Monetary Policy, Market Prices, and Supply-Side Forecasting

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Introduction

Market prices contain forecasts. In fact, markets cannot avoid forecasting economic variables like growth and inflation in order to arrive at sustainable prices. If the economic forecasts that are embedded in widely available price data can be decoded, much of the paraphernalia of conventional forecasting might be averted. Markets are offering us their own forecasts free of charge. Market prices can serve several roles simultaneously. They are an instrument for forecasting, they are a medium through which government "interventions" can influence the economy, and they are an objective statement about traders' expectations of the future. In this paper, the key market price is the nominal interest rate.

There are good reasons to believe what markets are saying. Markets must be smarter than any single analyst, because they are influenced by all of the information to which traders have access. It should be no surprise to find that they provide the earliest warning of economic events. How to decode them is not so obvious. Which markets are relevent? Which prices should be chosen? What are the mathematics of computing a forecast? Economic theory is of little help in answering such questions, but disciplined empirical investigation may be very fruitful. Many surprises can result.

This paper describes empirical results obtained over the past 10 years or so and suggests a rationale. Relationships are illustrated here as simply as possible, and without resorting to econometric analysis, although they can be supported by more formal statistical tests. Annual data are sufficient to make the most of the main points.

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The evidence outlined in this paper is limited to the U.S. economy since 1950. Exploratory work suggests that the phenomena described may exist in other countries and during other time periods.

My conclusions do not fit into the standard IS–LM framework in any obvious way. Though in some respects counterintuitive, those conclusions are compatible with claims by supply-side economists that economic activity is driven by incentives and disincentives. By "supply-side forecasting," I do not mean forecasting the supply side of the economy. I mean forecasting the economy by means of a model whose interpretation is consistent with what is widely called "supply-side economics."

Supply-siders and their forebears propose a sensitive relationship between output and effective marginal tax rates. Critics sometimes acknowledge a role for incentives in principle. But they are skeptical that, at current tax rates, the linkage is sensitive enough to make a difference. Incentives are harder to discount in a dynamic context. Take consumers, for example. They might insist on spending a set fraction of their income on apparel, liquor, or automobiles. But they are likely to be flexible about where they buy those goods, or when—especially if it affects the taxes they pay or the restrictions they face. Businesses are equally flexible about where, when, and what they sell. Hence, the rivalry of states and localities in attracting business from their neighbors.[1] So even if total output were nearly oblivious to incentives, the allocation of output across geography, among different activities, and across time must surely be sensitive. In this sense, the supply-siders (asserting the power of incentives) and their critics (discounting the effects of tax rates on total economic activity) could both be approximately right.

This paper is concerned with incentives across time. Just as rival fiscal policies help explain variations in growth among geographical domains, so monetary policy helps explain variations in growth among time domains. Fluctuations in real GNP, traditionally identified as the business "cycle," can be viewed as responses to intertemporal incentives. Interest-rate movements associated with the active use of monetary policy appear to be a primary source of these disturbances. The role of monetary policy in stabilizing inflation is a topic outside the scope of this paper. For that purpose, a different set of markets would be relevant for forecasting and policy control—for example, commodity prices. But whether monetary policy is effective in stabilizing inflation or not, this paper will focus on its role in destabilizing the real economy.

[1]For a recent empirical summary, see Genetski and Skorburg (1991).

Economic Activity and the Federal Funds Rate

My starting point is a fresh look at some perfectly commonplace data. The federal funds rate (like other interest rates) is connected empirically with economic activity in a very curious fashion. Changes in the federal funds rate are associated with both contemporaneous and subsequent changes in real GNP and in different directions.

Table 1 ranks calendar years 1956–89 according to changes in the average interest rate. The growth of real GNP is listed for each year, the following year, and the second year following. The years in which the interest rate rose materially are separated from those in which the interest rate fell, and averages for real GNP growth are calculated. Contemporaneously, real GNP moves in the same direction as the interest rate. After a lag of one or two years, however, real GNP moves in the opposite direction enough to more than offset the initial movement. These differences are statistically significant in more formal tests.

The same seesaw pattern shows up in other calculations. Figure 1, for example, plots real GNP growth rates against changes in the interest rate. The left panel shows contemporaneous, or current, variables, while the right panel reveals a one-year time lag between the interest-rate variable and the GNP variable. The dotted lines show the slopes of the least-squares lines, spanning 95 percent confidence intervals around the data. The contemporaneously positive slope contrasts strongly with the negative slope for the lagged relationship.

Early-Warning Forecasts of the Economy

The lead time between a change in the interest rate and the full associated change in real GNP is estimated to be between one and two years. But some components of the economy (such as the housing industry) usually lead GNP, while others (such as nonresidential construction) lag. Table 2 illustrates the time delay by contrasting the behavior of the federal funds rate in advance of the highest and lowest growth years of the 1952–90 period. The average delay from an interest-rate change to the associated (inverse) real GNP change is suggested by the period for which the contrast is greatest. According to this test, that time is 22 months, give or take a month or two.

Since early 1980 a model based on the similar explanatory power of three-month treasury bill rates has produced regular forecasts of the economy. The model is known as the "Conditional Forecaster Technique" (CFT)[2] because its estimates, termed "market forecasts," are conditional on the market prices of Treasury securities.

[2]The model is described in Ranson (1982, pp. 39–70).

TABLE 1

FEDERAL FUNDS RATE MOVEMENTS AND THE ECONOMY, 1956–89

Years Ranked in Descending Order of Change in Federal Funds Rate		Year-Over-Year Real GNP Growth		
Calendar Year	Interest Rate Change (basis points)	Same Year (percent)	Following Year (percent)	Second Year Following (percent)
1973	430	5.2	−0.5	−1.3
1979	326	2.5	−0.2	1.9
1981	302	1.9	−2.5	3.6
1969	255	2.4	−0.3	2.8
1978	239	5.3	2.5	−0.2
1980	216	−0.2	1.9	−2.5
1974	178	−0.5	−1.3	4.9
1959	173	5.8	2.2	2.6
1989	165	2.5	1.0	−1.2
1968	144	4.2	2.4	−0.3
1984	114	6.8	3.3	2.7
1966	104	5.8	2.9	4.2
1956	95	2.1	1.7	−0.8
1988	91	4.5	2.5	1.0
1962	73	5.3	4.1	5.3
1965	58	5.8	5.8	2.9
1963	50	4.1	5.3	5.8
1977	49	4.7	5.3	2.5
1957	38	1.7	−0.8	5.8
1964	32	5.3	5.8	5.8
1960	−8	2.2	2.6	5.3
1987	−15	3.4	4.5	2.5
1972	−23	5.0	5.2	−0.5
1976	−78	4.9	4.7	5.3
1967	−89	2.9	4.2	2.4
1970	−103	−0.3	2.8	5.0
1961	−127	2.6	5.3	4.1
1986	−130	2.7	3.4	4.5
1958	−154	−0.8	5.8	2.2
1985	−212	3.3	2.7	3.4
1971	−252	2.8	5.0	5.2
1983	−317	3.6	6.8	3.3

TABLE 1 (cont.)

FEDERAL FUNDS RATE MOVEMENTS AND THE ECONOMY, 1956–89

Years Ranked in Descending Order of Change in Federal Funds Rate		Year-Over-Year Real GNP Growth		
Calendar Year	Interest Rate Change (basis points)	Same Year (percent)	Following Year (percent)	Second Year Following (percent)
1982	−412	−2.5	3.6	6.8
1975	−468	−1.3	4.9	4.7
Averages for				
12 years that interest rate rose more than 100 basis points	220	3.5	1.0	1.6
9 years that interest rate fell more than 100 basis points	−242	1.1	4.5	4.4

It relies on futures prices to provide the market's own expectations of future spot prices.

