a new approach to monetary policy instituted in October 1979 permitted interest rates to reach unprecedented levels. With the lifting of ceilings on deposit and loan rates in 1980, the disintermediation of funds from financial intermediaries was delayed, and extraordinarily high interest rates were required to price out most homebuyers. The tight money and disintermediation factor worked more through interest rates and debt burdens in recent years than previously.

The duration of monetary tightness has always been a critical element in the crunch process. In virtually every precrunch period, the Federal Reserve overstayed a restrictive monetary policy for longer than was necessary. Similarly, periods of reliquefication often have been characterized by a prolonged period of excessively stimulative monetary policy.

*Financial Instability*

Financial instability refers to progressively weakening balance sheets and the development of more risky financial positions for households, business, financial institutions, and government during a credit crunch period. Deteriorating liquidity and weakened balance sheets arise from endogenous developments in the economy or from external shocks. The endogenous developments include a spending boom on the part of households and business, which causes loan demand and debt burdens to become excessive. External shocks, such as the commodity

and oil price shock inflation of 1973–74, can lead to large needs for finance in every sector of the economy. The financial instability takes the form of a shortage in liquidity, overwhelming debt service or debt repayment burdens, or an undesired liability structure. The development of exceptionally risky financial positions for each sector in the economy has characterized every crunch. Indeed, an increased frequency of bankruptcies, defaults, and failures has been induced by this process, sometimes leading to further apparently "autonomous" reductions in spending.

*Reliquefication*

The stage during which sectoral balance sheet strength and liquidity are restored is called reliquefication. In setting a base for future expansion, the process of reliquefication plays a key role in the financial cycle. The outlays of the household and corporate sectors are drastically reduced. Borrowing proceeds more slowly, outstanding liabilities are reduced, and the demand for financial assets rises sharply. New money flows are well in excess of the depressed outlays, providing ample funds to "reliquefy." Financial institutions benefit from the increased savings and cash flows of the private sector, through substantially higher deposit inflows. The financial institutions repay debts and accumulate financial assets in the face of weak loan demand. Monetary policy eases during this stage as the central bank strives to stimulate the economy. The reserves position of the banking system is enhanced, and interest rates decline or stay low.

During reliquefication, federal budget deficits and treasury financing are high but do little harm. The large deficits principally arise from the reduced tax receipts and higher government outlays of recession, corresponding to lower spending and increased financial saving by households and businesses. In a period of rebuilding balance sheets, the increased savings flows are used to strengthen the asset side of balance sheets—in particular through purchasing large amounts of the treasury financing associated with the deficits. The flows of funds from commercial banks and nonbank thrift institutions are directed toward absorbing a large volume of treasury securities. The Federal Reserve, before October 1979, also absorbed much of the treasury debt, as part of its monetary easing. And often the rest of the world sector has purchased a considerable volume of treasury securities. Interest rates stay low longer because of the phenomenon of reliquefication, with its strongly rising demands for high-quality assets to reduce the financial risk that has arisen during the crunch.

In the most recent episode of 1979 to 1982, the crunch process was somewhat different. This is because of the change in approach to monetary policy by the Federal Reserve in October 1979. Increases in the demand for money, whether from strong sectoral spending, shock in-

flation, or some interaction of both, put increasing pressure on interest rates with no attempt by the central bank to restrain the rises. Flows of funds were sustained through the deregulation of deposit and loan rate ceilings and new depository instruments, so that funds availability was less affected. Because scarce credit was almost entirely allocated through higher interest rates, affordability and debt service burdens played a greater role in the crunch process, eventually bringing a downturn just as in prior episodes.

The role of monetary policy in reliquefication has been the reverse of that in the crunch process, generally following a stimulative posture to aid the rebuilding of sector balance sheets.

### 1.5.3 Measures of Sectoral Financial Behavior in the Flow of Funds Cycle

Figures 1.4 to 1.10 show several summary measures that reflect the systematic behavior in the liquidity and balance sheet positions of households, businesses, and depository institutions. The precrunch period/crunch episodes are shaded in each. The clear areas represent the reliquefication and accumulation phases. The various measures show similar patterns of behavior across most flow of funds cycles, reflecting the stages of the financial cycle. The various balance sheet ratios also serve as an indicator of the financial strain that eventually induces restrained spending and borrowing in risk averse sectors.

For households, the mortgage loan repayment burden relative to disposable income and the ratio of financial assets to liabilities indicate strain or ease in the balance sheet. The higher the proportion of loan repayments to income, the less spending and borrowing will take place. The greater the quick ratio, the more room exists for new commitments. Other measures, such as wealth and net worth or the growth in financial assets, reflect the state of household liquidity.

For business, the "quick" ratio, proportion of debt service to cash flow, the ratio of short to total outstanding liabilities, and leverage are indicators of balance sheet strength and liquidity. These measures show the greatest deterioration near or in the crunch.

For financial institutions, loan-to-deposit ratios aptly characterize the state of liquidity. When high, depository institutions aggressively seek funds in the open market, pushing interest rates up sharply. The capital position of depository institutions also generally weakens at these times.

## 1.6 Sources of the Business Cycle: Some Simulation Results

The empirical significance of the various potential sources of the cycle has not been studied much, and doing so is an elaborate and

difficult undertaking. Yet if the business cycle is to be a serious subject of scientific study, such investigation must be performed.

The following simulations represent some initial research in that direction. The DRI model of the United States economy has been used in a series of counterfactual simulation exercises designed to identify and quantify the impact of some causes of the business cycle. The results are model-specific and thus must be viewed cautiously. Further, econometric model simulations provide only approximations, with each simulation one of a possible large distribution of outcomes.

However, though the model is inevitably imperfect, it is an elaborate representation of the United States economy. Since it is built on quarterly data and heavily used for short-term forecasting, the successful representation of the economy's short-run dynamics was high on the list of criteria in determining the model's design. Therefore it is probably at least as good as any other device for exercises designed to analyze business cycle cyclicality on a quantitative basis.

### 1.6.1 An Index of Cyclicality

To assess the contributions of different factors and mechanisms in the business cycle, an index of cyclicality is defined. Such a quantitative index is inevitably somewhat arbitrary. For the present set of exercises, we define the index as the sum of the absolute values of the differences of the simulated values from their own trend values, divided by the trend values. This division was done to weight the index by the relative magnitude of the series.[15] Since the deviations are strongly serially correlated, this statistic corresponds closely to cyclicality. The percentage deviations from trend are also plotted over time in numerous figures, to indicate how much and when a particular factor contributed to cyclicality during the simulation cycles.

### 1.6.2 The Tracking Simulation

The tracking simulation (Track Sim) is a full dynamic simulation of real GNP, conducted from 1966 to 1983:2, using actual values for ex-

15. The formula used was

$$\sum_{t=66:1}^{83:2} \frac{|X_{sim_t} - X_{simtrend_t}|}{X_{simtrend_t}},$$

which provided a measure of deviations from trend, normalized for the position of $X$ relative to the trend at various points in the period 1966:1–1983:2. $X_{sim}$ was the simulated value of real GNP, and $X_{simtrend}$ was the trend value generated by the simulation of real GNP values in a given simulation. As particular causal factors in the cycle were removed, a simulation of the result produced a new pattern relative to a new trend. The calculations were repeated, and a summary statistic for reductions or increases in the cyclicality index was used to measure the effects of the various factors on cyclical amplitude and duration.

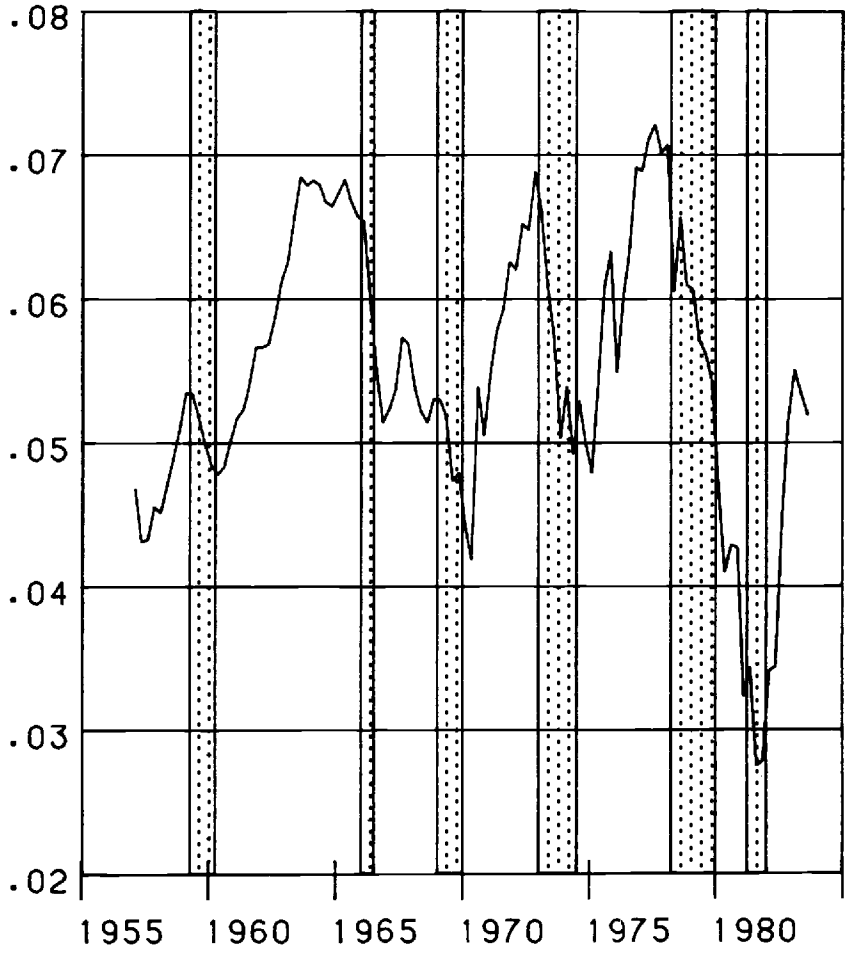


**Fig. 1.4** Mortgage repayments relative to disposable income: households, 1955:3 to 1983:4 (ratio). Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

ogenous variables and inputting all individual equation errors as add factors into the solution.[16] As a result, the tracking simulation reproduces history quite precisely. Given this baseline, it becomes possible to show how removing certain causes of instability from history as modeled reduces the recorded cyclicality. Both the direct and the prop-

16. Appendix 1.1 provides a fuller discussion of the experimental conditions underlying each simulation. Tables showing the cyclicality index calculations for inflation and the unemployment rate also are provided.

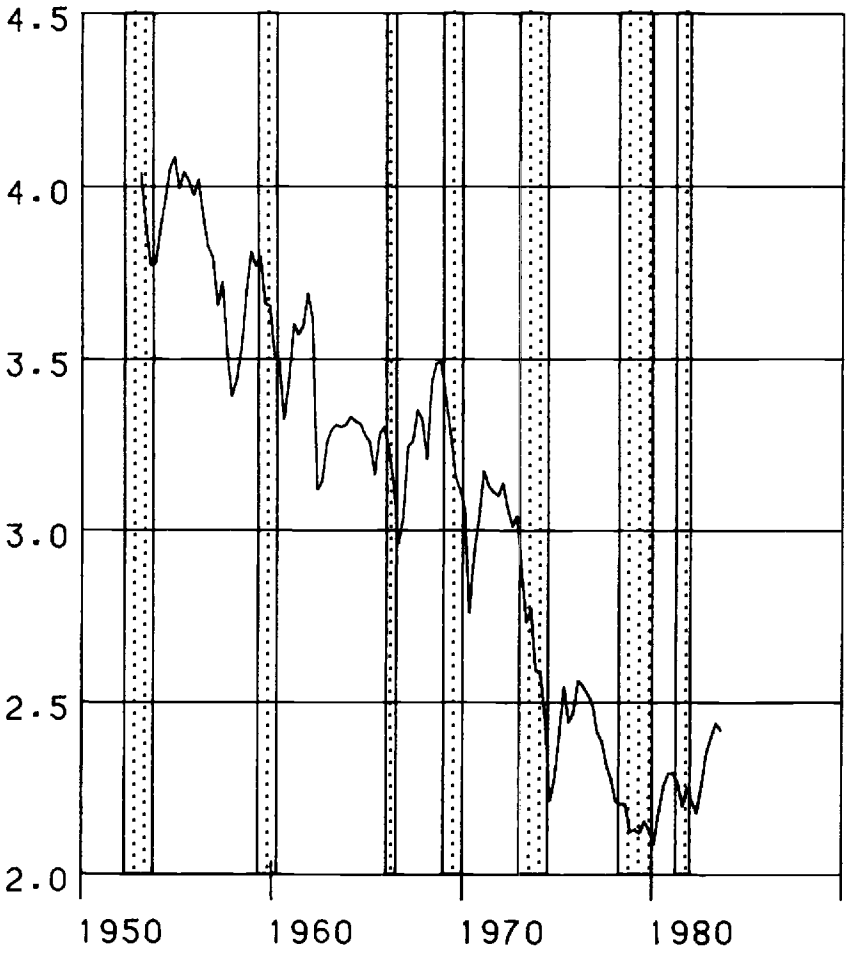


**Fig. 1.5** "Quick" ratio: household sector, 1953:2 to 1983:4 (ratio of household financial assets to total liabilities). Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

agation effects of a particular factor can be removed from the model, and the resulting path of behavior for real GNP and other variables can then be compared with the historical baseline.

This method of analysis assumes that the observed error terms are not correlated with the sources of instability, an assumption that probably understates the effects of removing various sources of instability. Error terms most likely are positively correlated with measured sources of instability.

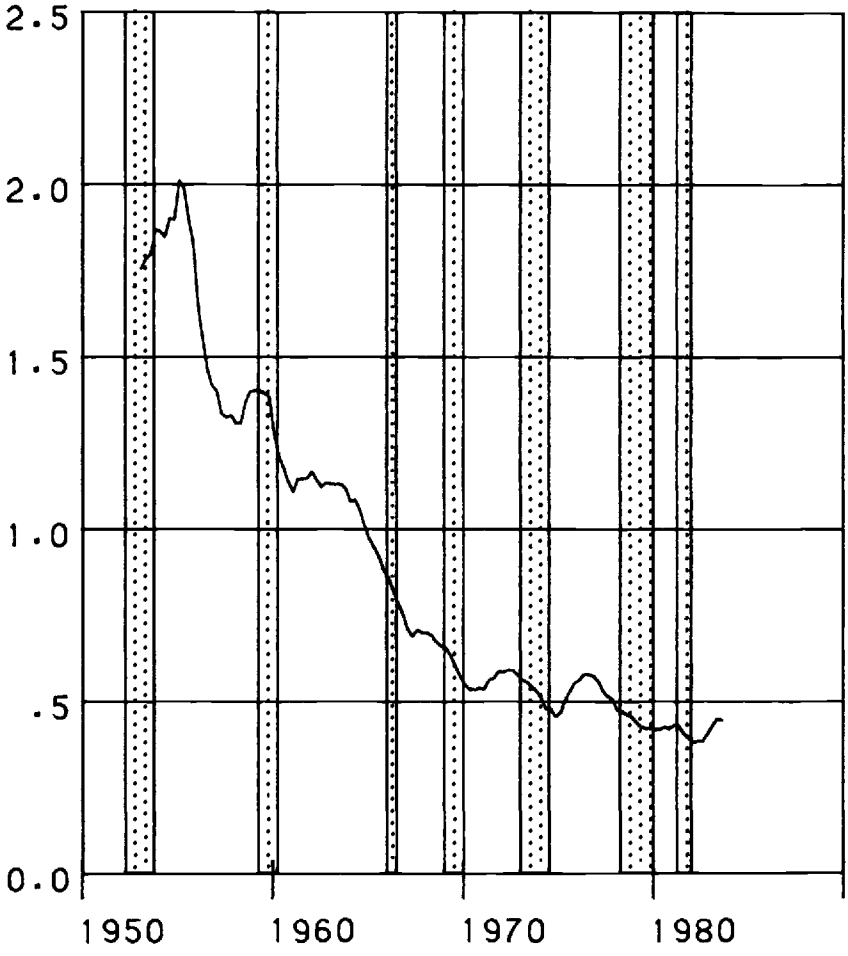


**Fig. 1.6** "Quick" ratio: nonfinancial corporations, 1953:4 to 1983:4. Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

### 1.6.3 The Role of Noise in Creating Cyclicality

Frisch (1933) showed that an otherwise damped system can become cyclical by the addition of random noise. The testing of this idea requires a definition of "noise": it could be specified to include not only the random errors of the equations, but also certain categories of exogenous shocks, including policies and coefficient uncertainty.