These interest-rate linkages capture a large part of the post–World War II fluctuations in real GNP that we call the business cycle. Figure 2 back-tests the power of the CFT to explain changes in real GNP growth over the postwar period. More than two-thirds of the year-to-year variation is picked up by the model. The CFT has also been able to forecast hundreds of GNP components and other economic variables that change as the business cycle runs its course. These forecasts, obtained from interest rate data alone, have succeeded in anticipating most of the economy's turning points during the 1980s.

The upper panel of Figure 3 compares the growth rate of real GNP with the market forecast published from the CFT in the middle of the previous year. The model erred in 1986–87[3] but tracked the economy surprisingly well otherwise, taking into account the large

[3]These errors are also visible in Figure 2, which reveals an suggestive symmetry between underestimation of growth in 1985 and overestimation in 1986–87.

FIGURE 1

INTEREST RATES AND THE ECONOMY: A SEESAW RELATIONSHIP

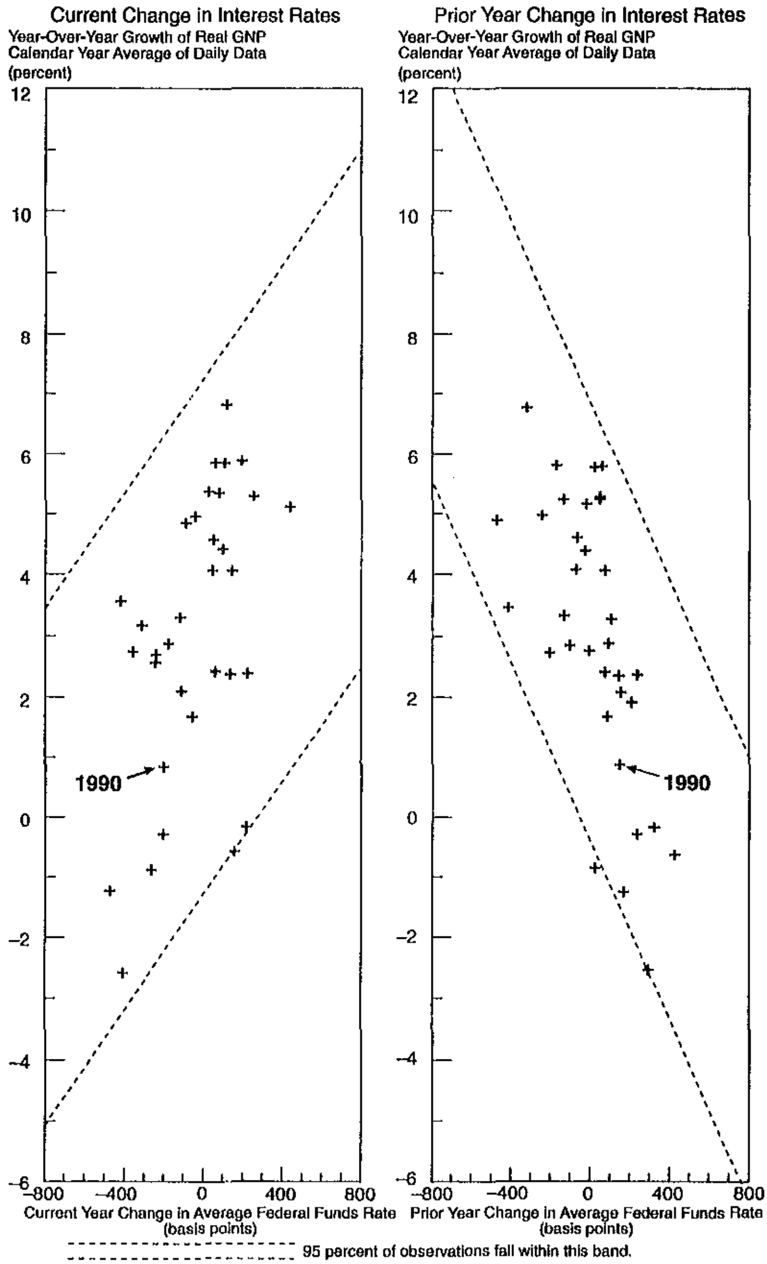


TABLE 2

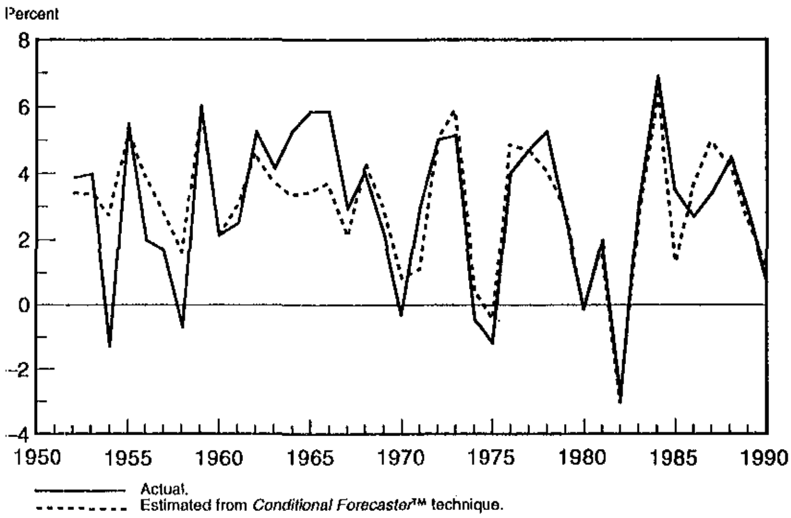
HOW EARLY THE FEDERAL FUNDS RATE MOVES IN ADVANCE OF GNP, 1952–90

		Fastest 13 Years of Real GNP Growth[a]	Slowest 13 Years of Real GNP Growth[b]	
Average Year-Over-Year Change in Real GNP (percent):		5.4	0.3	
Lead Time (months)	End of Month	Average Annual Change in the Federal Funds Rate[c]		Difference (percentage pts.)
0	June	1.0	−1.2	+2.2
2	April	0.9	−1.1	+2.1
4	February	0.9	−0.9	+1.8
6	prior December	0.7	−0.7	+1.5
8	prior October	0.5	0.1	+0.5
10	prior August	0.4	0.5	−0.1
12	prior June	0.1	0.8	−0.7
14	prior April	−0.2	1.1	−1.3
16	prior February	−0.5	1.3	−1.8
18	December 2 years prior	−0.7	1.4	−2.2
20	October 2 years prior	−0.8	1.5	−2.3
22	August 2 years prior	−1.0	1.3	−2.4
24	June 2 years prior	−1.0	1.1	−2.1
26	April 2 years prior	−.9	0.9	−1.8
28	February 2 years prior	−.7	0.8	−1.5

[a]The fastest growth occurred in 1984, 1959, 1965, 1966, 1955, 1964, 1962, 1978, 1973, 1972, 1976, 1977, and 1978.
[b]The slowest growth occurred in 1969, 1960, 1956, 1981, 1957, 1990, 1980, 1970, 1974, 1958, 1975, 1954, and 1982.
[c]The Fed funds rate is *both* a leading indicator and a coincident indicator of real GNP. With a lead time of 1.5 to 2 years, changes in the Fed funds rate anticipate movements in GNP in the opposite direction. Simultaneously, however, Fed funds rates track movements in GNP in the same direction.