In the present exercise, in order to come closer to a taxonomy of causes of cyclicality, "noise" was defined very narrowly: only equation

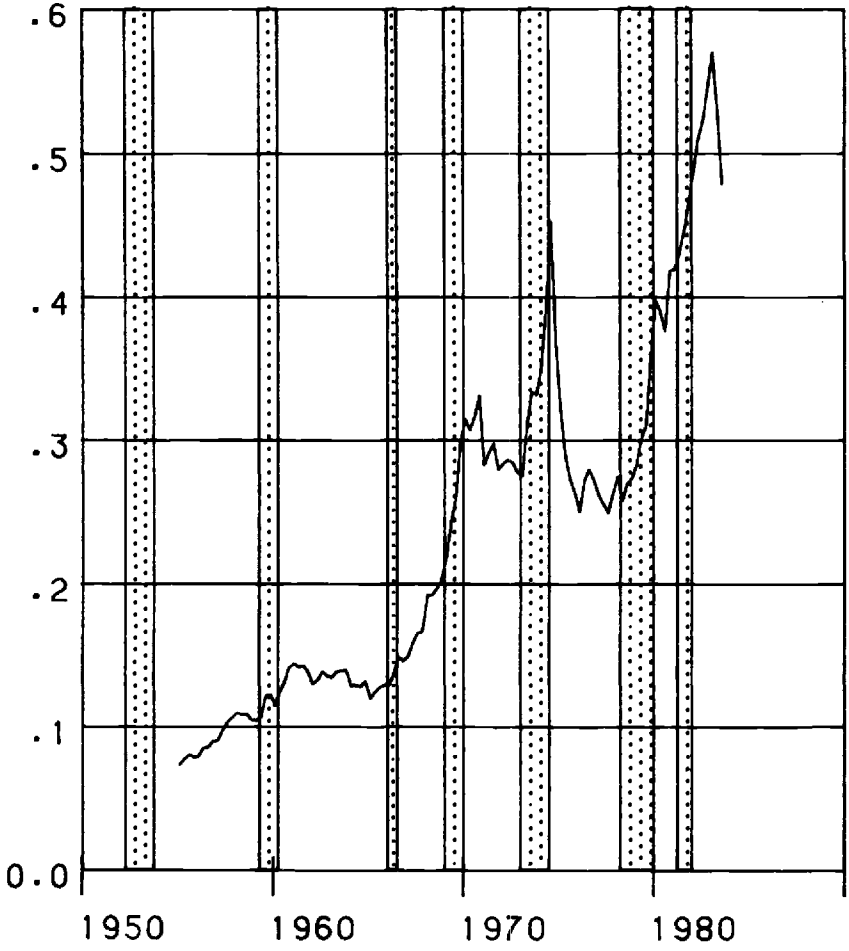


**Fig. 1.7** Debt service burden of nonfinancial corporations, 1953:2 to 1983:4 (estimated interest charges on outstanding short- and long-term debt divided by cash flow). Shaded areas, pre-crunch/crunch periods; clear area, accumulation and reliquefication.

errors were included, with exogenous shocks and policies left unchanged. Although this is an impure measure of noise, since the residuals of individual equations can reflect both systematic and random elements, the high degree of fit of most model equations suggests that "approximate randomness" probably was an appropriate assumption.

In order to identify the contribution of "noise" to the fluctuations of real GNP, a full historical dynamic simulation was run in which the

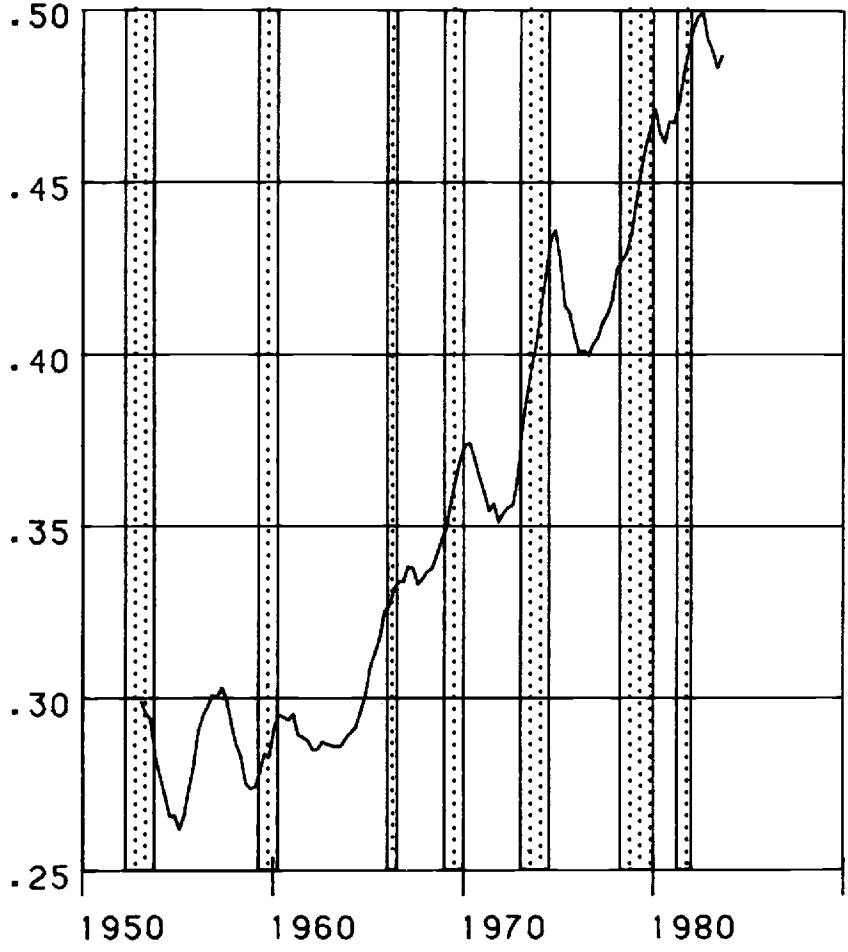


**Fig. 1.8** Ratio of short-term to total outstanding debt: nonfinancial corporations, 1953:2 to 1983:4. Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

equation errors were included and permitted to interact in the model simulation. The contribution of "noise" was then identified by comparing the results of this simulation with the tracking simulation that did not include the equation errors. Whereas the tracking simulation showed a cyclicality index value of 1.449, the "no noise" simulation indicated a comparable index value of 1.342, a reduction of 7.4%. Noise, defined in this way, seems to have contributed significantly to the recession of 1975; at other times the effect was small. Although the overall effect was small, it is a useful reminder that "noise" is part

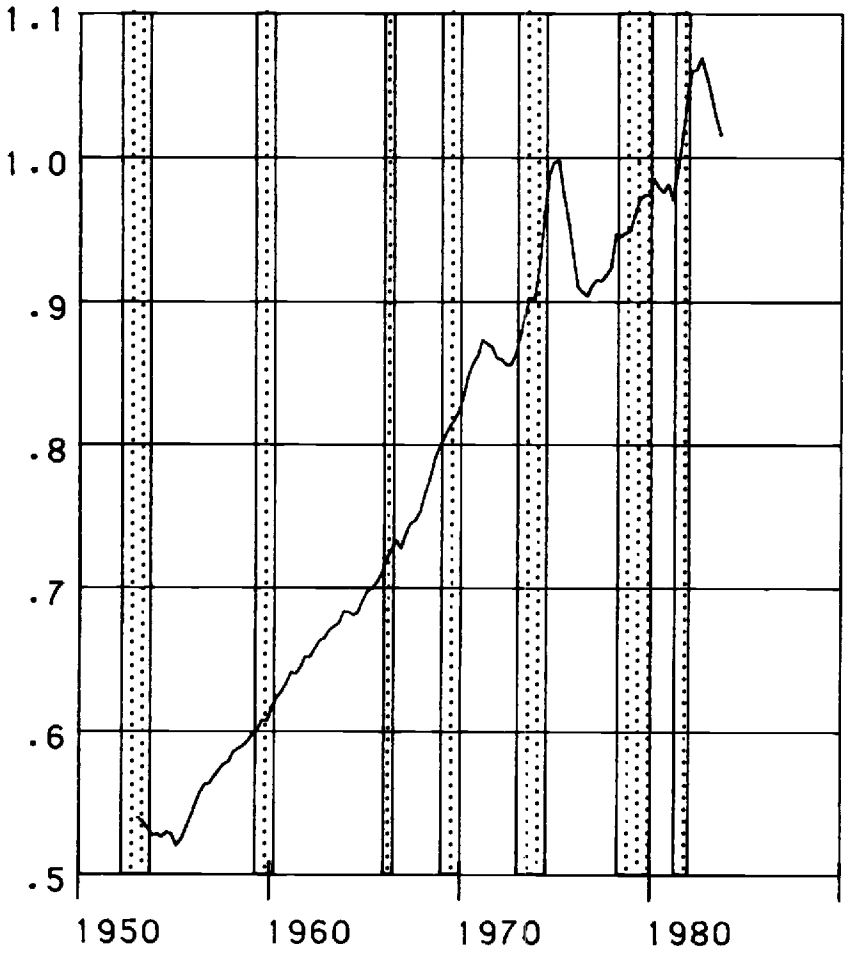


**Fig. 1.9** "Leverage" of nonfinancial corporations, 1953:2 to 1983:4 (total outstanding debt relative to assets, physical and financial, less total liabilities). Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

of reality, and it also sets the Frisch hypothesis in quantitative perspective (fig. 1.11 and table 1.6). The reduction in cyclicality may well have been limited because of interactions in the full model simulation that were not random.

### 1.6.4 The Oil Price Shocks

The business cycles since 1973 were partly triggered by the two jumps in the world price of oil during 1973–74 and 1979–80, which interacted

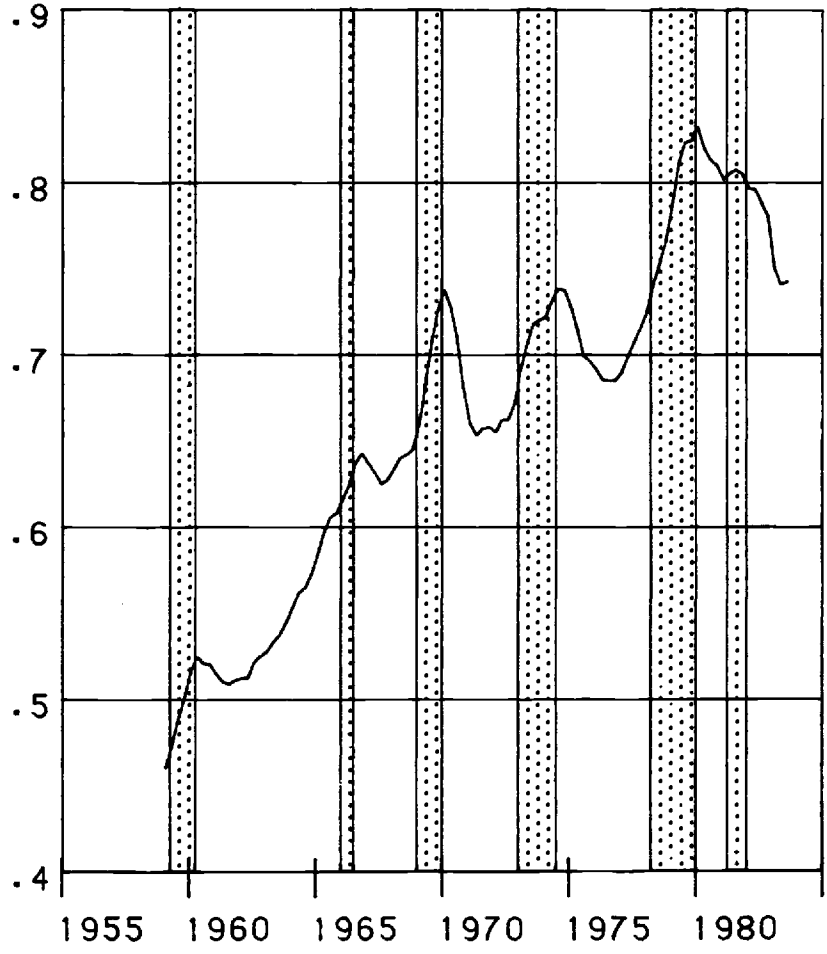


**Fig. 1.10** Loan/deposit ratio: commercial banks, 1959:1 to 1983:4 (total of outstanding commercial and industrial, mortgage, and personal loans relative to demand and time deposits). Shaded areas, precrunch/crunch periods; clear area, accumulation and reliquefication.

with other destabilizing forces in the economy and with economic policies. A model solution removed the oil price shocks by replacing the exogenous values for world crude oil prices by a steady 7.1% rate of increase, a figure that left the terminal value for the oil price equal to the actual result but removed any other variation from this shock variable. Monetary policy was made to hold the path of the money supply (M1) essentially unchanged, creating easier financial conditions. The

result was a reduction in the cyclicality index from 1.449 to 1.219, for a drop of 15.9% (fig. 1.12 and table 1.6).

The modesty of this result can partly be explained by the fact that oil became a cyclical problem only in the second half of the simulation period. As might be expected, the fluctuations in real GNP over 1973 to 1980 were reduced the most. If the cyclicality index is calculated from 1974 on, its reduction is from 0.935 in the baseline to 0.688 under no oil price shocks, or 26.4%. The experiment also was limited to the price side of the oil problem; the supply disruptions, with their gasoline shortages and damage to consumer confidence, created additional cyclicality but were not removed.

### 1.6.5 Stable Money Policy

One major potential source of instability is monetary policy, a key impulse mechanism in the business cycle. Throughout the postwar era, there has been controversy over whether monetary policy has stabilized or destabilized the business cycle. There has been considerable opinion that monetary policy was too "stop/go," adding a large amount of instability to the cycle.

Defining a stable monetary policy is difficult for a large-scale, structural econometric model that contains a full complement of policy instruments. The reserve components of the monetary aggregates, reserve requirements, regulatory ceilings on deposit and loan interest rates, the discount rate, and selective controls on margin requirements and loan down payments all have formed part of policy.[17] For example, to simply impose a smooth growth of nonborrowed bank reserves on history would still leave a highly unstable financial system, because interest rate ceilings, reserve requirements, and selective controls could still be operative. Variations in the growth of potential GNP, inflation, and other factors would convert smooth reserve growth into highly unstable paths for the various monetary aggregates and interest rates, probably for GNP, and would still leave business and household balance sheets buffeted by disturbances.[18]

A simulation was developed that dealt at least partially with these problems. In "stable money policy," all deposit rate ceilings were removed, extreme changes of reserve requirements over the simulation period were eliminated, and open market operations on reserves were eased when monetary policy was tight and tightened when monetary policy was easy. The monetarist policy after 6 October 1979 was mit-

17. There has been one instance of outright credit controls, in spring 1980. For some analysis of this episode, see Brimmer and Sinai 1981.

18. Such a simulation actually produced a higher cyclicality index than for the Track Sim. 1.727, or a 19.1% increase.

igated by limiting the range of interest rate volatility between 1979:4 and 1982:4.

The result was a reduction in the cyclicality index from 1.449 to 1.127 for a relatively large drop of 22.2%, offering support for the notion that monetary policy was destabilizing from 1966 to 1983 (fig. 1.13 and table 1.6). The biggest improvements occurred in 1966, between 1976 and 1980, and in 1981–82, periods generally recognized as having been characterized by a too tight or over expansive monetary policy.

### 1.6.6 No Oil Shocks, Stable Money Policy

Removing both the cyclicality induced by the oil price shocks and the variations in monetary policy led to an even larger reduction in the cyclicality index, to 1.055, or 27.2% (fig. 1.14 and table 1.6). It was surprising that there was not a stronger interaction effect. Removing both sources of instability added little to removing only one. This result was probably due to a less complete adjustment of the assumed monetary policy rather than to the different oil price assumptions. The combination of the two did limit the swings in almost all the cycles, however.

### 1.6.7 Simulating the Financial Factor

To examine some effects on postwar business cycles of the factors that characterize the crunch and reliquefication stages, a component by component removal of some major ingredients in the flow of funds cycle was attempted.

First, a critical factor in all the crunches and subsequent upturns, tight money and disintermediation, was eliminated from the Track Sim. This was accomplished in the stable money policy simulation (described in section 1.6.5 and fig. 1.13). The greatest improvement occurs between 1976 and 1983 because an over expansive monetary policy, then extremely restrictive policy, and wide swings in interest rates are attenuated. The lifting of deposit rate ceilings prevented the disintermediation of funds that characterized periods of boom and financial strain. The brief expansion of 1980–81 was more pronounced than in actual history, since interest rates were prevented from rising as high as actually occurred.

A second ingredient in the experiment was the removal of excessive loan demands by both households and businesses, thus toning down the boom ingredient of crunches as it affected the financial system and limiting the pressure on banks that is a major source of rapidly accelerating interest rates. The resulting behavior of real GNP with stable monetary policy, limited disintermediation, and less fluctuation in loans is shown in figure 1.15. Here the cyclicality index is a low 0.994, for a 31.4% drop in cyclical behavior relative to the Track Sim.