FIGURE 2

HOW INTEREST RATES TRACK REAL GNP



number of explanatory variables it omits. The lower panel repeats this exercise using the consensus forecasts published at the same time by *Blue Chip Economic Indicators*.[4]

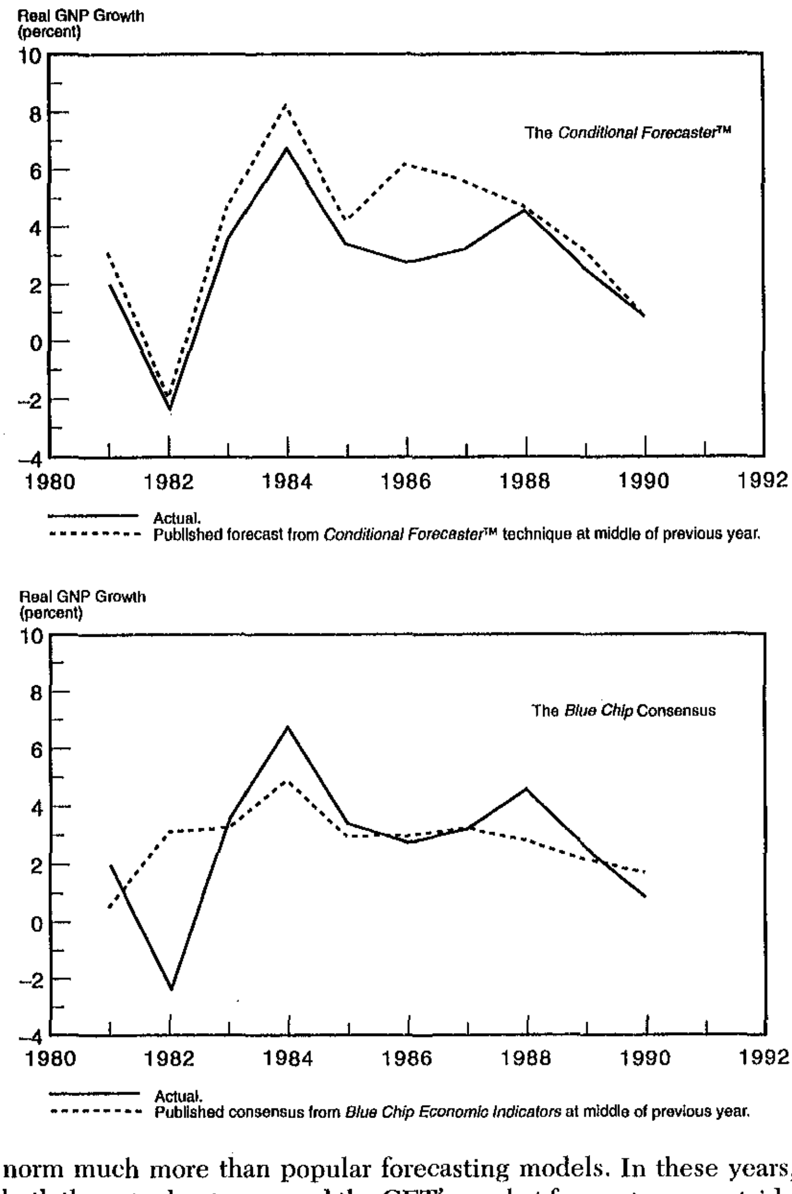
The graphs reveal a defect of the CFT in its original form. Over the 1980s the market forecasts were consistently optimistic by about .4 percent. The model from which these forecasts were derived allowed for no change in the relationship between the variables over the whole 1950–90 period. However, it appears that the secular growth rate of the economy has declined somewhat since the 1950s. Statistical tests confirm a downward shift, probably around the end of the 1960s, which is just significant at the 95 percent level of confidence. The CFT has now been modified to reflect this finding. In other respects, however, the relationship between interest rate movements and real GNP growth appears to be statistically stable from the 1950s through the 1980s.

The model is most effectively tested under unusual conditions. For the years in which economic growth departed furthest from the norm of about 3 percent growth, forecasts from the CFT have notably outperformed conventional forecasting models monitored by the Blue Chip survey. Table 3 illustrates the range of opinion at the midpoint of each prior year. The CFT tended to diverge from the

[4]Published monthly by Eggert Economic Enterprises, Sedona, Arizona.

FIGURE 3

FORECAST TRACK RECORD IN REAL TIME



norm much more than popular forecasting models. In these years, both the actual outcome and the CFT's market forecast were outside the range of opinion covered by Blue Chip. Table 4 suggests that "market forecasts" from the CFT were directionally correct as early

TABLE 3

FOUR TURNING POINTS OF THE 1980s[a]: FORECASTERS' ESTIMATES AT THE MIDDLE OF THE PREVIOUS YEAR

	1982 (percent)	1984 (percent)	1988 (percent)	1990 (percent)
Actual real GNP growth	−2.5	6.8	4.5	1.0
Forecasts				
Blue Chip average, high 10 forecasts	4.2	6.1	4.0	2.6
Blue Chip consensus	3.2	4.9	2.8	1.5
Blue Chip average, low 10 forecasts	2.1	3.9	1.3	1.0
Wharton Econometric Forecasting Associates	3.0	5.4	3.0	2.4
Chase Econometrics	3.4	4.6		
University of Michigan	NA[b]	6.2	2.4	1.6
Data Resources	3.1	4.6	2.5	1.2
Wainwright Economics market forecast[c]	−2.1	8.4	4.7	0.9

[a]Calendar years whose growth diverged most from the 3 percent norm.
[b]NA = Not available.
[c]Wainwright Economics' market forecast tended to diverge from the norm of 3 percent growth much more than popular forecasting models. In these years, both the actual outcome and the market forecast were virtually off the scale of the Blue Chip survey of 40 or 50 forecasters.

TABLE 4

EARLY WARNING FORECASTS FOR THE FOUR MAJOR TURNING POINTS OF THE 1980s[a]

	1982 (percent)	1984 (percent)	1988 (percent)	1990 (percent)
Actual real GNP growth	−2.5	6.8	4.5	1.0
Blue Chip consensus published on				
January 10 of target year	0.3	5.3	2.2	1.7
October 10 of prior year	2.2	5.1	2.8	1.8
July 10 of prior year	3.2	4.9	2.8	1.5
March 10 of prior year	3.7	4.6	3.3	1.7
October 10, 2 years prior	NA[b]	4.0	3.3	1.7
Wainwright Economics market forecast published during				
October of prior year	−2.0	8.2	5.1	0.8
July of prior year	−2.1	8.4	4.7	0.9
April of prior year	1.4	8.1	4.4	0.2
January of prior year	1.2	9.3	5.0	1.4
October 2 years prior	1.7	6.2	5.3	2.1

[a]Calendar years whose growth diverged most from the 3 percent norm.
[b]NA = Not available.

NOTE: Market forecasts that were based on interest-rate data gave a strong signal, and were directionally correct as early as 2 years in advance. The Blue Chip consensus underpredicted the magnitude of the turning points until very late.

as two years in advance. In contrast, the Blue Chip consensus underpredicted the magnitude of the turning points until very late.

Money Supply, Interest Rates, and the Yield Curve

Though it relies on monetary data, the CFT is not a monetarist model, and the quantity of money plays no role in it. This omission need not imply disbelief in the role of the monetary aggregates in the economy. Reliance on interest-rate data simply reflects the notion that prices provide better and earlier information than quantities. Indeed, interest-rate movements precede changes in the money supply by a substantial lead time and not vice versa.

Figure 4 illustrates this point by repeating the exercise in the right panel of Figure 1 while using the growth rate of real M1 instead of real GNP (left panel). An inverse relationship is unmistakable. The right panel of Figure 4 reverses the timing, showing the link between money supply changes and changes in the interest rate one year later: a less impressive relationship. Formal statistical tests confirm that the first relationship is statistically significant, and the second is not. This finding does not contradict the view that the monetary aggregates are legitimate leading indicators of the business cycle. But it does show that interest-rate movements provide similar information sooner. Moreover, when changes in real M1 are added to an equation that relies on interest-rate movements to explain real growth, they are not statistically significant. It seems that their value as leading indicators is co-opted by interest-rate movements that have already occurred.

Although operationally different from monetarist models, the model outlined here is sympathetic to monetarism. It emphasizes rational behavior in free markets and endorses the monetarist warning against fine-tuning. On the other hand, it points to price rules rather than quantity rules in the conduct of monetary policy.

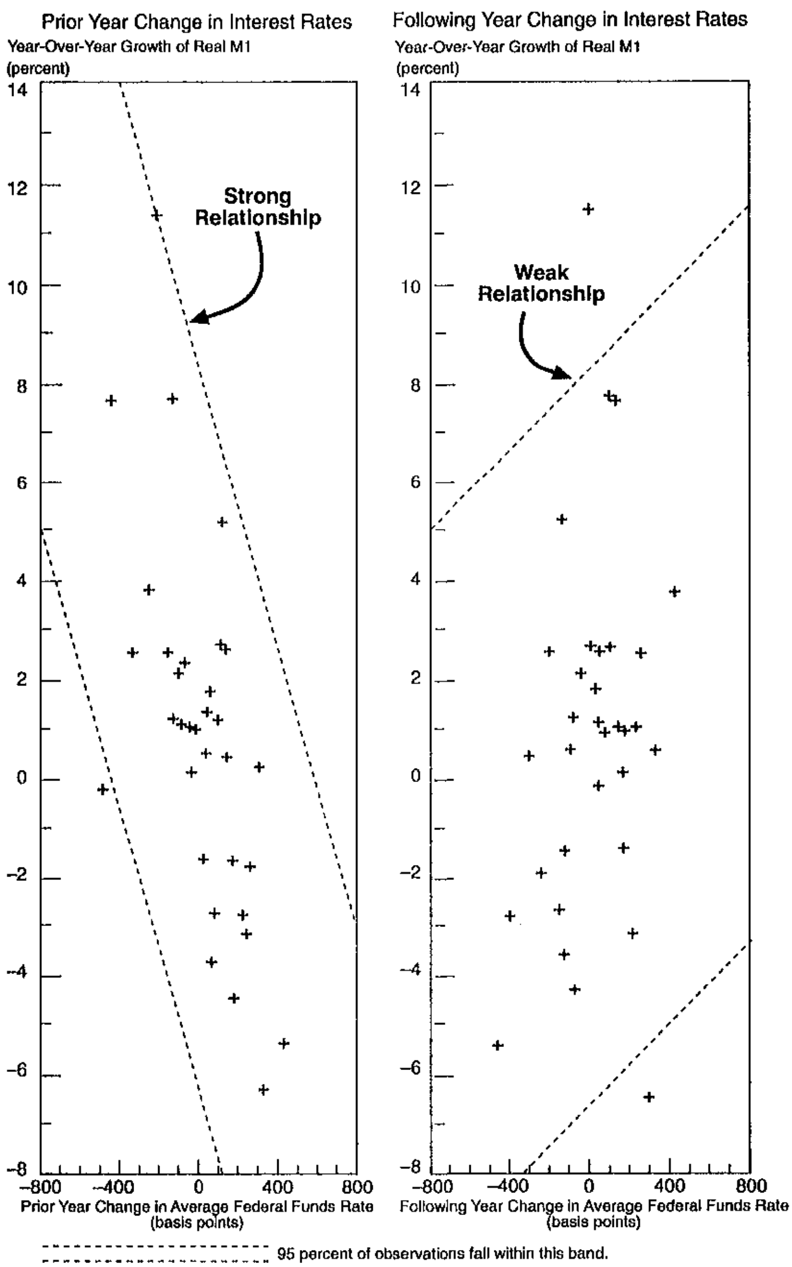
This model is not a vehicle for the widely known forecasting power of the yield curve. The yield spread between treasury bonds and the federal funds rate anticipates the growth of the economy about two quarters ahead[5], whereas the delay between changes in the funds rate and economic growth averages over a year.

Over the past 10 years, many other economic variables have been tested as candidates for inclusion in the model—for example, changes in equity prices, in oil prices, and in the stock of debt. Very few, if any, of these have boosted the explanatory power of interest-rate movements alone.

[5]For recent work, see Laurent (1990).

FIGURE 4

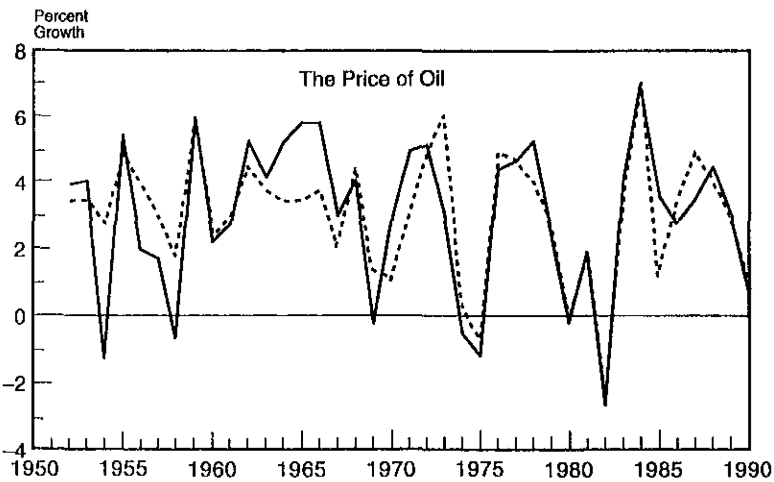
INTEREST RATES AND THE REAL MONEY SUPPLY: WHICH LEADS AND WHICH LAGS?



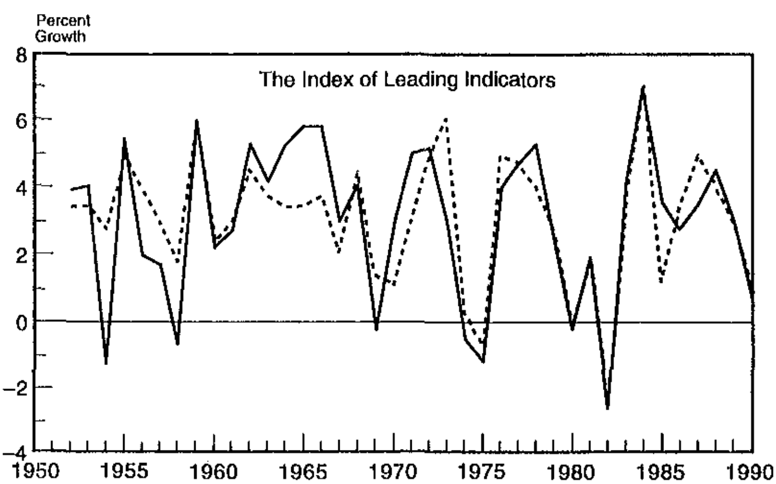
The first panel of Figure 5 shows the effect of incorporating annual changes in the price of oil within the CFT equation expressed in Table 2. The second panel uses instead the lagged change in the index of leading indicators. In neither case is a major

FIGURE 5

TWO ADDITIONAL VARIABLES OF MARGINAL SIGNIFICANCE



——— Actual.
- - - - - Estimated from past and current interest rates together with oil price changes 1 and 2 years earlier.