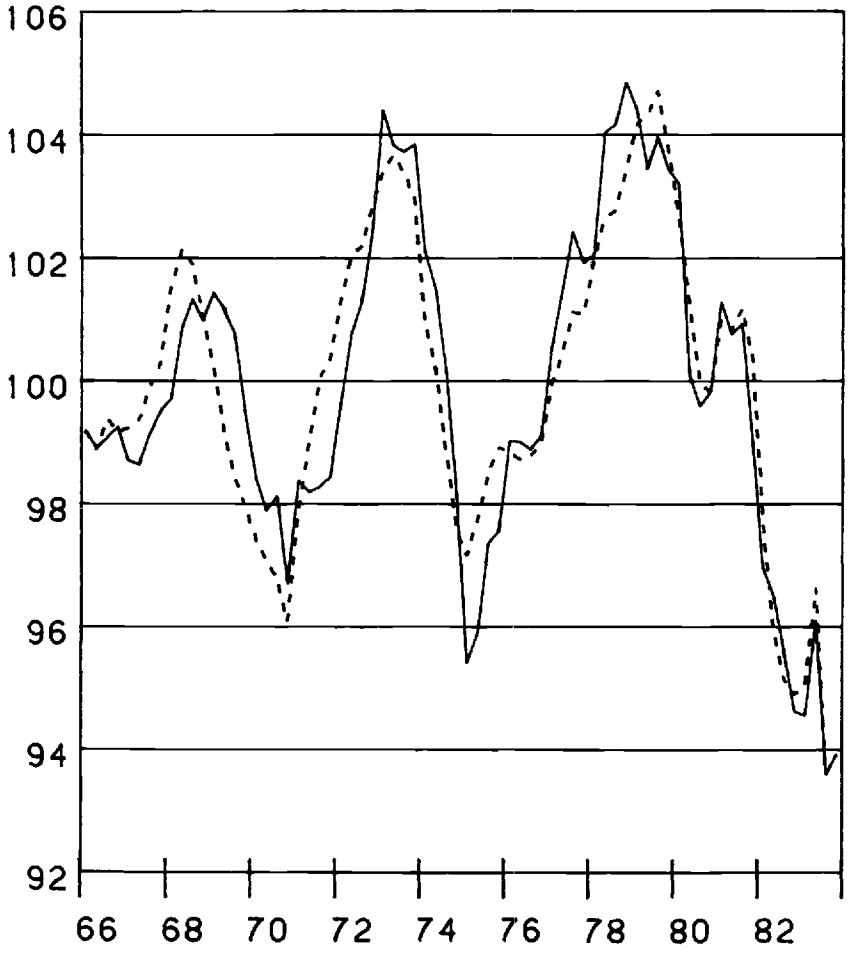


**Fig. 1.11** No "noise" simulation compared with Track Sim (percentage of trend). Track Sim ——; no noise------.

Finally, the oil price shocks also were removed (stable money policy, no oil shocks, no crunch), thus mitigating the inflation ingredient of the crunch periods in 1973–74 and beyond. Although not fully eliminating the accelerating inflation of these episodes, limiting the pace of increases in OPEC prices to 7.1% per annum served to show the effects of lesser inflation rates interacting with financial phenomena. The cyclicality index was only 0.960 in this simulation (fig. 1.16 and table 1.6).

Thus, with stable money policy, no disintermediation, lessened boom effects on private sector loan demands, and lower inflation because of

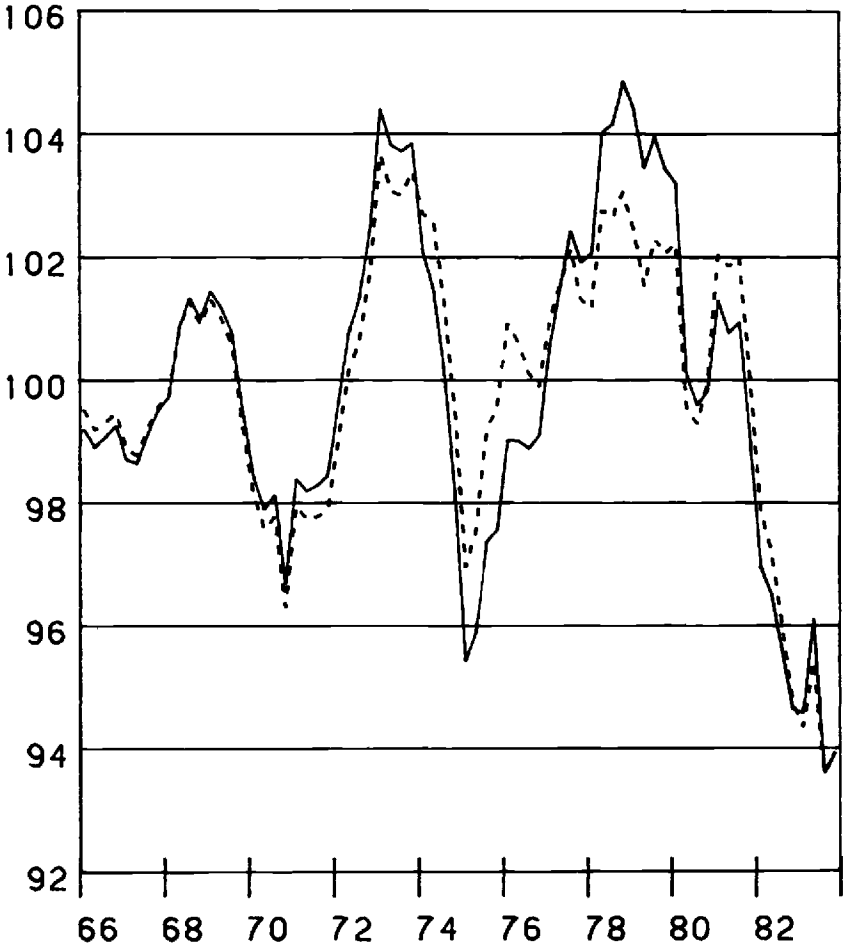


**Fig. 1.12** No oil shocks simulation compared with Track Sim (percentage of trend). Track Sim ——; no oil shocks ------.

no oil price shocks, fully 33.7% of the original deviations in real GNP from trend were eliminated. Figures 1.17 to 1.23 also show that removing these factors greatly reduced the interest rate fluctuations and financial instability that actually occurred, as indicated by various summary measures of sectoral balance sheets and liquidity. It was inevitable that interest rates would be better behaved with monetary policy smoother, not exhibiting the large swings of actual history.

Figure 1.16 reveals that an oscillation mechanism remained, but without the severity of the late 1970s. Inflation was also less severe in the

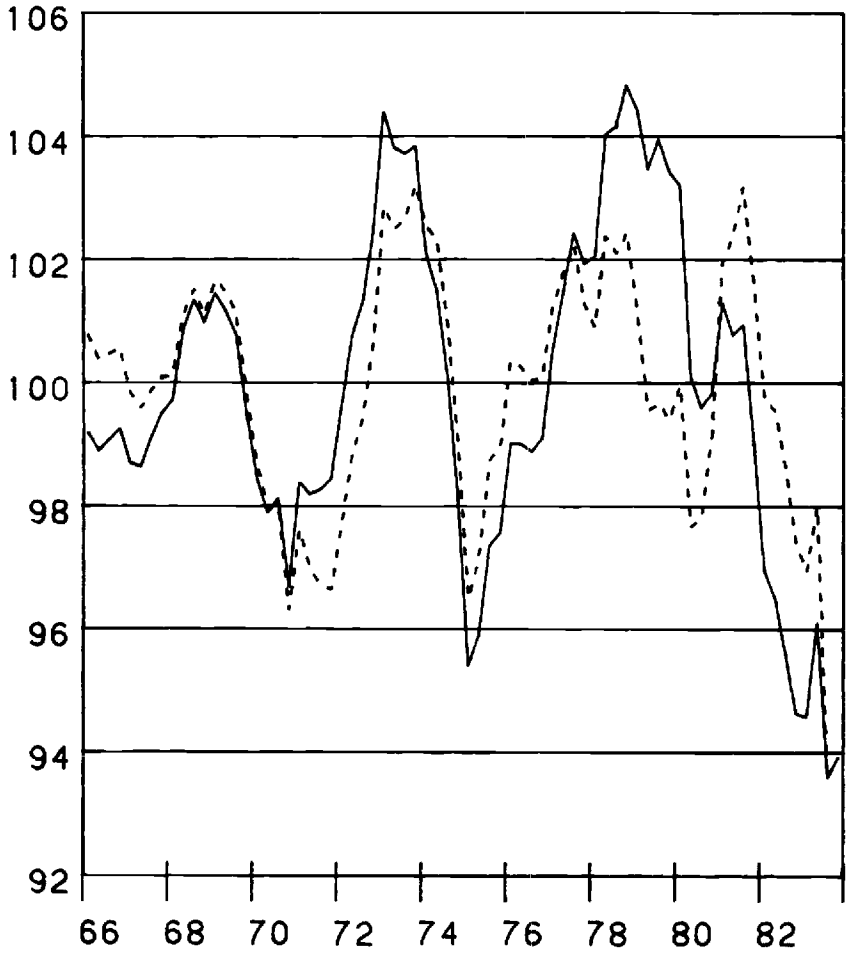


**Fig. 1.13** Stable money policy simulation compared with Track Sim (percentage of trend). Track Sim ——; stable money ------.

simulations of figures 1.14 to 1.16, as an endogenous response, suggesting that the series of interrelated shocks portrayed in these simulations were themselves a kind of propagation mechanism.

The flow of funds cycle and its ingredients thus appear to have operated as both an impulse and a propagation mechanism. In the model, the impulse comes mostly from changes in nonborrowed reserves and the resulting fluctuations of interest rates. Interest rates affect asset allocation, spending, and borrowing behavior. Reactions in stock prices, household net worth, debt service, and the flows of funds to housing

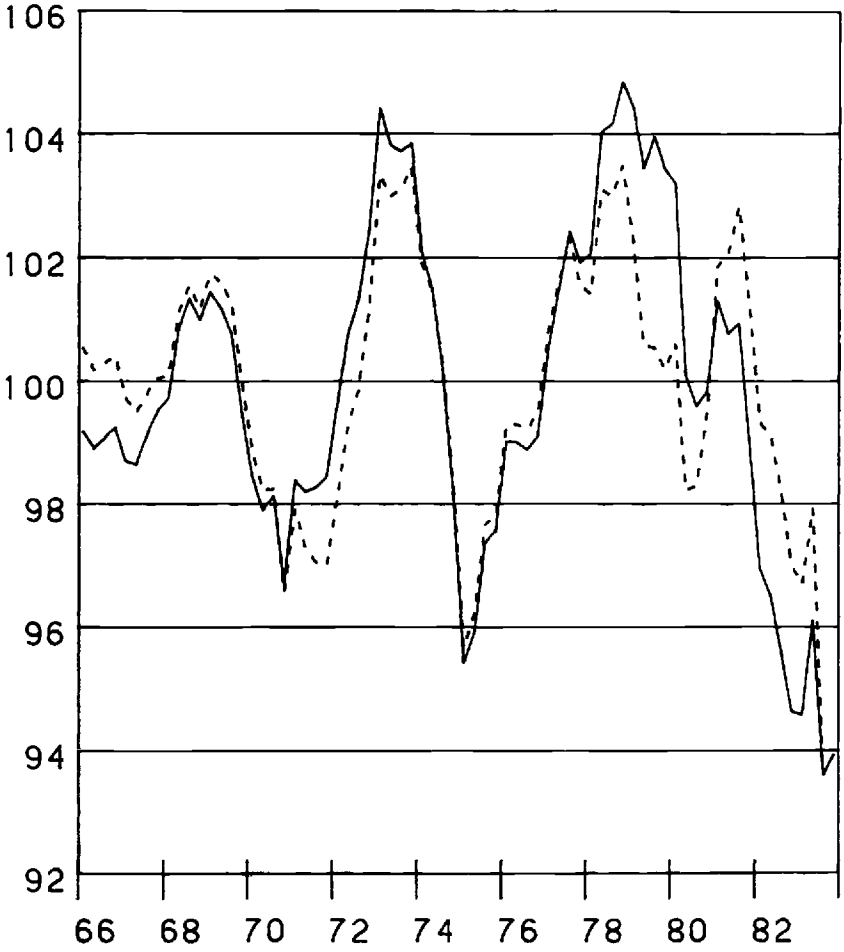


**Fig. 1.14** No oil shocks, stable money policy simulation compared with Track Sim (percentage of trend). Track Sim ——; no oil shocks, stable money ------.

follow. Prices and wages, then interest rates, react further, imparting additional motion to the system. As real and financial stocks are altered, the numerous stock adjustment or multiplier/accelerator mechanisms that permeate the financial and real systems of the United States economy are activated.

### 1.6.8 A Simple Cycle Exercise on the Propagation Mechanism

To gain some insight into the dominant features of the cyclical mechanism in the economy as depicted in the DRI model, a simple multiplier exercise was run. Nonmilitary federal purchases of goods and services

**Table 1.6** **Sources of Cyclicality in Postwar Business Cycles Results of DRI Model Simulations, 1966 to 1983:2**

| Simulation | Cyclicality Index | Percentage Reduction from History | Trend Growth[a] |
|---|---|---|---|
| Historical Track Sim | 1.449 | — | 2.8 |
| No "noise" | 1.342 | −7.4 | 2.8 |
| No oil shocks | 1.219 | −15.9 | 3.0 |
| Stable money policy | 1.127 | −22.2 | 3.0 |
| No oil shocks, stable money policy | 1.055 | −27.2 | 3.1 |
| Stable money policy, no crunch | 0.994 | −31.4 | 3.2 |
| Stable money policy, no oil shocks, no crunch | 0.960 | −33.7 | 3.3 |
| Autonomous real final demands | 0.571 | −60.6 | 2.9 |
| Durables consumption | 0.985 | −32.0 | 2.8 |
| Business fixed investment | 1.149 | −20.7 | 2.8 |
| Inventories | 1.223 | −15.6 | 2.9 |
| Residential construction | 1.032 | −28.8 | 2.7 |
| Autonomous real final demands, no oil shocks, stable money policy, no crunch | 0.482 | −66.7 | 2.9 |

*Note:* Calculated for fluctuations in real gross national product.

[a]The trend growth for each was calculated from a regression for an exponential trend.

were boosted by $10 billion and set to grow at the growth rate of potential GNP thereafter. How does the economy absorb such a stimulus? Does it lead to explosive growth, a stable multiplier, or a temporary multiplier portraying a business cycle? Figure 1.24 shows the multiplier, holding the money supply unchanged, peaking at 1.25 during the first year, dropping to 0.5 in year five, and reaching zero in year eight.

Table 1.7 shows that consumption reacts in the conventional Keynesian fashion, responding to the increased income created by the fiscal stimulus. Interest rates rise promptly, immediately producing the beginnings of a reduction in residential construction. In part, this is due to reductions of nonborrowed reserves in order to maintain a fixed money supply (nonaccommodating money). Business fixed investment initially is boosted slightly, as sales expectations are revised upward along with expectations on capacity utilization rates, inducing extra investment. By the second year, the higher interest rates begin to crowd out business fixed investment, and after three years the reduction is substantial. Under an accommodating monetary policy, defined as unchanged nonborrowed reserves, the crowding out would be mitigated.

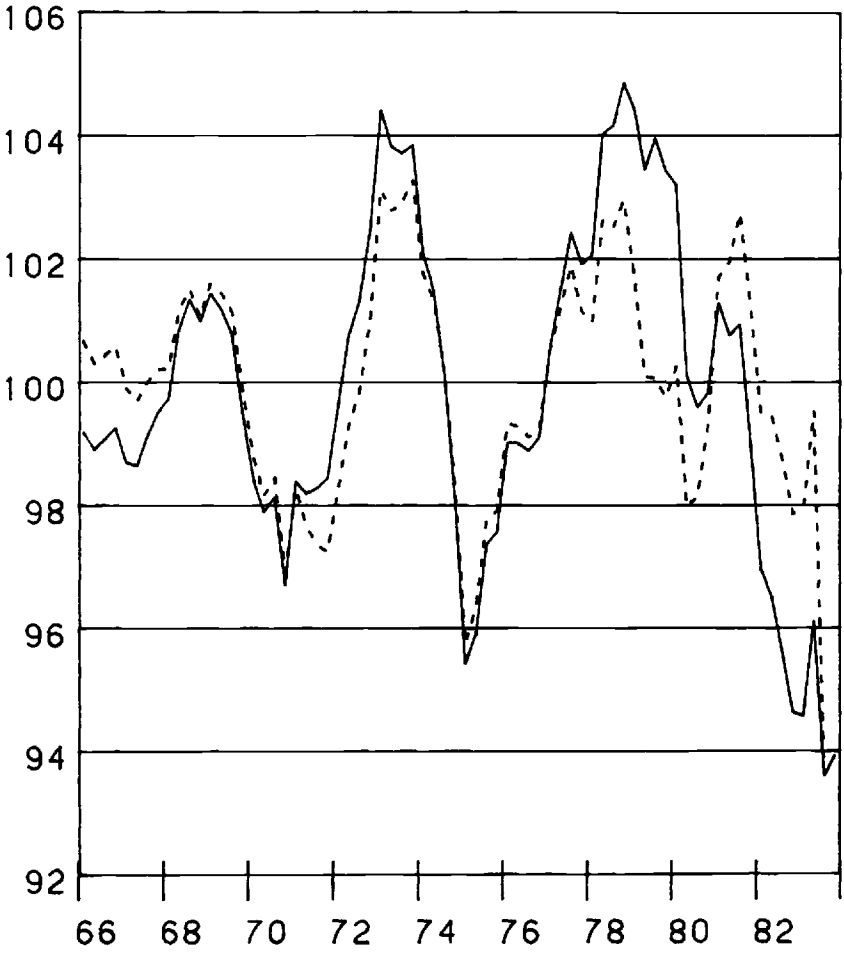


**Fig. 1.15** Stable money policy, no crunch simulation compared with Track Sim (percentage of trend). Track Sim ——; stable money policy, no crunch ------.