——— Actual.
- - - - - Estimated from past and current interest rates together with the prior year change in the index of leading indicators.

improvement in the fit perceptible to the unaided eye. More formal tests show each of these plausible predictors of real GNP to be statistically insignificant in the presence of the interest-rate variables.

Leading indicators such as the money supply growth, the yield curve slope, and inventory changes bear a one-way relationship with subsequent movements in the economy. But interest rates are different. Each change in the interest rate is associated with two changes in the economy: one roughly immediate and the other long delayed. Thus, interest-rate movements are not a conventional leading indicator. The interpretation suggested here is that interest-rate changes cause GNP to migrate from one time period to another. A fall in the interest rate causes GNP to be postponed—to migrate from the present into the future. Symmetrically, a rise in the interest rate causes part of future GNP to be brought forward into the present.

Table 5 provides evidence of such migration during the 1970–90 period. It compares what happened to real GNP two years after it grew rapidly with what happened two years after it declined or grew slowly. The inverse correlation is clear and is statistically significant as well. An inverse relationship is also detectable over the 1950–70 period, but annual data do not provide a statistically significant correlation over this longer period.

Figure 6 further illustrates the power of this mechanism to explain cyclical fluctuations in the economy during the 1970s and 1980s. The chart compares the actual history of real GNP growth with the following simple least-squares formula that fits the data quite well:

$$\begin{matrix}\text{real}\\ \text{GNP}\\ \text{growth}\end{matrix} = 5.3\% \text{ minus } 0.5 \begin{pmatrix}\text{real growth}\\ \text{2 years}\\ \text{ago}\end{pmatrix} \text{ minus } 0.5 \begin{pmatrix}\text{real growth}\\ \text{2 years}\\ \text{ahead}\end{pmatrix}$$

Both explanatory variables are statistically significant at well past the 95 percent level of confidence. The formula implies that real growth would have been substantially more stable if migration among time periods were eliminated.

The idea of GNP migration over time casts an unfamiliar and non-intuitive light on current debate over monetary policy. An interest-rate reduction may be of no help to the economy—either in the long run or the short. Far from hastening recovery from recession, a further sharp reduction in nominal interest rates would postpone it by further stimulating the emigration of current GNP into the future. If the migration view is correct, the route to the earliest possible recovery would be restoration of interest-rate stability.

TABLE 5

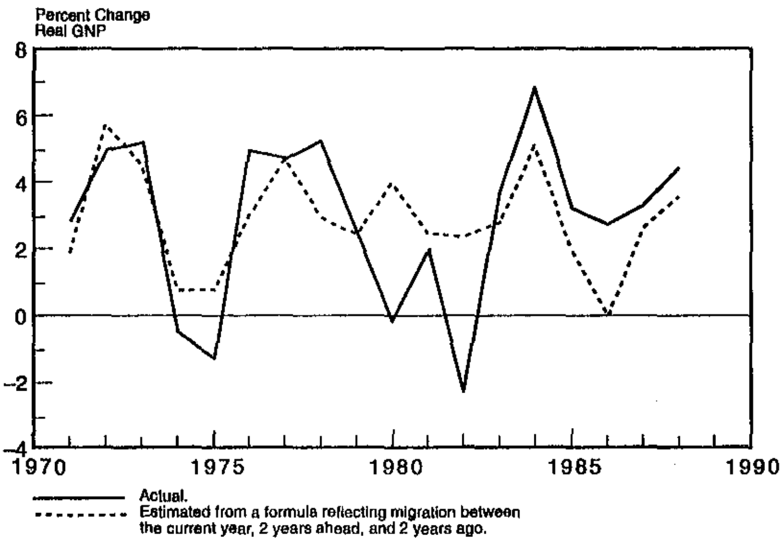
REAL GNP GROWTH IN THE PRESENT AND THE FUTURE: AN INVERSE CORRELATION

Year	Growth in Annual Real GNP: Same Year (percent)	Growth in Annual Real GNP: 2 Years Earlier (percent)
1984	6.8	−2.5
1978	5.3	4.9
1973	5.2	2.8
1972	5.0	−0.3
1976	4.9	−0.5
1977	4.7	−1.3
1988	4.5	2.7
1983	3.6	1.9
1987	3.4	3.3
1985	3.3	3.6
1971	2.8	2.4
1986	2.7	6.8
1989	2.5	3.4
1979	2.5	4.7
1981	1.9	2.5
1990	0.9	4.5
1980	−0.2	5.3
1970	−0.3	4.2
1974	−0.5	5.0
1975	−1.3	5.2
1982	−2.5	−0.2
Medians for		
7 high growth years	5.0	−0.3
7 average growth years	2.8	3.4
7 low growth years	−0.3	4.5

Table 6 provides further evidence on this point. Sudden movements in interest rates coincide closely in timing with sudden movements in real GNP, and in the same direction. On 13 occasions since data collection began in 1955, the federal funds rate has dropped more than 100 basis points from one quarter to another. During those same quarters, real GNP fell at a median annual rate of more than 3 percent. As always, statistical results cannot show causation, but can only suggest it. It is impossible to be sure to what extent this correlation reflects the response of the Fed to the economy, and to

FIGURE 6

EVIDENCE FOR MIGRATION: ITS CONTRIBUTION TO THE CYCLICAL BEHAVIOR OF REAL GNP 1971–88



what extent it reflects the response of the economy to the Fed. Both factors may be at work.

How such incentive effects on the real economy might be accomplished by changes in nominal interest rates is at first puzzling. Understanding the puzzle demands a different way of interpreting an interest-rate change. But if the interest rate is viewed as a statement by the market about expectations of the future, these statistical results begin to make sense, as explained next.

A General View of Migrating GNP

The view of the economy emerging from these observations is the opposite of the old view that the private sector is inherently unstable. Instead, we should entertain the polar opposite: (a) that, abstracting from secular growth, aggregate real GNP is stable in undisturbed free markets, and (b) that monetary policy introduces much of the instability that is observed.

Economic activity is always free to migrate. In one way or another, GNP votes with its feet. Like capital and population, it migrates from unfavorable to favorable climates. As a result, we observe more GNP than expected in one circumstance and less than expected in

TABLE 6

THE SHARPEST DECLINES IN FEDERAL FUNDS RATE: WHAT HAPPENED TO THE ECONOMY?

	Quarter-Over-Quarter Change in	
Quarter	Fed Funds Rate (basis points)	Real GNP (SAAR)[a] (percent)
1981 IV	−399	−5.5
1982 III	−351	−3.2
1975 I	−304	−7.6
1980 III	−285	0.3
1974 IV	−274	−3.5
1980 II	−236	−9.1
1984 IV	−212	1.7
1982 IV	−172	0.6
1971 I	−171	11.2[b]
1958 I	−137	−7.9
1972 I	−121	9.1
1970 III	−118	5.0[b]
1970 IV	−114	−3.6[b]
Medians	−212	−3.2

[a]SAAR = Seasonally adjusted annual rate.
[b]GNP may have been distorted during these quarters by a General Motors strike that occurred during the fourth quarter 1970.
NOTE: Included are all quarters in which the quarter-average federal funds rate dropped by more than 100 basis points.

another. Thanks to escape through migration, the effects of government policies may often be undesired and destabilizing.

Economic stability can be disturbed in at least four distinct ways. As incentives change, economic activity migrates between (1) the legal economy and the underground economy; (2) one country, region, or locality and another; (3) one industry, industrial segment, or class of institution and another; and (4) one time period and another.

First, consider a closed economy whose government imposes such severe taxes or restrictions on the use of private property that legitimate economic activity is unattractive to the population. In that case, much of GNP migrates underground. Those activities that continue in the legitimate sphere will tend to be the ones on which the government is least able or inclined to enforce its hostile policies.