The crowding out occurs not only because interest rates are higher, but also because the stronger economy gradually converts the larger nominal GNP into higher prices. Figure 1.25 shows the output/inflation transform, a plot of the percentage of the increase in nominal GNP that represents increased real activity. In year one, when the output/inflation transform (OIT) is equal to or near unity, nearly all the gain in gross national product is real. But after eight quarters it is down to 0.7, and after twelve quarters it is 0.5. By year seven the OIT is zero, so that the entire stimulus is converted into higher prices.

The results of this solution are largely, but not entirely, due to the assumption of an unchanged money supply that guarantees crowding

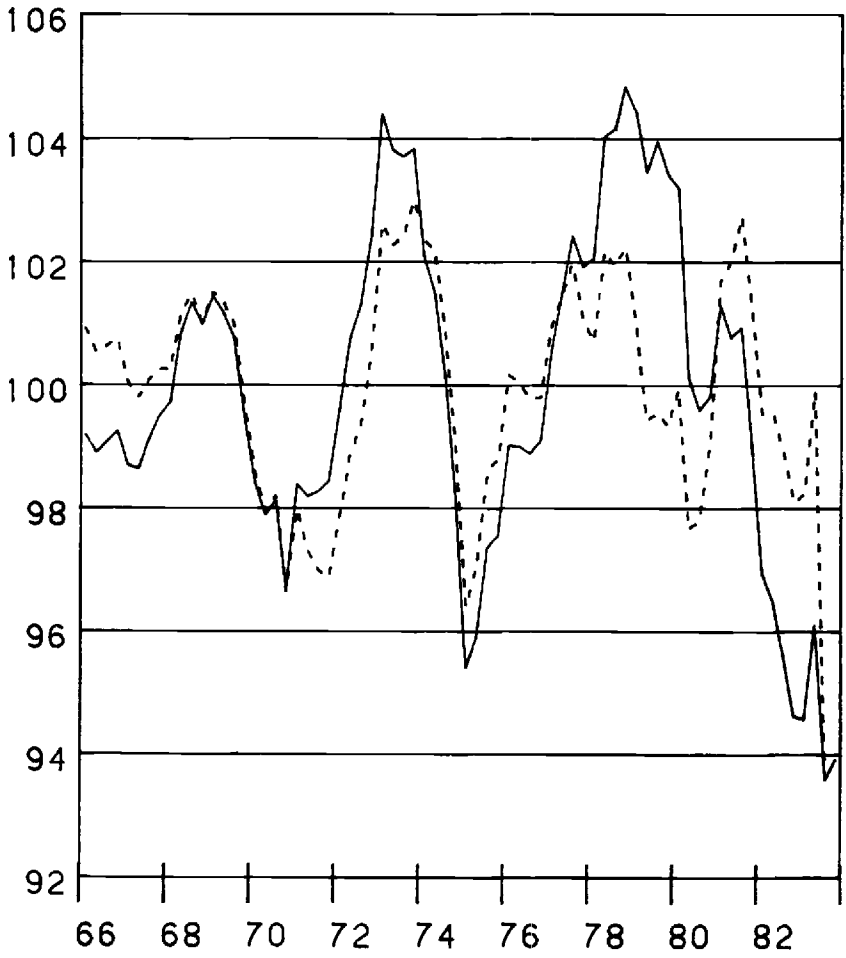


**Fig. 1.16** Stable money policy, no crunch, no oil shocks, no crunch simulation compared with Track Sim (percentage of trend). Track Sim ——; stable money, no crunch, no oil shocks ------.

out. If nonborrowed reserves are left unchanged, the multiplier is initially larger, equal to 1.48, and remains above unity for over five years. Nonetheless, there is a gradual reduction of the multiplier from its peak value, mainly owing to increased inflation, higher interest rates, and a using up of the financial base of the economy as measured by household and business balance sheets.

The traditional cyclical mechanisms, the stock flow adjustments of business and household fixed capital, play a rather minor role. The stock of business capital enters the investment equation with a small but positive sign. Apparently the increased opportunity for investment

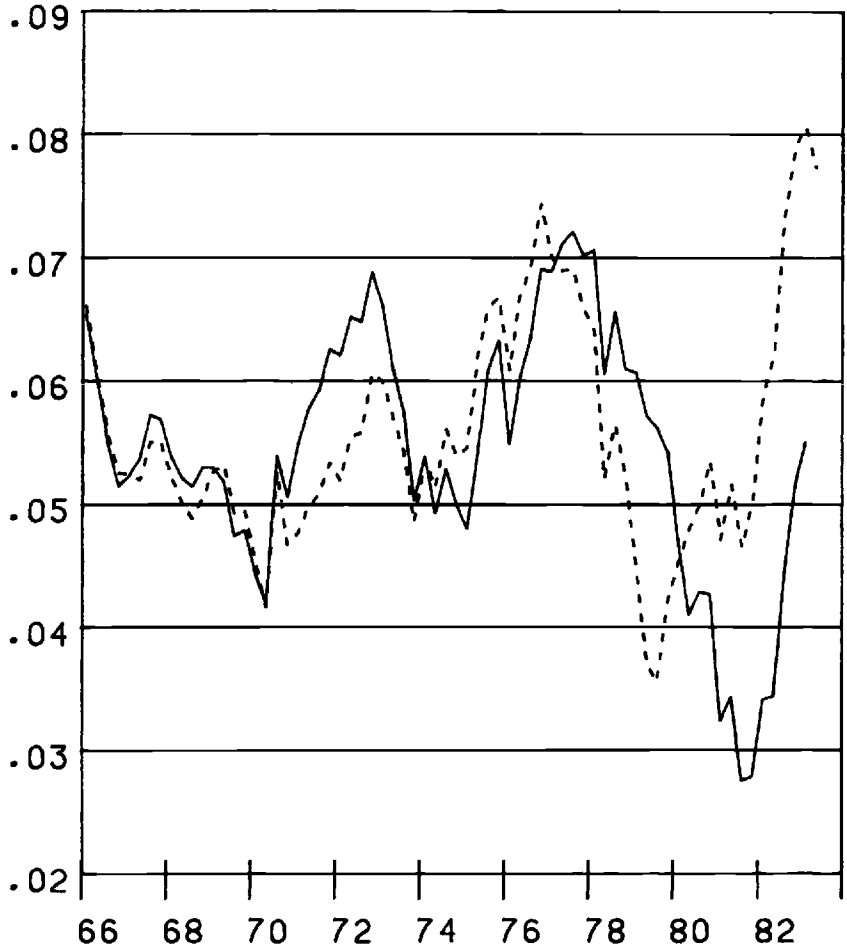


**Fig. 1.17** Mortgage repayments relative to disposable income: households, 1966:1 to 1983:1 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

created by replacement and modernization outweighs the negative accelerator effect. Inventory investment does follow the stock adjustment mechanism, but the coefficients are not large and the adjustments are quick. Household capital stocks, both for cars and homes, do have an impact through negative feedback, but their overall importance is small in comparison to the financial and inflationary reactions.

When money is not accommodating, much greater rises of interest rates create negative feedbacks to housing and other finance-sensitive

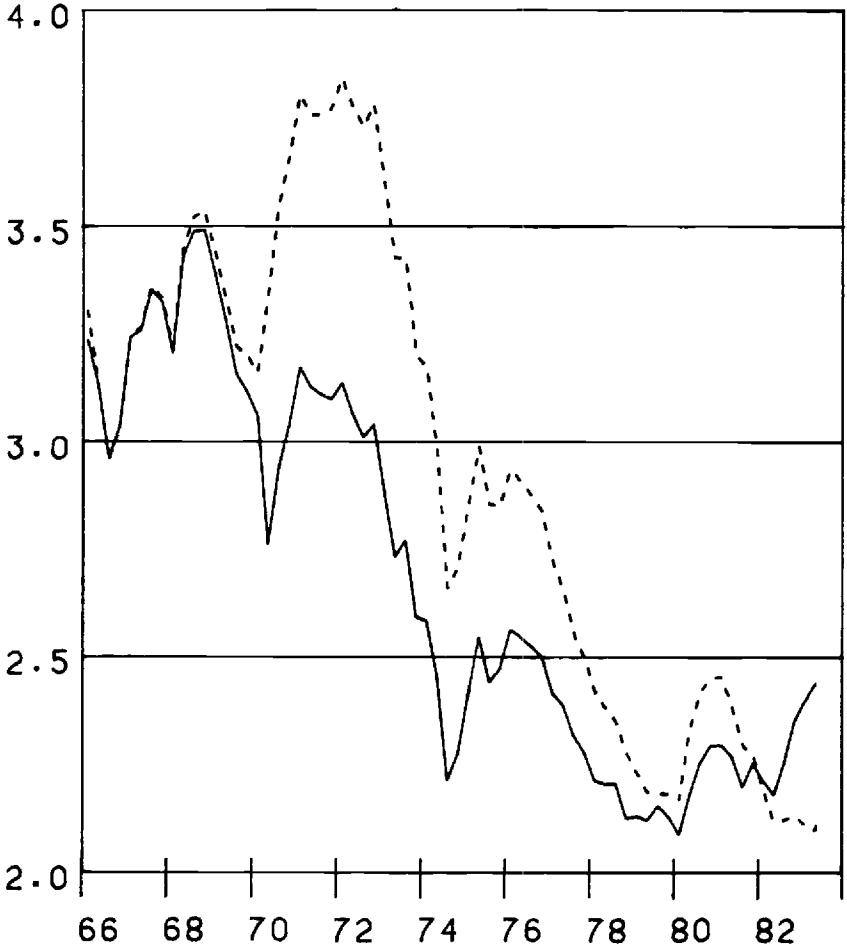


**Fig. 1.18** "Quick" ratio: household sector, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

final demands through reduced flows of funds and negative balance sheet effects. Increased debt service cuts business fixed investment, and reduced household net worth lowers consumption. Even the outlays of state and local governments are cut by reduced revenues and higher interest rates. When money is accommodating, the negative feedback originates in the output/inflation transform. As the initial stimulus converts into higher prices, real income gains are lost, and the extra inflation may adversely affect various demands, including net


**Fig. 1.19** "Quick" ratio: nonfinancial corporations, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

exports, housing, consumption (via consumer confidence), and investment. In any event, monetary policy never has retained a fully accommodative stance in the face of increasing inflation.

### 1.6.9 Remaining Sources of Cyclicality

The simulations show some effect on the trend growth rate of real GNP. Whereas the historical growth rate was 2.8% per annum from 1966 to 1983:2 and the no noise simulation left that figure unchanged,

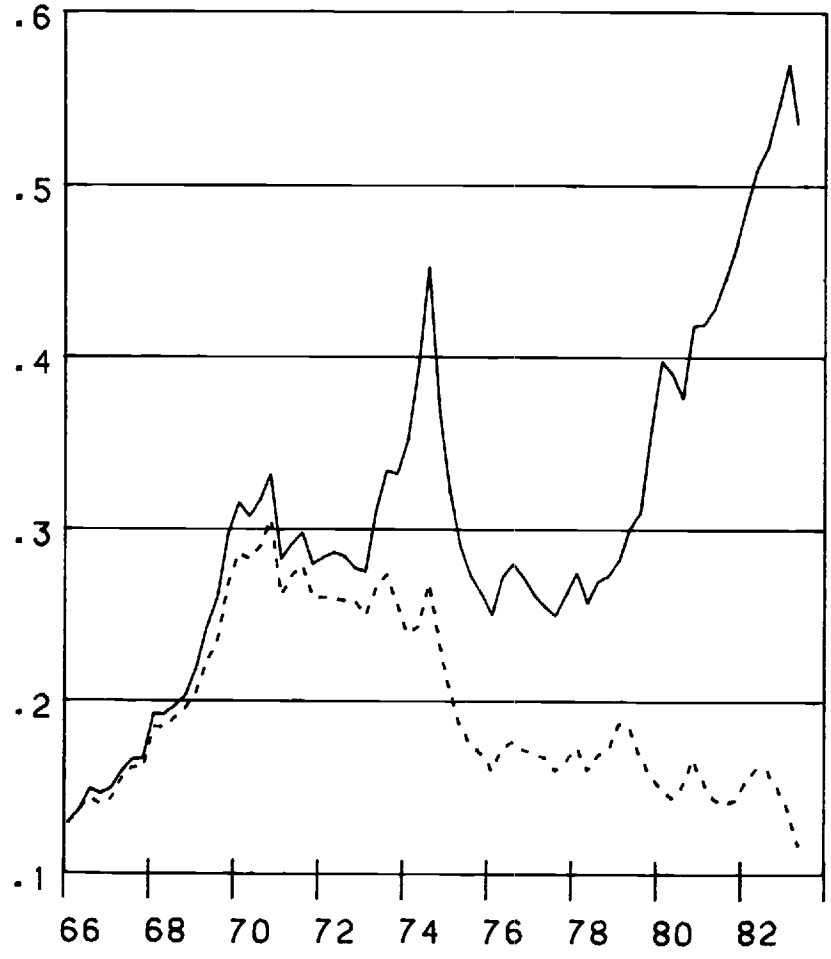


**Fig. 1.20** Debt service burden of nonfinancial corporations, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

removing the variability of the increase in the world price of oil boosted trend GNP growth to 3.0%, and adding stable money policy raised it to 3.1%. Thus instability does appear to reduce trend growth, partly by leaving unemployment high and partly by reducing the rate of capital formation and therefore the growth of aggregate supply.

The cyclicality that remains after the removal of the oil price shocks, stop/go monetary policy, and certain elements of the crunch is consid-

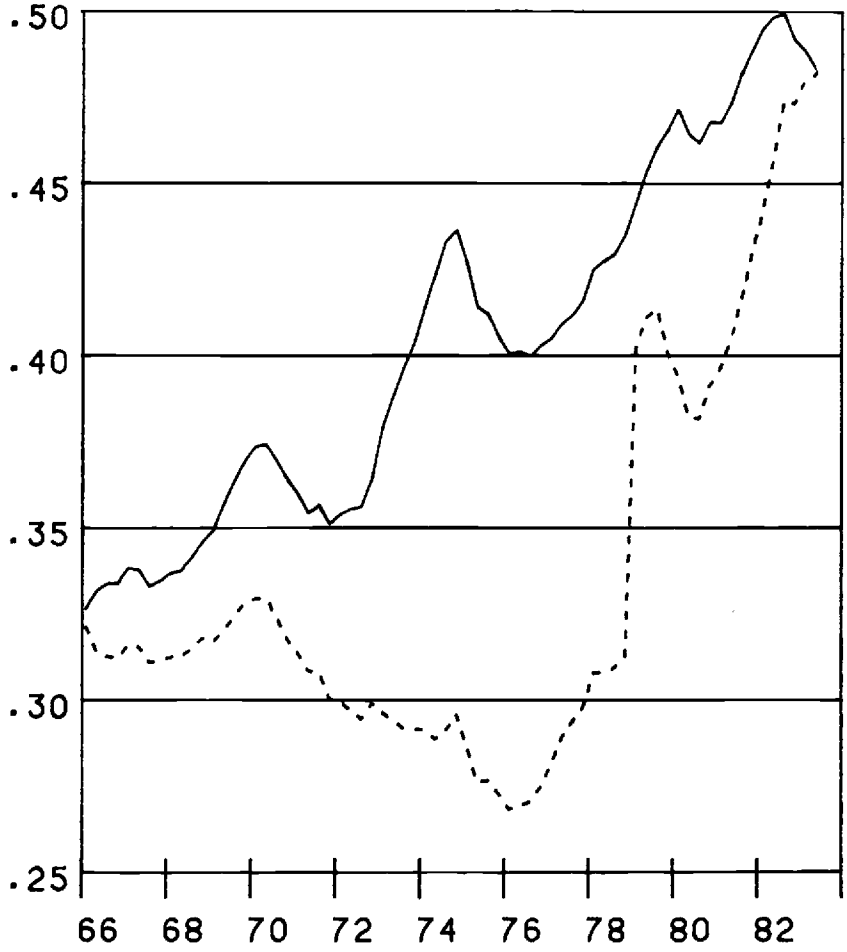


**Fig. 1.21** Ratio of short-term to total outstanding debt: nonfinancial corporations, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

erable, however—still 66.3% of the total experience. The possible sources of cyclicality that remain are extensive (table 1.5).