Second, GNP can also migrate from one place to another among countries or within the same nation state, reflecting the tax or regulatory postures of different local jurisdictions. Hence, the celebrated migration of economic activity from Massachusetts to New Hampshire or elsewhere when tax burdens rise in Massachusetts.

Third, GNP can migrate among industries, among sectors within industries, or among classes of institution, depending on the specific policies government adopts toward them. The banking industry serves as a topical example. Traditional commercial banks are succumbing to zealous efforts by the bank examiners to write down their doubtful assets; at the same time, those banks face tighter capital adequacy ratios. One predictable consequence is a loss of market share in the credit industry to other institutions that can readily create credit.[6] In all three of these instances, the operative principle is *substitution*. Each of these various leakages is a form of arbitrage.

Fourth, and less familiarly, GNP can migrate from one time domain to another. Here the motivating force is not exactly arbitrage but a parallel urge to exploit expectations about the future. The ability to recognize this process is hampered by a paradox. For example, the announcement of an increase in tax rates beginning with the next tax year would stimulate economic activity in the present.[7] "The farmer makes hay while the sun shines." Symmetrically, news of a tax cut yet to come enhances the future economy at this year's expense. So good news about the future climate, ironically, can be a temporary depressant to GNP.

Le Chatelier's Principle

Thanks to greater awareness of GNP migration, the power of government to determine the level of economic activity is not as credible as it was a generation or more ago. Economic agents find it second nature to look for escape routes, leakages, or opportunities to substitute whenever they are crimped by government policy.

The basic principle was formalized in the physical sciences more than a century ago by a French chemist, Henry-Louis Le Chatelier (1850–1936). Le Chatelier's principle provides that "When a constraint is applied to a dynamic system in equilibrium, a change takes place within the system, opposing the constraint and tending to

[6]C. J. Lawrence, Morgan Grenfell Inc. has documented a consistent market share loss in the past decades (see Malabre and Clark 1990).

[7]Such a situation occurred in spring 1979 in Britain when Margaret Thatcher's new government announced a July 1 hike in the value-added tax from 8 to 15 percent. This tax window was exploited by an unprecedented surge in spending. In 1991 the experiment was repeated, as the Major government gave a few weeks' warning of a further increase in VAT to 17.5 percent.

restore equilibrium" (Pitt 1977, p. 217). The usual physical illustration is a compressed balloon. When pressure is applied, the shape of the balloon may be distorted in many ways without much reduction of the volume of air inside it.

Especially in the field of money and credit, belief in "government as provider" dies hard. However, it may be a myth that real GNP is brought into existence by "loose" policy and snuffed out by "tight" policy. An ability to create and destroy GNP, like air inside a balloon, is at the heart of the Fed's assumed powers. In recessionary times, the Fed is pressed to get the economy moving again. Over the long haul the Fed is expected to keep the path of GNP stable. Even those keenly alert to the destabilizing effects of Fed policy usually blame its failures on policy mistakes rather than on an automatic response of the economy to defeat the policy. According to this view, monetary policy may be *inherently* destabilizing. That view could help to explain why, in spite of decades of research and practical experience, Fed chairmen still preside over recessions. Perhaps "loose" (low interest rate) and "tight" (high interest rate) policies do not work to create or destroy GNP after all. They may succeed merely in rescheduling it.

The idea of migration casts an unfamiliar and counterintuitive light on the current debate over monetary policy. An interest-rate reduction is not helpful to the economy—either in the long run or even, paradoxically, the short. Far from hastening recovery, a further rapid reduction in nominal interest rates would postpone it by further stimulating the emigration of GNP into the future. If the migration view is correct, the route to the earliest possible recovery would be immediate interest-rate *stability*.

Real Effects from Nominal Interest Rates

Empirically, a change in the nominal interest rate influences real GNP in the same fashion as the announcement of a future tax change. What possible connection exists between the price of credit and expectations of future tax rates? The answer is direct but, perhaps, unfamiliar. At least since Irving Fisher ([1930] 1986, p. 41ff), economists have recognized the nominal interest rate as the market's statement of its expectations regarding the future purchasing power of the dollar. And changes in the purchasing power of the dollar—that is, inflation—imply changes in tax rates.

Supply-side economists have long emphasized this collision between inflation and progressive tax schedules.[8] The fact that

[8]Complaints about the distortive effects of a tax structure designed originally for a no-inflation economy are, of course, much older than supply-side economics. Some of the earliest attention in the literature occurs in Britain, where both inflation and tax

inflation drives the economy into steadily higher tax brackets received some attention from the Reagan administration, but the federal tax authorities have done little as yet to eliminate the problem. Even after the indexation of personal tax brackets to the consumer price index, several features of the tax code remain highly sensitive to inflation. Thanks in part to the capital gains tax and the mandatory use of historic cost accounting, inflation continues to drive businesses and individuals into higher effective tax brackets (Ranson 1982, p. 48ff).

FIGURE 7

WHAT MAKES THE MODEL WORK?

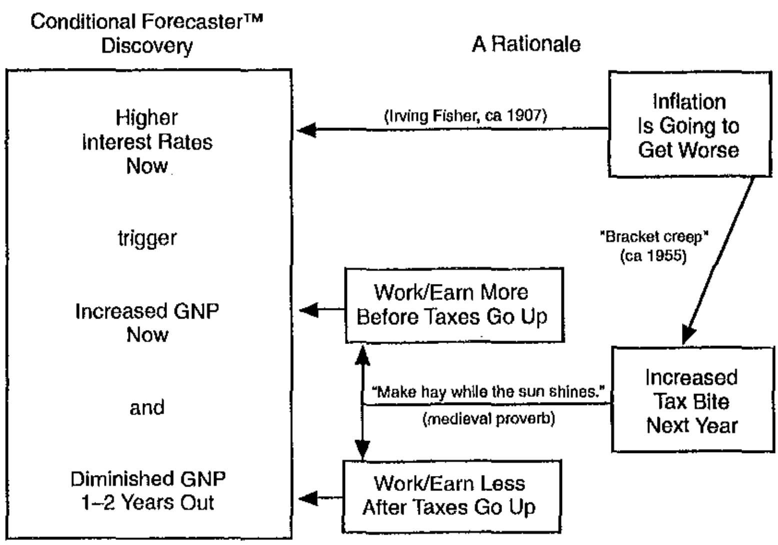


Figure 7 diagrams the theoretical linkages in plain language. Three widely recognized truths are connected in an unfamiliar way to support the conclusion documented in the U.S. postwar evidence outlined above. The three linkages are the following:

1. The market nominal rate of interest reflects the expected rate of decline in the purchasing power of the dollar.
2. The lower the purchasing power of the dollar, the more incomes are overstated for tax purposes—thanks to improperly designed tax formulas.

progressivity were steeper after World War II than in the United States (see Myddelton 1969, pp. 102, 107, 112).

3. A change in expected future tax rates alters the balance of incentives to produce output now or in the future.

Hence, a change in the market rate of interest transfers output from one time period into another.

Conclusion

The short-term interest rate is a fascinating, powerful, and underused predictor of the U.S. economy. Because it is a market price, its lead time is longer than that of other leading indicators. And its relationship to economic activity is unlike theirs. Fluctuations in nominal interest rates trigger a "bouncing" process in the economy, trading off one year's real GNP against GNP in future years. The tradeoff reflects the opportunity to postpone or expedite production. Incentives to bounce are driven by expectations of the rate at which inflation will drive up effective marginal tax brackets.