The United States government budget and fiscal policies may well have been destabilizing, particularly during the buildup for the Vietnam War and as a result of Reaganomics. The price controls of 1971–74 contributed to peak inflation, which in turn was a major factor contributing to the large 1974–75 recession. The world food price explosion of 1972–73 was a serious disturbance. The General Motors strike of

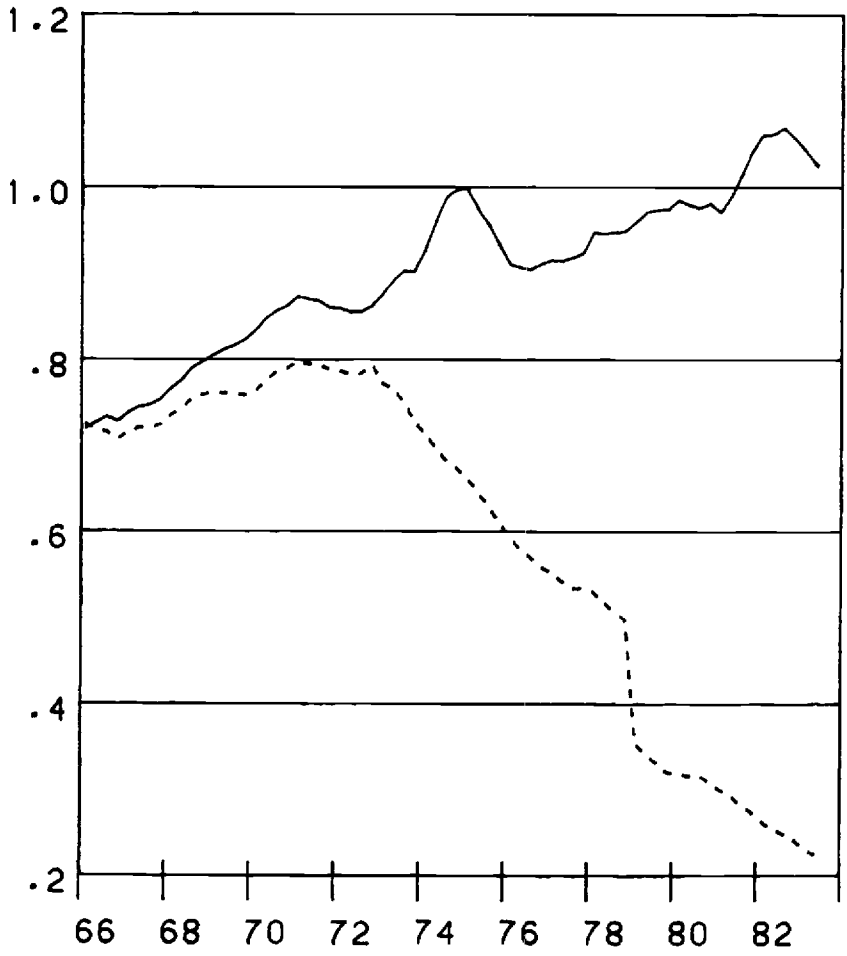


**Fig. 1.22** "Leverage" of nonfinancial corporations: nonfinancial corporations, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

1970 affected the macro data. The two disruptions in the availability of gasoline supplies caused consumer sentiment to collapse, shifting the consumption function downward and worsening the recessions of 1974–75 and 1980.[19]

Variations in aggregate supply also contribute to the large residual cyclicality. Our index was calculated on the basis of an exponential

19. For the 1974–75 recession, these matters were pursued in Eckstein 1978.

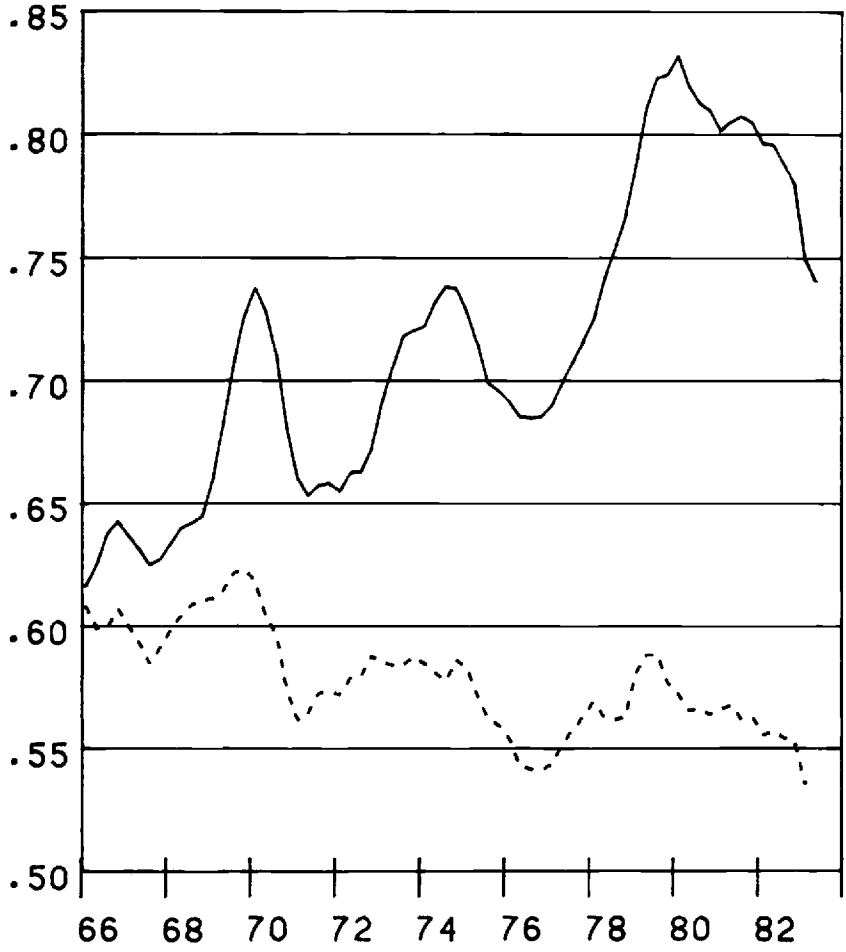


**Fig. 1.23** Loan/deposit ratio: commercial banks, 1966:1 to 1983:2 (before and after removing unstable Fed policy, crunch, and oil shocks). Track Sim ——; stable money, no crunch, no oil shocks ------.

trend. Aggregate supply did not grow so smoothly, however, because of demographic variations and changes in the productivity trend. Indeed, a cyclicality index calculation for aggregate supply, as measured by potential GNP, had a value of 0.649, or 45% of the cyclicality of actual real GNP. Although the timing of the supply variations does not coincide perfectly with the business cycle, there was sufficient coincidence to make the supply variations account for a significant portion of the residual cyclicality.

**Table 1.7** **The Multiplier and Related Measures ($10 Billion Increase in Real Government Spending)**

| Quarters after Shock | Real GNP[a] | Investment in Residential Structures[a] | Total Consumption[a] | Implicit Price Nonresidential Fixed Investment[a] | Deflator (% difference in levels) | Change in T-Bill Rate (basis points) |
|---|---|---|---|---|---|---|
| | | | *Fixed Money Supply (M1)* | | | |
| 4 | 1.26 | −0.15 | 0.41 | 0.01 | 0.2 | +77 |
| 8 | 0.94 | −0.35 | 0.28 | −0.02 | 0.4 | +87 |
| 12 | 0.81 | −0.32 | 0.18 | −0.07 | 0.6 | +135 |
| 16 | 0.64 | −0.34 | 0.10 | −0.13 | 0.7 | +142 |
| 24 | 0.56 | −0.34 | 0.10 | −0.21 | 1.0 | +186 |
| | | | *Accommodating Money Supply*[b] | | | |
| 4 | 1.48 | −0.04 | 0.37 | 0.03 | 0.4 | +20 |
| 8 | 1.45 | −0.06 | 0.36 | 0.07 | 1.0 | +30 |
| 12 | 1.38 | −0.08 | 0.31 | 0.08 | 1.6 | +17 |
| 16 | 1.30 | −0.06 | 0.27 | 0.05 | 2.1 | +27 |
| 24 | 1.10 | −0.06 | 0.22 | −0.03 | 2.7 | +36 |

[a]Ratio of change in final demand category to autonomous change in spending.

[b]Unchanged nonborrowed reserves—in the fixed money supply case, nonborrowed reserves were reduced to keep M1 at its original values.

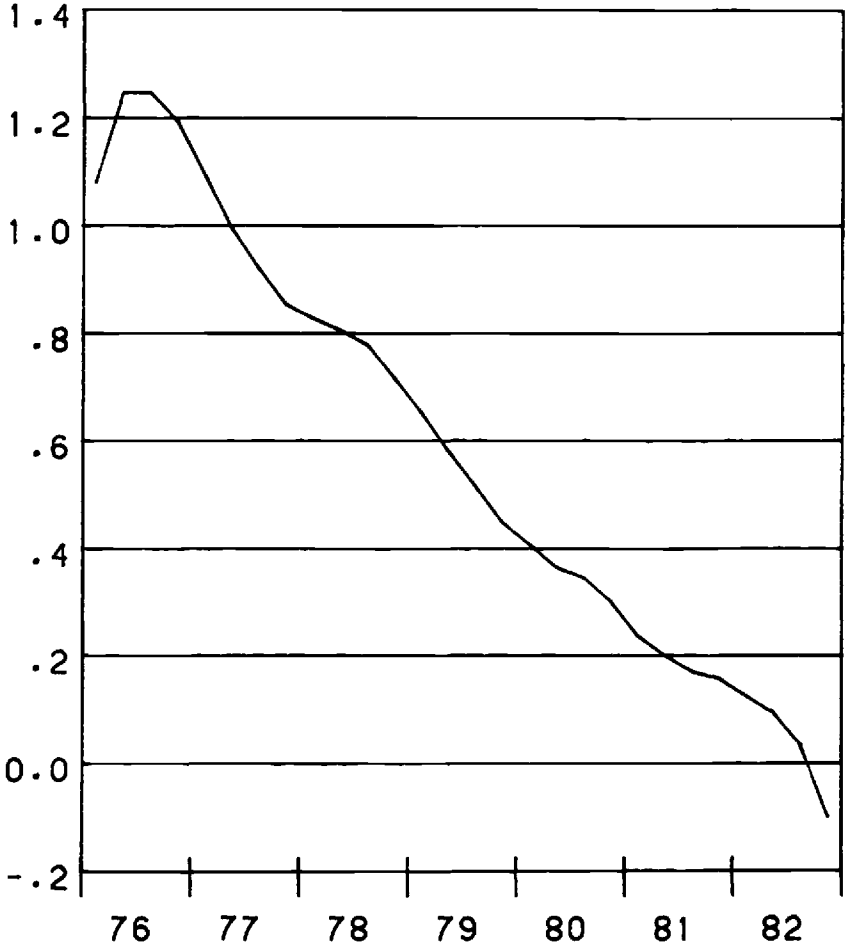


**Fig. 1.24** Multiplier, civilian federal purchases. Sustained $10 billion rise, unchanged money supply.

To test further the sources of cyclicality, simulations were performed that set each of the major volatile components of private sector aggregate demands equal to their trend growth paths.[20] These included (1) consumption of durable goods, (2) business fixed investment, and (3) inventory outlays, all in real terms, and (4) housing starts. Another simulation set all the growth paths at trend. Finally, a combined sim-

20. Values of add factors, the intercept terms in the key behavioral equations, were selected to set the various spending components on their trend growth paths. There was no trend in housing starts, which were set at their mean value.

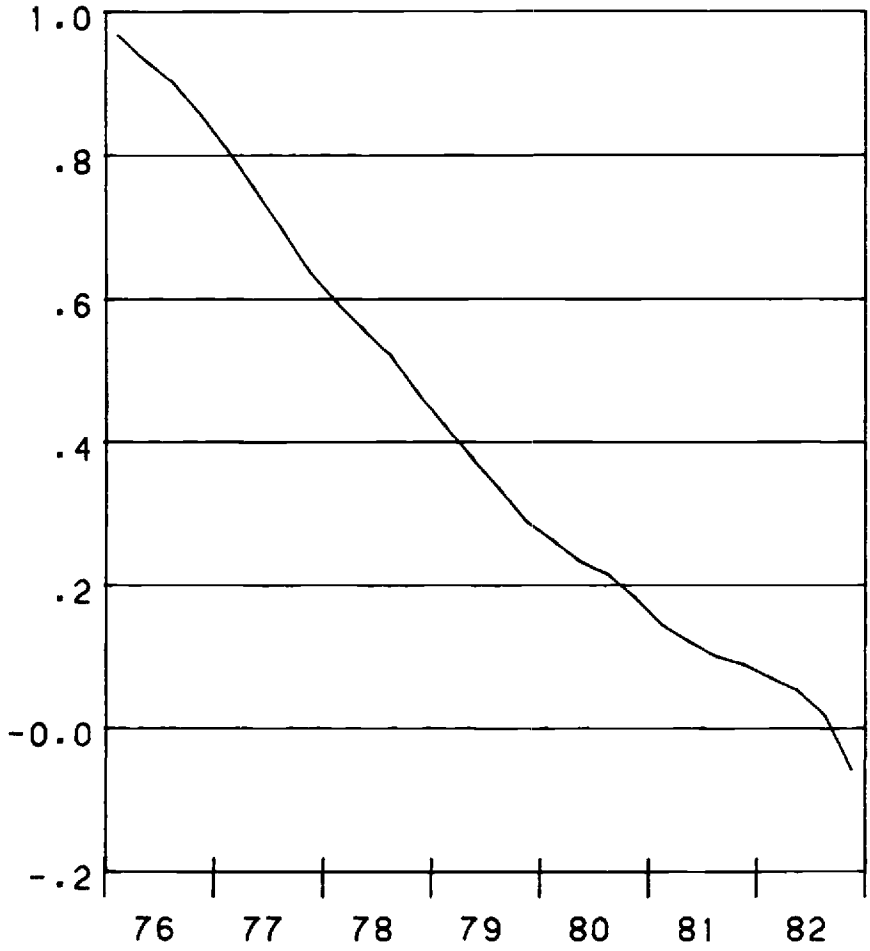


**Fig. 1.25** Output/inflation transform, civilian federal purchases up $10 billion (fixed money supply).

ulation of the final demand trend growth paths with the stable money policy, no oil shocks, and no crunch case was performed. The intent here was to identify the real final demands that were major sources of cyclicality over 1966 to 1983. The results are summarized in table 1.6.

From the table, it can be seen that of the real final demands that were considered, durable consumption spending was the major source of cyclicality. Setting the growth in durable consumption at trend reduced the cyclicality index to 0.985, a reduction of 32% from the Track Sim value. The multiplier/accelerator impacts of smoothing this major

component of final demand, more even impacts on the financial markets through consumer loans and deposit flows, and a more stable performance for household balance sheets contributed to the lessened cyclicality.

Setting housing starts at its mean value resulted in the next largest reduction in cyclicality, with the cyclicality index falling from 1.449 to 1.032, a reduction of 28.8%. While somewhat surprising in that it was a lesser factor than durable consumption in cyclical behavior, this result supports the highly cyclical role of housing indicated in earlier experiments and most of the literature. In a sense, housing starts can be thought of as related to consumption spending. Surprisingly, business fixed investment and fluctuations in inventories accounted for the least amount of cyclicality.

With all the more volatile elements of real final demands set at trend, the cyclicality index was 0.571, down 60.6% from the value of the historical Track Sim. Of course such an exercise begs the question of the "causes" for the fluctuations, but it does permit an assessment of the domestic private, nonpolicy sources of cyclical behavior.

Finally, in addition to stabilizing the real final demands, removing the oil price shocks, stabilizing monetary policy, and eliminating the volatility of loans stemming from the crunch and reliquefication stages in the flow of funds cycle, produced a cyclicality index value of 0.482. Figure 1.26 shows the resulting behavior of real GNP relative to trend, where the cyclicality is 66.7% less than in the Track Sim. Again, however, considerable volatility remains, reflecting the propagation mechanisms in the system and suggesting that a full removal of cyclicality is not possible in the real world.