Since 1980, real-life forecasts based on movements in treasury bill rates have anticipated economic turning points better and earlier than many other approaches. For example, in winter 1989, this model warned of the 1990 recession. However, its logic suggests that strong efforts by the Federal Reserve to push interest rates down will delay the upturn.

This paper has suggested that monetary policy has incentive effects on the economy that have not been widely recognized. Changes in market prices, such as the federal funds rate, produce seesaw movements in the economy:

- Interest-rate movements provide exceptionally early warning of changes in real GNP.
- The relationship is very tight.
- The time lag from the Fed funds rate to real GNP is at least a year.
- It is as if GNP migrates from one time period to another when interest rates change.
- A sharp decline in the Fed funds rate is associated with *more* GNP a year or more from now, but symmetrically *less* in the immediate future.

Intertemporal migration of GNP is an instance of LeChatelier's principle. In the field of political economy, this principle implies that, while the government has enormous power to change the shape of the economy, government can do little to alter the economy's size.

These thoughts shed new and unfamiliar light on old problems. How sharply should the Federal Reserve force interest rates down so as to hasten recovery from recession? The answer would be "Not at all." In the short run, a reduction in interest rates postpones recovery. At the same time, this paper supports an old, familiar conclusion. Monetary fine-tuning is dangerous because it countermands the natural role of free markets in keeping the economy stable.

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Supply-Side Forecasting: Theory and Practice

Robert J. Gordon

Introduction

David Ransom has written two papers. The first paper endorses the short-term nominal interest rate as a "fascinating, powerful, and underused" predictor of output growth in the U.S. economy. The second paper proposes a theoretical supply-side explanation of the forecasting results of the first part, arguing that changes in the interest rate induce intertemporal migration of economic activity. Since the two papers are largely independent, I will discuss them separately.

If the first paper is correct, Ranson's predictive results have profound implications for the forecasting community. There is no need for large models, nor for the hundreds of professional economists in private corporations, in government departments, or at the Federal Reserve. For Ranson's model not only performs better than such comparison groups as the Blue Chip forecasters, but also is so simple that it can be employed without professional help by any chief executive owning a personal computer. His paper might be relabeled to carry the subtitle: "Economic Forecasters' Unemployment Act."

Before turning to the details, let me summarize my evaluation of the two papers. Regarding the first, Ranson's new forecasting tool for the U.S. economy, as presented, is plagued by simultaneity between the contemporaneous changes in the nominal interest rate and real GNP. Variants that either omit the current interest rate term or replace it with an interest rate forecast fit the data much worse. All versions fail miserably in forecasting the weak economy in 1991, a failure that becomes more obvious when quarterly versions of the equations are estimated. This failure is shared by other forecasting

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methods that rely heavily on interest-rate changes or interest-rate spreads, as in the poor performance of the NBER experimental leading indicator developed by James Stock and Mark Watson. These two related forecasting tools, Ranson and Stock-Watson, have failed for the same reason. Summarizing my critique of the second paper, the theoretical interpretation, the proposed mechanism is at best a second-order effect and probably does not exist at all.

Forecasting Real GNP with the Short-term Interest Rate

Much of Ranson's paper advertises the advantages of a forecasting equation relating the change in real GNP to the current and lagged change in the federal funds rate. However this equation is never actually written down in this paper, and I found it only by searching through earlier papers using the same technique. This earlier work, dated 1980, used the treasury bill rate rather than the federal funds rate, so all the results I report here use the treasury bill rate. The basic Ranson (1980) result, which he estimated for 1952–79, is displayed on the first line of Table 1, reestimated with current data through 1991. Indeed, in annual data the current change in the short-term interest rate has a high positive correlation with the current percentage change in real GNP, and the first annual lag has a high negative correlation. However, any econometrician would be disturbed by the inclusion of the current interest rate change in the equation, because the current change must be positively correlated with the error term in the equation, introducing simultaneity. A high realized value of real GNP, for whatever reason, raises the demand for money relative to the supply and raises the interest rate, as long as the Fed is pursuing any policy other than rigid pegging of the short-term interest rate.

These regressions are extremely simple, containing only a constant, a current interest-rate change, and a lagged interest-rate change.[1] One of his three coefficients is illegitimate. It is also useless. Forecasting cannot take advantage of the contemporaneous coefficient, since one cannot predict the change in real GNP for the year 1991 until all the data on the 1991 short-term interest rate are in. It is hardly a triumph to forecast real GNP for 1991 on January 1, 1992! The next line in Table 1 shows that when the contemporaneous interest rate term is dropped, the $\bar{R}^2$ of the equation falls by half, although the coefficient on the lagged interest rate change is quite stable.

[1]My versions also include a constant shift term for the period after 1972, following a suggestion in Ranson's text. This term is never significant at the 5 percent level in any version reported in Tables 1 and 3.

TABLE 1

ANNUAL REGRESSIONS OF PERCENTAGE CHANGE IN REAL GNP ON CURRENT AND LAGGED CHANGE IN NOMINAL TREASURY BILL RATE

	Coefficient on Δi					Forecast Error, Sample Ends 1989		
Time Period	Actual at t	Predicted at t	Actual at t-1	$\overline{R}^2$	S.E.E.	1990	1991	Mean Error
1952–91	0.89**	—	−1.09**	0.62	1.44	0.43	−2.34	−0.95
	—	—	−0.94**	0.32	1.92	−0.45	−4.16	−2.31
1982–91	0.95**	—	−0.74**	0.63	1.59	−0.60	−2.61	−1.60
	—	−0.09	−0.77*	0.20	2.33	−0.60	−3.83	−2.22
	—	—	−0.86*	0.29	2.19	−0.21	−3.71	−1.96

NOTE: All equations also contain a constant term, and those for the 1952–91 sample period include a constant shift term for 1973–91. Statistical significance at the 5 percent level is indicated by * and at 1 percent by **.

The use of the contemporaneous interest-rate term can be salvaged, however, with the use of interest-rate forecasts. Ranson has provided me with his unpublished forecasts of the annual interest rate for 1981–91 made at various dates in advance, and I am using those made in the middle of the previous year—a method that is consistent with Ranson's Figure 3. The bottom section of Table 1 contrasts three different equations covering the maximum sample period for which the predicted interest rate changes are available, 1982–91. Here, the first equation includes the illegitimate current interest-rate term and the second replaces it with the predicted interest rate. The $\overline{R}^2$ with the predicted interest rate drops by two-thirds and is even lower than the third version that uses only the lagged interest-rate term; the coefficient on the current predicted interest-rate change is completely insignificant.

In short, many of the correlations displayed in the paper reflect the positive feedback from GNP to the current interest rate and fall apart when the current interest rate is either omitted or replaced with the predicted interest rate. Also notable is the forecasting failure of every version of the equation in Table 1 for 1991, since every version forecasts robust growth of real GNP in 1991 instead of the very slow growth that actually occurred.

The forecasting errors from three versions of the equations for 1982–91 are shown in Table 2. The first two versions correspond to the first two lines of Table 1 but truncate the sample period at 1981, so that information from the forecasting period is not used in the estimated equation. The final version uses the predicted interest rate and is estimated for 1982–89. The standard deviation of the forecast errors for 1982–89 is similar to that of the Blue Chip forecasters and is almost double that of the Ranson forecasts displayed in the top frame of his Figure 3. Unfortunately, there is no way that the relatively accurate Figure 3 forecasts can be replicated with any equation, using either actual or predicted data for the current rate change.[2]

[2]Reading forecasting errors off Ranson's Figure 3, the 1982–90 standard deviation of the forecast error for the Conditional Forecaster in the top frame is 1.0, the Blue Chip in the bottom frame 2.0, and the three versions of our equations in Table 2 are 1.7, 1.9, and 1.8, respectively. But there is no way to replicate the low forecasting errors of the top frame of Figure 3 with any permutation of these equations. For instance, I tried to take the estimated coefficients for 1952–81 and forecast for 1982–91 by applying the estimated coefficient on the current rate change to data on the predicted (rather than actual) current rate change. This led to huge forecasting errors and the prediction that real GNP growth would be negative in both 1983 and 1984 (because the predicted rate series rises sharply from 1981 to 1982 and peaks in 1983, instead of peaking in 1981 like the actual rate series).