## 1.7 Conclusions

What are the causes of the business cycle in the postwar era? It is very clear that impulse mechanisms have been crucial. Large shocks, ranging from OPEC oil price changes to shifts in monetary policy and credit crunches, were responsible for up to one-third of the cyclicality of the United States economy from 1966 to 1983:2, using a very conservative measure. Of the various components of aggregate demand, changes in durable consumption spending and residential construction accounted for a large amount of cyclicality. Small shocks, on the other hand, as measured by the equation errors of the DRI model, seemed to be of minor significance. Our examination of the internal propagation mechanisms was very incomplete. Calculated as a residual, after removing a large number of impulse mechanisms, it is about one-third of the cyclicality from 1966 to 1983 (table 1.6, fig. 1.26). A core of

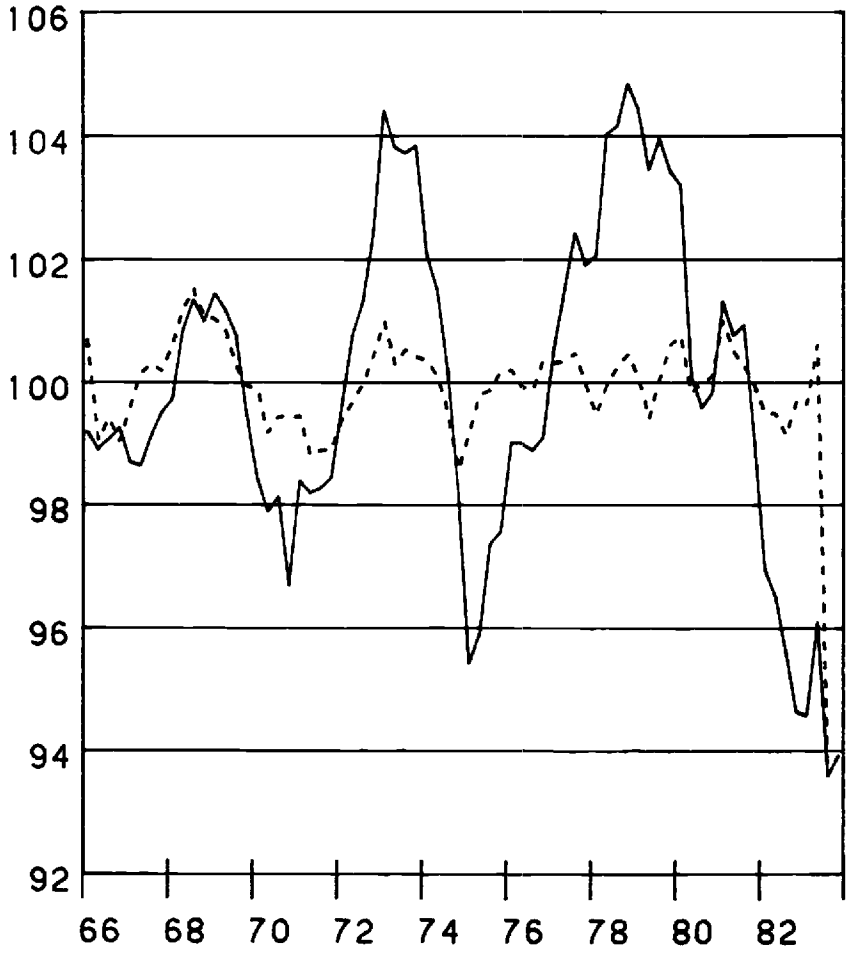


**Fig. 1.26** Autonomous final demands at trend, stable money policy, no oil shocks, no crunch simulation compared with Track Sim (percentage of trend). Track Sim ——; autonomous real final demands, stable money, no oil shocks, no crunch ------.

cyclicality thus remains, suggesting that a balanced growth path for the economy was and is not attainable.

One essential business cycle mechanism appears to have been financial, especially since a near-monetarist approach has been taken to monetary policy, and was estimated to provide a 31.4% reduction in cyclicality over 1966 to 1983:2 (table 1.6; stable money policy, no crunch). If a boom in real activity or an unacceptable rate of inflation develops, the central bank causes these phenomena of the upswing to be con-

verted into crowding out, credit crunches, and recessions. Other stock flow adjustments are numerous but do not seem to add much to cyclicality.

Has the business cycle changed in the postwar era? Have there been changes in the mechanisms? On the surface, an affirmative answer might be suggested to both of these questions. As figure 1.1 and 1.2 and table 1.2 show, expansions and recessions have become more pronounced with severe, volatile, and longer recessions in the later years of the postwar era. But from our experiments it is not clear that any significant changes really occurred. From the model simulations, the apparent result is that shocks matter most, whether external shocks stemming from policy or inflation or "internal shocks" taking the form of autonomous shifts in consumption and investment. The propagation mechanism that transmits their effects to the rest of the economy remains intact. The simulations show changing amplitudes from a series of shocks that acted as impulses. But figures 1.16 and 1.26 show continuing oscillations that were not fully eliminated in the simulations with the least cyclicality. This suggests that the inherent business cycle mechanisms are unchanged and that a greater frequency of shocks was responsible for the more violent recent episodes. Also, if a balanced growth path exists, it was not achieved during the past twenty years. For the future, these results suggest it is highly unlikely that a balanced growth path can be attained.

The factors most responsible for the increasing cyclicality of business activity were revealed in the results of the computer simulations on the effects of OPEC price shocks, the extremes and mechanisms of monetary policy, financial crises and instability, and their interaction. Smoothing or removing these factors substantially reduced the severity of the business cycles between 1966 and 1983 through the business cycle mechanisms that are structured in the DRI model. The business cycles did not disappear but were mitigated in severity, duration, and the extreme behavior that actually occurred, suggesting that, despite appearances to the contrary, an intrinsic cyclical mechanism remained.

While the factors associated most with greater cyclicality generally would be classed as exogenous, the monetary policy responses of 1966 to 1983 certainly were greatly conditioned by the presence of worsening inflation. Supply side cost shocks, particularly from OPEC oil price increases, reverberated through the price/wage mechanism in the United States economy to raise inflation and alter inflation expectations to a large degree, eventually requiring a strong response by the central bank to limit the inflation. And even these shocks had an endogenous element, of course.

One surprising result is that autonomous changes in real durable consumption were found to be a greater source of cyclicality than either

housing, business fixed investment, or inventory fluctuations.[21] The latter components of real final demands are most often considered the key elements in short-run business fluctuations. But durable consumption has taken a larger share of total aggregate demand over the postwar years. And given its large absolute size, the derived real and financial effects from shifts in this category of spending are now considerable.

As for the propagation mechanisms, several factors underlying the business cycle have been altered in the postwar period and do suggest some changes. The changed approach to monetary policy over the 1970s and early 1980s has altered the propagation mechanism and is surely the single most identifiable change. Monetary policy changed from free reserves and interest rate targeting in the 1960s to monetary growth targeting vis-à-vis the federal funds rate in the 1970s, and then quite radically in the period 1979–82 to reserve growth and freely fluctuating interest rates. The predominant change in structure occurred with the New Fed Policy of October 1979 and has been demonstrated here to be a major source of cyclical instability since then.

In the DRI model, wide fluctuations of interest rates induce wide swings in spending and borrowing behavior that in turn feed back to sustain the volatility of interest rates. The change in monetary policy that unhinged interest rates from Federal Reserve control inevitably had to create substantial instability in both financial and real markets. The simulation (stable money policy) that had Federal Reserve policy return to stabilizing interest rates over 1979:4 to 1983:2 produced a much more damped performance in the economy than actually occurred. Some interest rate effects of the unanticipated monetary policy shock of the New Fed Policy also were removed in other simulations with similar results.[22]

Second, the housing cycle, though just as volatile as in previous years, has been affected by changing patterns in mortgage finance and interest rates. Simulations of a less volatile monetary policy with more stable interest rates worked, in part, through the housing cycle as a major component of business cycles. Tight monetary policy, high interest rates, and disintermediation have always been major causes of instability in housing and construction as an impulse mechanism to shorter-run fluctuations. Whereas the periods from the mid-1950s to the late 1970s were characterized principally by availability of funds constraints on housing activity, the deregulation of financial institutions and the removal of interest rate ceilings now has thrown the burden of adjustment on demand and affordability. Much greater fluctuations

21. This result provides empirical support for the hypotheses of Hall, discussed in chapter 4.

22. See Brimmer and Sinai 1981 for an attempt to quantify the effects from the New Fed Policy in simulations with the DRI model.

in interest rates now seem to be required for a given cyclical movement in housing, throwing the rest of the interest rate sensitive areas of the economy into a more volatile cyclical pattern.

Finally, also important in recent years have been the globalization of economic activity and the effect on the dollar of fluctuating exchange rates. Increased trade, interest rate, and capital linkages are transmitting the business cycle, though the adoption of flexible exchange rates may serve as a partial buffer. More fundamentally, the worldwide boom of 1971–73 and the post-OPEC experience suggest that the business cycle is becoming more of an interrelated global phenomenon.

## Appendix 1.1
## Descriptions of Simulations

1. Track Sim

The historical tracking simulation was obtained by removing the errors of a dynamic historical simulation through offsetting equation add factors. In each quarter, an add factor equal to the simulated error of each behavioral equation and opposite in sign was inserted (about five hundred behavioral equations were involved). After several iterations, the solution converged on the actual historical data, producing a model-based tracking of history on which other simulation exercises could be performed.

2. No Noise

The "no noise" simulation represented an attempt to simulate the effects of random shocks on the cyclicality of the United States economy from 1966:1 to 1983:2. A full solution of the model over this period was run, with actual historical values inserted for all exogenous variables and the solved values for each endogenous variable fed back into the right-hand side of the equations in current and subsequent periods. No add factors were used in the behavior equations for this simulation.

The resulting residuals comprised two components: individual equation and interactive model simulation errors. In a properly specified model, with appropriate properties for the estimated parameters, both the equation and model simulation errors would be random and could be assumed to reflect "noise." The reduction in cyclicality from the Track Sim of this simulation thus represents an approximation, defined in this way, of the effects from noise over the simulation period. To the extent that the equation or model simulation errors contain nonrandom components, certainly likely in a large-scale macroeconometric

model simulation, the reduction in cyclicality from history would be understated.

3. No Oil Shocks

The overall purpose of this simulation was to remove the variability of inflation created by the OPEC oil price shocks. The DRI model has a well-defined energy sector (Eckstein 1983, 234–45) that serves three functions: "to trace the effects of exogenous prices to the retail stage, to provide a supply-demand check to see if available supplies can sustain particular levels of economic activity, and to determine the effects on potential GNP and productivity."

One way to examine the effect of the severe OPEC inflation on the business cycle was to create a new more stable time path for oil prices and to have the model endogenously trace the implications.

Therefore in this simulation the only change made was in the series for crude oil prices, the key exogenous input to oil and energy prices. The prices of both domestic and foreign crude oil were lowered. Although part of the OPEC disruption was through effects on supply and production, no attempt was made to include them except through endogenous reactions in the model. The only other change was in the path of nonborrowed reserves, the key exogenous variable for monetary policy, which was raised to produce an unchanged M1 from the Track Sim over the simulation period. In effect this amounted to an easing of monetary policy, since inflation rates generally were lower. Interest rates were permitted to respond endogenously in this simulation.

4. Stable Money Policy

In this simulation, the objective was to remove from the business cycle the variability stemming from the wide swings in monetary policy over 1966 to 1983. The Federal Reserve is generally agreed upon as having been "tight" in 1966, "easy" in 1968, "tight" in 1969–70, "easier" in 1971–72 with the advent of a wage/price freeze, "tight" in 1973–74, "easy" in 1975–76, perhaps too easy in 1977–78, and exceedingly tight in 1980–81.

The modeling of monetary policy is a complicated matter in a large-scale macroeconometric model, involving not only movements in the money supply but also variables like bank reserves, legal reserve requirements, deposit rate interest ceilings, and loan down payment conditions. Since the money supply, whether measured as M1, M2, or M3, is an endogenous variable, monetary policy is not implemented by controlling the growth in the money supply. Instead, changes in the pattern of nonborrowed reserves, reserve requirements and required reserves on demand and time deposits, deposit and loan interest rate

ceilings, the discount rate and sometimes loan-to-value ratios are the mechanisms.

The general approach was to impose more stability on the path of monetary policy, as measured by the exogenous policy instruments. Large shifts in monetary policy, as measured by the growth in nonborrowed reserves and changes in reserve requirements, were reduced in those periods of known easy or tight monetary policy by smoothing the growth of nonborrowed reserves and raising reserve requirements when the Federal Reserve had lowered them and lowering reserve requirements when the Federal Reserve had raised them. Monetary policy thus was tightened when it had been easy and eased when it had been tightened. The timing of these historical changes also was altered, with the undoing of the historical changes in monetary policy implemented early rather than late, given the lags between changes in monetary policy and the effects on the economy. Regulation Q deposit rate ceilings were removed during the historical period, thus eliminating a major distortion in relative interest rates that was responsible for much of the disintermediation that occurred from 1966 to 1980.

The first major policy lever considered was legal reserve requirements. The DRI model has two legal reserve requirement variables—one for demand deposits and one for time deposits. For the sake of simplicity, total required reserves was smoothed, using legal reserve requirements on demand deposits, the more erratic of the two variables.

This change had a significant impact on the interest rate block of the model, both through a free reserves equation and also directly in individual interest rate equations. These equations include the federal funds rate equation, the three-month treasury bill rate equation, the prime interest rate equation, and the consumer installment rate equation. These in turn have a simultaneous impact on other short-term interest rates, on yield curves, and to a lesser extent on longer-term interest rates.

Another policy instrument altered was deposit interest rate ceilings. The historical ceilings on rates for large certificates of deposits, deposits at commercial banks, deposits at savings and loan associations, and deposits at mutual savings banks were all removed. Deposit interest rates thus rose above historical ceilings during tight money periods and prevented the massive disintermediation that actually occurred. There was some simultaneous impact upon other short-term interest rates as well.

Nonborrowed reserves also were changed directly, made to grow more rapidly in periods when growth was very low or negative and limited in growth during times of rapid increase to tone down the periods of aggressively easier monetary policy.

To mitigate the effects of the New Fed Policy after 1979:4; nonborrowed reserves were altered to limit the swings in key short-term interest rates. This variable has a strong impact on short-term interest rates, especially the federal funds and treasury bill rates, and operates by altering free reserves. There is also a smaller impact on longer-term rates through a liquidity variable in the key long-term corporate bond rate equation.

5. No Oil Shocks, Stable Money Policy

This simulation was constructed by combining the changes made in the no oil shocks and stable money policy simulations. The one alteration was to eliminate the change in the no oil shock simulation by adjusting nonborrowed bank reserves to retain M1 at its baseline path. Otherwise, all changes were as described in simulations (3) and (4).

6. Stable Money Policy, No Crunch

This simulation used the stable money policy exercise as a base and included all the changes in it. Tight money and disintermediation was essentially eliminated as a crunch ingredient in this exercise. But in addition several elements of the credit crunch and reliquefication experienced during this simulation period were removed.

The growth patterns of certain loan and asset variables were smoothed throughout the simulation interval to remove the effects on interest rates and real final demands brought by volatile credit growth and asset accumulation and decumulation. Those variables smoothed were commercial and industrial loans at all large weekly reporting banks, loans to individuals, outstanding mortgage loans and commitments, borrowing by nonfinancial corporations at banks, and issues of commercial paper by nonfinancial corporations, all of which exert considerable upward pressure on interest rates late in expansions and put downward pressure on interest rates in recessions. Household and business balance sheets also were made more stable as a result, as asset/debt ratios were less volatile. The rate of growth in these categories of borrowing was reduced during the credit crunch periods. The loan variables directly influence short-term interest rates and indirectly affect the deposit flows and balance sheets of households, nonfinancial corporations, and state and local government.

A financial variable that was adjusted was household financial assets, which consists of household holdings of money, deposits, bonds, and equity. In credit crunches, the growth of household financial assets is considerably diminished. Instead, the growth in this variable was increased during credit crunches, easing one of the major negative household balance sheet inputs to the business cycle. Household financial

assets influence household net worth, the performance of the stock market, and also the final demands of real personal consumption.

7. Stable Money Policy, No Oil Shocks, No Crunch

This simulation combined the changes and features of the stable money policy, no oil shocks, and no crunch simulations, removing the cyclicality brought about by "stop/go" monetary policy, the oil price shock inflation, and several elements of the crunch process. In essence, almost all the ingredients of the "financial factor" in the business cycle were smoothed as a result.

8. Autonomous Real Final Demands

In this simulation, the more volatile components of final demands were exogenized at trend values one by one, then all together. These were, specifically, personal consumption expenditures of durable goods in real terms, gross fixed private nonresidential investment in real terms, the total change in real business inventories, and housing starts. These variables were constrained to grow at their historical levels over the entire simulation interval; housing starts were set at their mean value for the period.

In the DRI model, most of these variables enter directly into real gross national product. However, feedback effects influenced some other variables, with endogenous reactions permitted elsewhere, except back on the final demand category that was exogenized.

9. Autonomous Real Final Demands, No Oil Shocks, Stable Money Policy, No Crunch

This simulation combined the exogenizing of the various components of real final demands at trend growth rates and the characteristics and underlying features of the no oil shocks, stable money policy, and no crunch solutions to remove most of the suspected major sources of volatility during the simulation period. All the changes described in the relevant simulations above were combined for this exercise.

## Appendix 1.2
## Expectations and Econometric Models

The role of expectations in the business cycle has not yet been fully and systematically explicated or empirically determined. The "new macroeconomics" provides an equilibrium theory of business cycles, stressing the impact of unanticipated shocks as a source of cyclical

**Table 1.A.1 Sources of Cyclicality: Results of DRI Model Simulations, 1966 to 1983:2 (Inflation, GNP Deflator)**

| Simulation | Cyclicality Index | Percentage Reduction from History |
|---|---|---|
| Historical Track Sim | 18.964 | — |
| No "noise" | 16.003 | −15.06 |
| No oil shocks | 17.064 | −10.0 |
| Stable money policy | 18.709 | −1.3 |
| No oil shocks, stable money policy | 17.462 | −7.9 |
| Stable money policy, no crunch | 18.116 | −4.5 |
| Stable money policy, no oil shocks, no crunch | 16.792 | −11.5 |
| Autonomous real final demands | n.m.[b] | n.m. |
| Durable consumption | n.m. | n.m. |
| Business fixed investment | n.m. | n.m. |
| Inventories | n.m. | n.m. |
| Residential construction | n.m. | n.m. |
| Autonomous real final demands, no oil shocks, stable money policy, no crunch | n.m. | n.m. |

[a]Since the historical dynamic simulation gave a less cyclical result than the Track Sim, the "gap" between potential and real GNP in the simulation did not widen as much as in history, especially in downturns, producing a more cyclical result. Setting the final demand components exogenously at trend growth values eliminated certain model feedback mechanisms on inflation that limit the usefulness of these results.
[b]n.m. = not meaningful.

movements and rationally formed expectations in making anticipated changes in policy ineffective (Lucas 1975).

In the new theory, expectations affect the business cycle through "disappointment" or "surprise" over monetary and fiscal policy actions. Unanticipated changes in monetary and fiscal policies perturb the amplitude of the cycle, with the propagation of these shocks depending on internal mechanisms.

The new expectations theory challenges econometric models on several counts. First, conventional macroeconomic models have often been devoid of expectations phenomena and, where existing, derived from historical data of the same series rather than "rationally" formed. Specification errors may exist on both grounds, biasing the results in the dynamic simulations of these models. Second, to the extent that parameters (the structure) vary in response to policy changes, the predictions of econometric models that are conditional on assumed policies may be invalid or biased. More important for the business

**Table 1.A.2** **Sources of Cyclicality: Results of DRI Model Simulations, 1966 to 1983:2 (Unemployment Rate)**

| Simulation | Cyclicality Index | Percentage Reduction from History |
|---|---|---|
| Historical Track Sim | 9.560 | — |
| No "noise" | 9.483 | −0.8 |
| No oil shocks | 8.349 | −12.7 |
| Stable money policy | 8.827 | −7.7 |
| No oil shocks, stable money policy | 8.143 | −14.8 |
| Stable money policy, no crunch | 8.328 | −12.9 |
| Stable money policy, no oil shocks, no crunch | 7.795 | −18.5 |
| Autonomous real final demands | 6.159 | −35.6 |
| Durables consumption | 8.820 | −13.4 |
| Business fixed investment | 7.060 | −26.2 |
| Inventories | 9.924 | 3.9 |
| Residential construction | 8.591 | −10.1 |
| Autonomous real final demands, no oil shocks, stable money policy, no crunch | 7.853 | −17.9 |

cycle, anticipated changes in policy are believed to have no impact on real variables or inflation, since the economic structure adjusts to offset them. Third, the activity may really be equilibrium paths in a world where information is rationally used, since markets have quickly adjusted and learned in an efficient manner. These arguments, though valid in certain circumstances, nevertheless must themselves be questioned. Expectations formation is not necessarily rational, but at times can be adaptive and slow, depending upon the markets in question. It is not clear that the errors potentially introduced by using a formulation of expectations different from rational expectations are large enough to perturb equation parameters sufficiently to render invalid the approximate conclusions of econometric model simulations. It is an empirical question whether significant variation occurs in structural coefficients when policy is changed. Many policy changes are not different enough from history to alter structural parameters by a large amount.

Further, the notion that economic agents perceive and use the correct structure in forming expectations is difficult to accept. A homogeneity of views across decision makers on the determinants of the economy,

interest rates, and responses to policy is very unlikely. Equilibriums are not instantaneous: the real world is characterized by quarter-to-quarter adjustments. Finally, only few economic markets are characterized by quick, inexpensive, full information flows on those activities relative to decisions. The flow of information and reactions of decision makers might be near perfect in the financial markets, but reactions in labor and other markets are much less efficient.

## Comment

Michael C. Lovell

I think I have an advantage in reading Eckstein and Sinai's paper, for whereas courses in the business cycle are no longer offered at most institutions, I was well trained; in the fall of 1955—six recessions ago—it was my pleasure to take a graduate course about business cycles that was team taught by Gottfried Haberler and Otto Eckstein. That was a precomputer course; it was not until the following summer that the dawn of modern computers at Littauer was marked by the arrival of the Burroughs E101. That machine was the wonder of its day, for it had 110 words of storage. Eckstein and Haberler taught a great course, one of the last of its breed; at the time it was obvious to everyone that Otto would go far, but I suspect that few of us in the class anticipated that he would pass the market test so well, entrepreneuring business cycle forecasting on time-sharing computers.

The six recessions suffered by the American economy since Eckstein and Haberler taught their course provide additional evidence on the nature of business cycle phenomena. But in the interim the very existence of the business cycle came to be questioned: it was suggested at one time that the business cycle was a topic that could be relegated to economic historians; more than a decade ago a former colleague of mine, Martin Bronfenbrenner, edited a Social Science Research Council volume entitled *Is the Business Cycle Obsolete?* and successful macro texts avoid even a chapter on the business cycle. This conference gives testimony that the business cycle is alive and sick. And we have much to learn about business cycle phenomena from Eckstein and Sinai's contribution.

### Key Points

Let me begin by saying that to my mind the most surprising thing about the contribution is that so much of it is so familiar. With the exception of the simulation results of section 1.6, the Eckstein/Sinai

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paper closely resembles the Eckstein/Haberler course. Indeed, the business cycle mechanism described is not that different from the one discussed by Joseph Schumpeter in his *Theory of Economic Development* and his two-volume *Business Cycles*; and much that is in the paper would offer no surprise to readers of Burns and Mitchell. In particular, Eckstein and Sinai follow Burns and Mitchell in stressing the sheer complexity and irregularities of business cycle phenomena. Let me mention some of the most striking features of their contribution:

1. They augment in a rather interesting way the standard NBER business cycle chronology, as is most easily seen from table 1.3, which chronicles five types of cyclical phenomena. The recovery expansion dates and the recession dates are those of the NBER (in contrast to Blinder's contribution to this volume, they stick to the official chronology). Eckstein and Sinai have superimposed on this standard chronology three types of "stages." The first of these are "booms." In addition there is the "precrunch period/crunch" and the "reliquefication" stage. Reliquefication is a process that usually takes place near the end of the recession but may be continuing while the recovery phase is getting under way. The boom usually precedes the onset of recession. Observe, however, that there is considerable irregularity, testifying to the complexity of the phenomena under study; in particular, the precrunch period/crunch of 1966 was not followed by recession (though at one point the authors refer to a "growth recession"). And the downturn of 1960 was not preceded by a boom, which they attribute to Eisenhower's efforts at balancing the budget.

2. Eckstein and Sinai present the "DRI boom monitor," which may be a close cousin of the NBER coincident indicators; by identifying periods of boom, they hope to determine more precisely the upper turning point. It is plotted on figure 1.3, and its components are listed on table 1.4. Note that it is a weighted average of eight components; six are real indicators; one is a measure of credit conditions; the one with smallest weight is the monetary base growth index, but in real terms, which means it is not considered a policy instrument by monetarists. It is interesting that in terms of their boom index the 1972:6 to 1973:11 boom is the biggest bang since World War II—perhaps the magnitude of the Korean War boom is artificially downplayed because of the cutback in new car sales.

3. While Eckstein and Sinai do not focus on any single measure of monetary conditions, they do emphasize the importance of the financial factor in referring to the "flow of funds cycle." To briefly summarize, they explain that the precrunch period culminates in the *crunch,* which they define "as a credit crisis stemming from the collision of an expanding economy with a financial system that has been depleted of liquidity." It is characterized by deteriorating balance sheets, sharply

increased interest rates, a scramble for available funds, depressed stock markets, and the inability of many borrowers to obtain funds at any cost. "The financial factor is a critical ingredient of the business cycle. . . . But it is not just monetary policy that influences the business cycle process; the feedback effects from borrowing, lending, stock-flow processes in finance, balance sheets, changes in liquidity, and financial risk affect cyclical behavior as well." If my memory serves me right, there is not much in this description that would surprise either John Maynard Keynes or Joseph Schumpeter.

4. While their paper does not blame the cycle on any single factor, they do cast a few stones at the policymakers—Eisenhower for shifting so abruptly toward the balanced budget in 1960 and the Fed for being too contractionary in downturns and too expansionary in revivals. Thus they state: "In virtually every precrunch period, the Federal Reserve retained a restrictive monetary policy for longer than was necessary. Similarly, periods of reliquefication often have been characterized by a prolonged period of excessively stimulative monetary policy." They argue that the October 1979 shift in Fed policy was a mistake, causing the subsequent crunches to become more intense; also, the shift to flexible exchange rates contributed to the globalization of cyclical phenomena in the 1970s.

5. Simulation results focusing on the sources of the business cycle are conveniently summarized in section 1.6. They compare a variety of alternative counterfactual simulations using an "index of cyclicality," defined as the sum of the absolute value of deviations from trend over the period 1966 to 1983:2. The results are conveniently summarized on table 1.6, the middle column of that table being most informative. In the absence of random shocks (no noise), the cycle in real output would have been 7.4% less severe. No oil *price* shocks would have removed 15.9% of the cycle, and a stable money policy would have smoothed out 22.2%. And table 1.7 shows the multiplier effect of a $10 billion increase in real government spending, contrasting a fixed money supply with unchanged nonborrowed reserves.

Critique

1. I suspect many readers of this paper will be upset; but I am sure those sections that are most upsetting to some readers are likely to receive strong applause from others.

Some will be upset because Eckstein and Sinai do not focus on any single simple indicator of what the central bank is about—if they do mention the rate of M1 growth once or twice, they also refer more than a few times to free reserves.

Some readers may be upset because they do not advance a straightforward statement as to what *causes* cyclical phenomena. My own

inclination is to applaud Eckstein and Sinai for following Burns and Mitchell in stressing the complexity of the business cycle; they explicitly reject monocausal explanations.

Others will be upset by the things they leave out. They have little to say about the slowdown in productivity growth or rational expectations. And I am sure many will dissent from their proclivity to downplay much that is new in the literature: "Some ideas from the recent literature, such as asymmetric information, the misreading of absolute price changes as relative price changes, the serial correlation introduced by buffer inventory stocks into production, and lags in the wage/price process, may be part of reality, but even the most cursory look at actual history shows that they can be no more than a small part of it." Because I believe the jury is still out on these issues, I myself am not upset on these points. I am an agnostic, and I believe the pendulum of professional wisdom will be swinging back toward Eckstein and Sinai.

2. I think Eckstein and Sinai may not have adequately qualified the results of their simulation runs. True, they do provide the following cautionary note concerning the precision of their simulation results: "This method of analysis assumes that the observed error terms are not correlated with the sources of instability, an assumption that probably understates the effects of removing various sources of instability, because error terms most likely are positively correlated with measured sources of instability." I believe this is an inadequate qualification; in particular, readers must be cautioned about the problem of specification error. And it would be useful to know how sensitive their simulation results and multiplier estimates are to perturbing their parameter estimates within the indicated range of sampling error. No argument is presented as to why the multiplier response profile presented in table 1.7 is any more creditable than any of the wide-ranging candidates plotted for alternative models by Carl Christ in his article "Judging the Performance of Econometric Models of the U.S. Economy" (Christ 1976). Some readers may suspect that the simulation results reported in this contribution may be telling us more about the characteristics of the DRI model than about the United States economy.

3. I also believe that their simulations do not constitute a definitive exercise in counterfactual history. To illustrate, consider the "no oil shocks" simulation reported in table 1.6. Potentially this is the most interesting of simulations, not only for academic economists but also for Detroit autoworkers who lost their jobs and New Englanders who heat their homes with oil. According to their analysis, their cyclicality index for the period 1973–80 would have been 26.4% lower if the world price of oil had climbed at a steady 7.1% rate over this period. While removing the erratic jerks, this simulation leaves the price of oil at its historical high by the terminal year of the simulation. Thus the reduc-

tion in cyclicality is entirely due to the erratic nature of the price shocks, leaving out the consequence of supply disruptions; and the simulation does not purport to show how productivity and prices would have behaved in the absence of OPEC price hikes.

In thinking about this exercise in counterfactual history, it seems obvious that it should make a difference whether the experimental effect was achieved through an increase in oil imports or by the imposition of price ceilings, with accompanying shortages—the Eckstein/Sinai simulation focuses only on the price effects. The consequence would also depend upon whether the lower price for gasoline would have prevented the shift away from Detroit's "gas guzzlers" to Japanese minis. Research by Ohta and Griliches, as reported in the *NBER Digest* (February/March 1984), reveals that tastes were stable but consumers responded to changes in the price of gasoline and the associated changes in the implicit prices based on weight and size of cars. Unfortunately, Eckstein and Sinai do not explore the effect of stable petroleum import prices on car sales and so forth; and they do not tell us whether energy conservation expenditures by public utilities and households are appropriately netted out; they do not tell us whether they assume that the elimination of the petroleum price hikes would influence the direction of investment spending and the rate of productivity growth.

In the oil price shock simulation they held the historical time path of the money supply (M1) unchanged, which meant the interest rates were made much lower. This simulation is not without interest, but it is of greatest interest to those who believe the money supply is exogenous—some may believe that the problems of the 1970s arose because the Fed spontaneously ran amok with the money supply; the Eckstein/Sinai simulations suggest that, even so, elimination of price shocks would have reduced the real-output cyclicality index by about 15.9%; it would have cut fluctuations in the rate of inflation by 10% and achieved a 12.7% reduction in fluctuations in the unemployment rate.

For those of us who believe that Fed policy was responsive, rightly or wrongly, to what was happening at the moment, an alternative set of simulations is required in which monetary policy is treated as an endogenous variable. The "stable money policy" simulations are a step in this direction. For these simulations Eckstein and Sinai specify that deposit ceilings are removed, extreme changes in reserve requirements are eliminated, and open market operations on reserves are eased when monetary policy was tight and tightened when monetary policy was easy; the range of interest rate volatility was limited after 1979:4. This is a very complex specification; and while I sympathize with their statement that the definition of a stable monetary policy is complex, I

for one would find it interesting to have supplemental information on the resulting time path of interest rates and the money supply.

They do report on a simulation simultaneously eliminating oil price shocks and invoking a stable money policy. If I interpret their brief discussion of this simulation correctly, they are having reserves and interest rates follow the same time path as in the second simulation, which means that the path of M1 departs substantially from its historical path.

4. I think what is needed are *more* DRI simulations better described! It would be useful to simulate within the DRI model environment the implications of alternative assumptions (rules) about the determination of monetary and fiscal policy. A number of years ago Edward Prescott and I (*Southern Economic Journal,* 1968) modeled alternative monetary rules within a simple analytical framework—because which policy rule worked best depended on the relative magnitude of the system's parameters, the basic questions of which policy was most appropriate could not be resolved analytically. Appropriate simulations with the DRI model would provide one set of answers to these fundamental policy issues. One set of simulations would introduce monetary rules attempting to model as closely as possible the actual decision rules of the authorities. These would be contrasted with normative policy rules—for example, constant money supply growth, leaning against the wind, or stable interest rates. The relative success of alternative policy rules in coping with various types of large shocks, such as OPEC price hikes, should be explored by simulation.

## Comment

Kenneth J. Singleton

The paper by Otto Eckstein and Allen Sinai focuses on the role of the financial sector in both the generation and the propagation of cyclical fluctuations in aggregate variables. I shall begin my comments by placing the analysis in this paper in a somewhat different light than the authors have. Then I shall discuss the different phases of the business cycle set forth by Eckstein and Sinai, as well as their taxonomy of the mechanisms underlying the cycles, examining the theoretical underpinnings of the DRI model in relation to modern theories of portfolio choice and consumption. Finally, I shall present some comments on the simulations. Consistent with the focus of the paper, most of my comments will address the specification of the financial sector in macroeconomic models.

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The optimal decisions of consumers, firms, and governments embody the structure of financial markets through the budget constraints faced by these agents. Thus the cyclical behavior of such aggregates as GNP, unemployment, and inflation is intimately related to the nature of the financial instruments available for financing expenditures and for saving. In a frictionless world with complete contingent claims markets, there would be many equivalent ways of arranging financing to achieve the optimal level and rate of growth of expenditures. Indeed, non-interest-bearing money is typically a dominated asset in such an economy, in which case fiat money would not circulate in equilibrium.

Of course there are in fact many restrictions in the United States and other countries that preclude certain types of financial contracts or the provision of certain types of insurance and that limit the forms of the contractual arrangements that can be achieved with the available instruments. The time series properties of aggregate variables are affected in important ways by these restrictions, so economies with and without such restrictions imposed, though otherwise identical, may behave very differently. Furthermore, changes in the types of contracts and in communications technologies over time will in general alter both the amplitude and the periodicity of macroeconomic time series.[1] The important role of financial arrangements in the business cycle process is the central theme of this paper.