TABLE 2

FORECASTING RECORD, 1982–91, SELECTED ANNUAL EQUATIONS

		Forecast Errors (Actual minus Predicted in %)		
		Sample 1952–81		Sample 1982–89
	Change in Actual Real GNP (%)	Uses Actual Current, Lagged Δi	Uses Only Lagged Δi	Uses Predicted Current, Actual Lagged Δi
1982	−2.6	1.7	−3.1	−2.8
1983	3.5	−1.2	−3.8	−1.1
1984	6.6	0.4	0.7	2.0
1985	3.3	4.2	1.0	2.0
1986	2.7	−0.9	−3.1	−2.0
1987	3.4	−0.9	−1.8	−0.6
1988	4.4	0.9	0.8	1.9
1989	2.5	−0.2	0.1	0.6
1990	1.0	1.1	−0.7	−0.6
1991	−0.8	−1.9	−4.9	−3.8
Std.dev., 1982–89		1.8	2.0	1.9
Std.dev., 1990–91		2.1	2.9	2.3

Any commentator would be mystified at a paper that limits itself to forecasting annual growth rates. There cannot be much of a market for that in the forecasting fraternity, when real GNP is published quarterly, and much hangs on the quarterly announcements of real GNP and its subsequent revisions. Table 3 shows the results of regressions with quarterly data for the full period runing from 1955 to 1990, and three subperiods. A search revealed that up to 9 lags on the interest rate change are necessary, but (omitting the current value to avoid simultaneity) the first is insignificant and is omitted here.

The low $\overline{R}^2$s of these equations are to be expected, since the one-quarter change in real GNP is a very noisy series. The sum of the lagged interest-rate coefficients is highly significant and uniformly larger than the coefficient on the lagged term in the annual equations of Table 1. Interestingly, the subperiod results show that the interest-rate effect declines in size in the later subperiods. These lower coefficients are consistent with the view that financial deregulation has raised the volatility of interest rates relative to the volatility of real GNP (which was unusually low after 1982). The bottom two rows of Table 3 show that the real interest rate performs much worse than the nominal rate, even if allowance is made for the effect on real GNP of supply shocks (which replace the normal negative correlation between the real interest rate and GNP with a positive correlation, as supply shocks drive up inflation and drive down the real interest rate and real GNP).

The abysmal 1990–91 forecasting record of all versions of these equations is evident. Because interest rates fell substantially from 1989 to 1991, the equations predict that real GNP growth would be rapid in 1991. Most versions predict growth in late 1991 and early 1992 at a 5 percent annual rate, instead of the stagnation that actually occurred.

What are the implications of the poor forecasting performance for 1990–91? This failure of real GNP to respond to a steady fall in short-term interest rates since early 1989 tells us that the current episode is not a garden-variety recession caused by tight money. The refusal of the economy to recover has been caused by some combination of the debt overhang from the 1980s together with a credit crunch caused by tighter regulation of bank balance sheets.

Theory

The second paper proposes a "migration model" to explain the seesaw response of real GNP changes to interest-rate changes, with a positive coefficient followed by a negative coefficient of about the same size. Before criticizing this model, let us reconsider the standard mainstream analysis based on the *IS–LM* model.[3] Consider any positive demand shock that moves *IS* to the right, say an increase in spending for the Vietnam War in 1966–68. The economy's equilibrium shifts to the northeast as *IS* slides up *LM*. We observe then the positive contemporaneous correlation between Δi and ΔGNP that Ranson observes, and we can allow for partially accommodating monetary policy as long as the Fed does not peg the interest rate completely.

After a while, however, the correlation shifts. The *LM* curve begins to move to the left, sliding the economy northwest along the *IS* curve. The leftward *LM* shift comes from a falling growth rate of real money, stemming from some combination of monetary tightening in response to the previous expansion, and the direct effect of higher prices in reducing real money. Ever since the early days of the MIT–Penn (MPS) model in the mid-1960s, we have been used to distinguishing three channels of monetary influence on the real economy: (1) the substitution effect as an increase in interest rates reduces the net return to investment activity; (2) the availability effect related to nominal interest-rate ceilings, also known as credit rationing and disintermediation; and (3) the wealth effect of changing stock and bond prices. All three channels contribute to the negative correlation between real GNP changes and lagged interest-rate changes.

As an alternative to this standard view, Ranson posits a convoluted mechanism based on substitution, which is already present in conventional channel (1), but in his version the usual disincentive effect of higher interest rates on investment is ruled out. What he requires is that higher interest rates are a *signal* of increased expected inflation, which in turn makes people *believe* they will be pushed into higher effective tax brackets in the future. His business cycle is based entirely on voluntary substitution between periods in response to expected future changes in effective tax rates. This channel of monetary influence strikes me as a second-order effect, likely to be a sideshow compared with the direct incentive, availability, and wealth effects. One reason we know that it must be a sideshow is that most year-to-year changes in nominal interest rates do not signal changes in future inflation, because most are accompanied by changes in *real* interest rates.

[3]Thus, I reject Ranson's claim that his "conclusions do not fit into the standard IS–LM framework in any obvious way" (Ranson 1992, p. 198).

TABLE 3

QUARTERLY REGRESSIONS OF PERCENTAGE CHANGE IN REAL GNP ON LAGGED CHANGES IN NOMINAL AND REAL TREASURY BILL RATE

Time Period	Sum of Coefficients on Lagged Δi (Lags 2-9)	$\bar{R}^2$	S.E.E.	Forecast Error, Sample Ends 1990:3 1990:4	1991:1	1991:2	1991:3	1991:4	Mean Error
1955:1–1990:3	−1.69**	0.24	3.46	−3.46	−5.54	−3.98	−2.65	−4.32	−3.98
Subperiods									
1955:1–1969:4	−3.73**	0.23	3.32	−4.18	−6.81	−7.33	−7.85	−8.80	−6.99
1970:4–1982:4	−1.89**	0.20	4.22	−3.47	−5.89	−4.63	−3.35	−4.82	−4.43
1983:1–1990:3	−1.27**	0.37	2.03	−3.83	−5.72	−3.19	−1.52	−3.99	−3.65
Real interest rate, full period									
Without supply shocks	−1.40**	0.09	3.80	−4.35	−6.08	−4.00	−2.20	−3.87	−4.10
With supply shocks	−1.16**	0.15	3.67	−5.48	−6.34	−3.17	0.43	−1.63	−3.24

NOTE: All equations also contain a constant term, and those for the entire period and middle subperiod include a constant shift term for 1973–90. The final line enters lags 0–4 of the difference between the quarterly rate of change of the fixed-weight consumption deflator and the rate of change of the same deflator excluding food and energy. Statistical significance at the 5 percent level is indicated by * and at 1 percent by **.

From all this I reach the conclusion that changes in short-term interest rates are normally a useful leading indicator, but not in 1990–91. The huge recent forecasting error means that we are more uncertain than ever about the multipliers of monetary policy and about the right dose of monetary ease needed to generate an economic recovery. To understand why (normally) real GNP changes are negatively correlated with changes in short-term interest rates over the previous nine quarters, we can do no better than to accept the wisdom of the MPS model as set out 25 years ago.

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