Historically, the emphasis on the financial sector in models of business cycles has varied. Fluctuation in interest rates has long been recognized as a central factor in the determination of aggregate real economic activity. However, as Eckstein and Sinai emphasize, much less attention has been given to developing formal models of the business cycle that account explicitly for disintermediation, bankruptcy risk, and considerations of "liquidity."[2] In sections 1.3 and 1.5, Eckstein and Sinai provide a useful and informative description of the evolution of several financial aggregates during the postwar business cycles, giving particular attention to the changes in the composition of the balance sheets of firms, consumers, and financial intermediaries. Both the magnitude and the timing of the changes in these financial aggregates lead the authors to conclude that financial factors were important for shaping the business cycle.

While these sections present clear evidence of a "flow of funds" cycle, a detailed description of the mechanisms by which changes in

1. Some properties of the equilibria of monetary economies have been discussed recently by Townsend 1982, Lucas 1983, and Bewley 1984, among others, under different assumptions about borrowing and insurance markets.

2. Many authors have, of course, argued that these financial factors play an important role in generating cycles. For instance, illiquidity and the bankruptcy of firms was a key feature of Irving Fisher's (1930) theory of the business cycle. These considerations have not, for the most part, been incorporated into recent analytical models of aggregate behavior.

credit variables affect real economic variables is not provided, beyond several informal observations. Throughout their discussion they use such terms as liquidity, credit availability, and insufficient financing, but without providing precise definitions of these terms or giving precise reasons why these conditions obtain. It seems clear, however, that they are implicitly making assumptions about the existence of legal restrictions and transactions costs and about the nature of the contingent claims markets that are excluded from their model. For instance, the authors note that there has been substantial fluctuation in durable goods purchases during the postwar period, but they do not provide a formal description of the mechanisms that produced the fluctuation. Instead, only a brief outline of the "mechanisms" of the business cycle is displayed in table 1.5. Several of these mechanisms seem to refer implicitly to the consequences of incomplete contingent claims markets, but the links between the inability to insure against certain types of risks, illiquidity and bankruptcy, and durable goods purchases over the cycle are not formalized. The imprecision here is unfortunate, since precisely which markets are excluded and which legal restrictions are imposed in an economic model have important implications for how policies affect real economic activity through financial markets and hence for the design and analysis of monetary and fiscal policies.[3]

Furthermore, if liquidity and bankruptcy are as important as Eckstein and Sinai suggest, then different types of consumers and firms may be affected differentially by economic events. Hence a distinction should be made between those who are wealthy and less likely to be affected by a financial crunch and those in the lower and middle income groups who are most likely to be affected. By making this distinction, very different time series properties for consumption and output in the presence of a given monetary and fiscal environment may emerge, compared with the time series properties of a model with representative agents. In particular, individual consumption may be much more volatile and may exhibit quite different patterns of comovements with interest rates than aggregate consumption. Some qualitative evidence about the different time series properties of individual and aggregate consumption in the presence of borrowing constraints is provided by the simulations in Scheinkman and Weiss (1983). Their findings suggest that substantially more insights into the financial factor in the business cycle may be obtained by disaggregating by types of individuals (e.g., constrained and unconstrained) in the presence of restrictions on financial contracting.

3. More generally, the assumptions about informational asymmetries on the part of agents and the nature of the legal restrictions affect the nature of the financial contracts that will be observed. For instance, Townsend 1984 shows that the type of communication technologies available affects the structure of financial markets.

The way expectations are introduced into a model also has important implications for both the magnitude and the cyclicality of the responses of GNP to monetary and real shocks. The role of expectations in the DRI model is described briefly in this paper and more extensively in Brimmer and Sinai (1981) and Eckstein (1983). In light of the evidence that the credit crunch experience has been a systematic element in the postwar business cycle and the general perception that expectations are important determinants of the behavior of financial variables, an evaluation of the expectational assumptions underlying the Eckstein/Sinai analysis seems warranted.

For the most part, Eckstein and Sinai assume that agents form expectations adaptively according to a long distributed lag. The reasons given for choosing this specification seem to represent misconceptions about the properties of dynamic economic models. First, Eckstein and Sinai (appendix 1.2) argue that the assumption of rational expectations implies that anticipated changes in policy have no effect on real variables. This interpretation of the rational expectations assumption is incorrect. The assumption of rational expectations per se has no implications for the effectiveness of systematic policy. Rather, it is the underlying structural model, together with the expectational assumption, that determines whether anticipated policy has real effects. In a monetary model in which markets are incomplete and there are legal restrictions on financial contracting, it seems likely that anticipated monetary policy will have real effects under rational expectations.

Second, they argue that adaptive expectations processes are incorporated into the equations of the financial sector of the DRI model in part because rational expectations requires a "quick adjustment" of the economy to shocks. In fact, the assumption of rational expectations does not restrict the speed by which the economy adjusts to exogenous shocks or how far into the past a rational agent looks when forming expectations about the future. Such properties of a model are determined jointly by the structure of the model and the assumptions about the expectations formation process.

Furthermore, such rigidities as long-term contracts are not incompatible with the assumption of rational expectations. Recent studies of price setting under asymmetric information have shown that wages and prices may appear to be relatively unresponsive to economic events, even though agents have rational expectations conditioned on their own information.[4] An implication of this literature on optimal contracting is that standard pricing formulas derived under symmetric information do not apply. Eckstein and Sinai study labor market relations derived under the assumption of symmetric information among workers and

4. See, for example, Hall and Lilien 1979 and Stiglitz and Weiss 1981.

firms. If long-term contracts are a consequence of imperfect information, then it may be that, by studying a misspecified model, the authors are led to the conclusion that expectations are formed extrapolatively when they are in fact rational.

Before discussing in more detail the specification of the financial sector in the DRI model, it will be helpful to digress briefly and comment on the specification of the consumption sector described in Eckstein (1983). The theory underlying the consumption equation in the DRI model is one in which a representative household maximizes the expected value of a two-period utility function. While not formally deduced from a complete specification of the economy, this relation embodies a key feature of modern consumption theory. Namely, consumption decisions today are affected by the returns on alternative assets and the uncertainty about future consumption opportunities. This risk is captured by the probability of a contingency's arising, and this probability is in turn a function of the current inflation and unemployment rates and the variability of income.

The equations describing interest rates are based on a static theory of portfolio selection, augmented by the introduction of adjustment costs. This formulation virtually ignores the dynamic considerations underlying the specification of the consumption equation. Modern theories of portfolio choice and asset price determination proposed by Merton (1971), Lucas (1978), Breeden (1979), and others have forward looking investors considering all moments of the distributions of the variables in the models.[5] Additionally, Eckstein and Sinai assume that the yields on long-term bonds are determined separately from the yields on short-term securities, as in the model proposed by Feldstein and Eckstein (1970). Their interest rate equation has long rates depending principally on long-term price expectations formed according to an adaptive learning process, and a measure of the policy controlled liquidity of the economy. Sargent (1971) has argued previously that this "mongrel" equation, which represents an attempt to merge Fisher's theory of interest with the liquidity preference theory, is not identified as a structural equation. Thus there is little reason to expect that the parameter estimates for this equation will bear any simple relation to the true parameters of agents' expectations of inflation. Like the short-rate equations, this relation is also not linked in an economically consistent way to the real sectors of the economy.

The motivation for the introduction of adjustment costs is that businesses cannot adapt their balance sheet portfolios fully in response to

5. In practice, it is often assumed that agents have quadratic objective functions and face linear constraints, so that decision rules are linear (e.g., Hansen and Sargent 1980). This is one rationalization for restricting attention to conditional first moments in models with rational expectations.

changing market conditions. The "need" for the introduction of adjustment costs in the financial sector in order to "fit the data" may well be a consequence of the following features of the model. First, the model is based on a static theory. In a dynamic, uncertain environment, the portfolio decisions of consumers and firms will in general depend nonlinearly on the current and past values of variables summarizing market conditions. Agents will typically adjust their portfolios gradually over time as the optimal response to disturbances, even when there are small transaction costs associated with portfolio adjustments.

Second, the equations for the long-term bond rates use yields to maturity as the dependent variables. It is well known that yields obscure the links between nominal interest rates and movements in expected inflation or real interest rates. It is the pure discount bond returns that convey information about the value of money in future periods, not yields to maturity. The latter are a confounding of the discount rates for all periods over the life of the security.

These observations are not intended to suggest that there are no adjustment costs associated with financial transactions. There may be adjustment costs induced, for instance, by such restrictions on financing as those mentioned at the outset of this discussion. However, if such restrictions are present, then the static portfolio theory underlying the analysis in this paper does not hold. The specification of the consumers' optimum problems should explicitly incorporate these restrictions through the specification of the budget constraints.

For the purpose of discussing the role of the financial factor in the business cycle, Eckstein and Sinai take the constructs of a representative consumer and a representative firm as given. They argue that the financial factor manifests itself most strongly during two stages of the business cycle that heretofore were not considered explicitly as part of the NBER business cycle stages: the credit crunch and reliquefication stages. Here again their discussion leaves several important questions unanswered. In particular, the basic issue of what exogenous and endogenous factors induce a credit crunch at the peak of a cycle and the stage of "reliquefication" at the trough is not resolved. In section 1.5.1 it is noted that no single factor is responsible for the onset of a credit crunch, and that a combination of several factors "causes" a crunch. A restrictive monetary policy is clearly an important ingredient in generating a credit crunch. What is not clear is whether it is a necessary ingredient. Will, for example, a crunch emerge whenever certain legal restrictions and borrowing constraints become binding? That is, can this stage of the business cycle be induced by both real and nominal disturbances in the absence of a restrictive monetary policy? Another question raised by this analysis in whether the monetary

authorities could prevent a credit crunch by acting differently in the expansion phase of a business cycle.

The answers to these questions are likely to be model specific, which further underscores the importance of being precise about the structure of financial markets. Of course, institutional and legal restrictions on financial contracting are not easily modeled at a formal level. The implied nonlinearities and inequality restrictions typically preclude closed-form relations for the optimal consumption decisions or asset prices. Similarly, the implications for economic behavior of moral hazard and adverse selection under asymmetric information have to date been analyzed only in the context of fairly simple models. Finally, throughout the postwar period there have been changes in the operating procedures of the Federal Reserve and important revisions in the tax codes, and markets for new financial instruments have been established. Accounting for all of these considerations in models of the business cycle specified at the level of the objective functions of economic agents is currently not feasible. Therefore, large-scale models that introduce explicitly "frictions" in financial markets but have hybrid expectations schemes may provide some insights into the implications of such frictions for the business cycle.

The DRI model represents in part the product of an ambitious attempt at incorporating some of the many institutional and legal restrictions on financial contracting into a macroeconomic model. Unfortunately, no catalog of the restrictions or description of the way they are imposed on the decision rules of agents in the DRI model is provided by Eckstein and Sinai. This omission limits the potential insights about the role of financial markets in the business cycle process that can be obtained from the simulations reported in the final section of the paper.

Turning to the simulations, the effect of removing a particular source of shocks from the model is measure by a "cyclicality index," defined as the normalized absolute deviations in real GNP from a trend growth path. The index was calculated first with all sources of shocks included in the model and then with a particular source of shocks removed. The difference between the two values of the index is a measure of the importance of the omitted source of shocks in the business cycle process. There are, as I am sure the authors realize, numerous problems with such a measure when shocks are removed stepwise as in some of the simulations—most notably, the results will in general not be insensitive to the order in which the shocks are removed. In addition, the results may be sensitive to the measure of the trend growth path for output, so a description of the trend used in the simulations would be useful.

These simulations are also based on the assumption that the residuals in the equations of the DRI model are not correlated with the sources of instability. Errors in asset and commodity demand equations typi-

cally arise for one or more of the following reasons: shocks to utility or production functions (e.g., random elements in tastes), surprises in the behavior of the policy authorities, measurement errors, and shocks that originate externally to the United States. Measurement errors may well be uncorrelated with the other sources of shocks. On the other hand, the remaining shocks may be correlated owing, for example, to various types of automatic stabilizers built into the economic system. Moreover, the errors that appear in the demand equations that constitute the DRI model are themselves complicated functions of all of these "primitive" shocks. Thus, not only will the residual typically be correlated with exogenous shocks, but the signs of these correlations seem difficult to predict a priori. Consequently, I am less sure than Eckstein and Sinai that their presupposition leads to an understatement of the effects of removing sources of instability. For the same reasons, I find it difficult to interpret the results from the first simulation in which the errors in the equations were set to zero, while the shocks to the exogenous variables and the policy variables remained unchanged.

Consider first the simulation of a stable monetary growth. A stable monetary environment was taken to be one in which deposit ceilings were removed, extreme changes in reserve requirements were removed, and open market operations were eased when policy was tight and tightened when policy was easy. As a result, the cyclicality index decreased by 22.2%. The reason given for removing such restrictions as interest rate ceilings and selective credit controls was that simply imposing a smooth growth path for nonborrowed reserves would still leave a highly unstable financial system. But this seems to be one of the key issues that would be interesting to address with the DRI model. That is, by how much does the cyclicality of GNP decrease in the presence of a stable monetary growth path and in the presence of legal restrictions on financial contracts? Although the results from such a simulation would have to be interpreted with caution for the reasons outlined above, they would provide some information about the severity of credit crunches that arise owing to nonmonetary shocks.

Turning to the analysis of oil price shocks, the structure of this simulation presumes (no doubt correctly) that there was a strong response by the monetary authorities to be oil price increases. Thus the simulation amounts to the analysis of the combined effects of removing the oil price increase and holding the path of monetary policy unchanged. Interestingly, the results from this analysis were very similar to those from the simulation in which both the oil price shocks were removed and a stable monetary path (as broadly defined above) was imposed. As Eckstein and Sinai note, this result may be a consequence of a less than complete adjustment of the assumed monetary policy to the different oil price assumptions. Put somewhat differently, since the

monetary authorities respond to exogenous shocks, to analyze the consequences of eliminating a shock it is necessary to alter the structure of the time series on all of the policy variables. Accurate adjustments to the policy variables is in general feasible only when the decision rules of the private agents and policy rules of the governments are solved for simultaneously from the model.

The final simulations reported were designed to examine the effects on postwar business cycles of the flow of funds cycle. Here again no attempt was made to assess the importance of certain "structural" restrictions in financial markets on the cyclical behavior of output. First, the stable money policy considered previously was imposed. Then additional limitations were placed on the endogenous responses of consumers and firms to economic developments. Specifically, in a way not described in the paper, limited fluctuation in loan demand and disintermediation was allowed. Limiting the behavior of endogenous variables in this manner provides little information about the role of the financial sector in economic activity. Experiments designed to determine the importance of different features of the financial sector should involve direct changes in the assumed structure of the financial sector.

In sum, it seems indisputable that a better understanding of how financial arrangements affect economic decisions is critical for a better understanding of business cycles. As in-depth analysis of the implications for economic activity of different contractural arrangements in financial markets will probably require simulating a closed model specified at the level of individual agents objective functions, with the limitations on financing introduced explicitly into the budget constraints. The analysis in section 1.5 of this paper could have provided some information about which limitations on financing are likely to be most important quantitatively. Overall, however, Eckstein and Sinai did not provide enough detail about the structure of the DRI model or conduct sufficiently focused experiments with the model for the potential gains from their analysis to be realized.

## Discussion Summary

Stephen R. King and John M. Veitch

Robert Hall drew attention to the fact that table 1.6 implied that almost no economic variation was attributable to residuals in equations, im-

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The discussion summaries for all the chapters were written by Professor King and Professor Veitch.

plying that the DRI model had been constructed with special factors to dummy out otherwise inexplicable variation in time series. The analysis of the table showed that exogenous shifts to demand for consumer durables were responsible for most cyclical variation. Robert Gordon also drew attention to the overlap between this paper and those by Hall and by Gordon and Veitch. All had noted the increased importance of shocks to consumer demand for durable goods in the postwar period, whereas before the war much of the variation had been in demand for nonresidential structures.

Benjamin Friedman noted that the paper drew an unusual distinction between accommodative and nonaccommodative monetary policies, the former being used to signify a constant nonborrowed reserve aggregate and the latter signifying constant M1. He noted that a more natural use of the term would have led "accommodative" to mean keeping an interest rate constant, while "nonaccommodative" would imply keeping a monetary aggregate fixed. Stanley Black felt that the paper's finding that cycles were due to fluctuations in autonomous spending was reminiscent of Adelman and Adelman's findings (1959). He consequently felt that the benefits of a large model compared with a small one were yet to be demonstrated.

Allen Sinai defended the use of special variables to capture variation in equations that other variables could not account for. He stressed that they were not included in the equations arbitrarily but were meant to capture special events such as automobile strikes whose effects could not be expected to be captured by equations estimated for the entire sample period. Merely treating such events as residuals would not identify why the schedule shifted. He also defended the use of large models over small ones, emphasizing that which one is appropriate depends on the purposes for which they are required.

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