[COMMITTEE PRINT]

THE IMPACT OF THE FEDERAL RESERVE SYSTEM'S MONETARY POLICIES ON THE NATION'S ECONOMY

STAFF REPORT OF THE

SUBCOMMITTEE ON DOMESTIC MONETARY POLICY

OF THE

COMMITTEE ON BANKING, CURRENCY AND HOUSING

HOUSE OF REPRESENTATIVES

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LETTER OF TRANSMITTAL

DECEMBER 1, 1976.

Transmitted herewith for use by the Subcommittee on Domestic Monetary Policy, the full Committee, and the Congress is a staff report entitled, "The Impact of the Federal Reserve System's Monetary Policies on the Nation's Economy."

When I became Chairman of the Subcommittee last spring, I asked the staff to determine as precisely as possible the effects that the Federal Reserve's money supply policy has on our economic performance, and to analyze also the parts played by fiscal policy, import prices and other factors. Although this research will be refined and extended in the future, the results which have been obtained to date are sufficiently important to be made public. They provide new validated insights into the determination of yearly inflation rates and yearly changes in our real economic growth. In the next Congress, we intend to add to the understanding which we have now acquired about the inflation process and cycles in real GNP, and to broaden the analysis to cover employment trends. In addition, we plan to investigate credit flows and interest rate trends and patterns. Our aim is to provide background information on the behavior and determination of the variables which are central to the legislative and oversight functions of the full Committee and its several Subcommittees.

Now, let me review the results of our research to date. It was carried out in two phases. Phase one looked at inflation. Phase two studied recessions and expansions in real GNP.

As a first step, the staff graphed post Korean War percentage changes in the Consumer Price Index (CPI) and money supply, contemporaneously and at lags up to 36 months to find the best inflation/money supply relationship. Money supply was measured conventionally by M–1, which consists of publicly held coin, currency and demand or checking deposits. Percentage changes were computed between the same months from one year to the next. This initial research showed that we can track and predict inflation in 12-month periods fairly well just by looking at the percentage change in money supply occurring 23 months earlier in the same 12 months. For example, inflation from June 1975 to June 1976 is predicted fairly closely by the July 1973 to July 1974 percentage change in M–1.

The research was then extended to cover the full post World War II period. Yearly averages were used instead of monthly data and the analysis was broadened to take into account factors other than expansion of money supply which are commonly believed to affect inflation. This completed the first phase of the analysis. Phase two analyzed recessions and yearly percentage changes in real or constant dollar GNP during the 1953–1975 period. The effects of the Federal Reserve's money policies and various other factors, including past inflation, were studied.

The results now in hand explain much (about 90%) of both year to year percentage changes in the CPI in the 1947–1975 period and real GNP in the 1953–1975 period. In summary—

ON INFLATION

• On average, consumer prices rose 1% two years after each yearly increase of 1½% in M–1 money supply. More than 70% of the rise in the CPI that we experienced in the inflationary 1966–1975 decade can be attributed to excessively rapid money growth. But money supply is not all that matters.

• Inflation can be triggered and fueled by velocity increases. A buying spree that started right after North Korea invaded South Korea on June 25, 1950, caused consumers' prices to jump sharply in 1951 over the 1950 average.

Apart from the Korean War years, however, changes in velocity were not a significant inflationary factor in the 1947–1975 period.

• Inflation can be imported from abroad. Increases in import prices contributed substantially to inflation in the 1973–1975 period. The staff estimates that increases in import prices raised U.S. consumer prices by 1½% in 1973, 5% in 1974 and 1% in 1975.

• In 1949, large increases in agricultural and raw material supplies appear to have contributed to the fall in consumer prices. But there is no evidence that special supply factors affected inflation in any other year.

• Nor is there evidence that the state of the economy—whether measured by unemployment rates or changes, or by production trends—affected the inflation process in the period since World War II. The staff explains this as follows. When production rises and unemployment falls, prices tend to rise because markets tighten. However, offsetting this is that increased supplies must compete for the same money supply. This tends to lower prices. Vice versa, in recessions, markets are looser but supplies are down, and the price effects of the two cancel one another.

• On average, Federal Government deficits did not have significant inflationary impact during the post World War II period. Though this finding is certain to be controversial, there is a plausible explanation. Big swings in the deficit are largely induced swings. Thus, the deficit is as much or even more effect as it is cause. Moreover, with a given money supply, financing deficit spending by selling bonds causes private spending to fall roughly in proportion, dollarwise, to the increase in Government spending. Any residual spending effect is too small to be a significant inflationary factor.

The staff also investigated the inflationary impact of the High Employment deficit. It, too, was found not to be significant. A plausible reason is that to the extent the economy is stimulated by High Employment deficits, government revenues rise and the deficit vanishes. This happens very quickly in inflation because of our income tax structure. In other words, High Employment fiscal stimulus erodes before enough time passes for it to generate inflation.

• Finally, and perhaps most important, I want to stress that the evidence which the Subcommittee staff has assembled shows that our economy's pricing system is not explosive. It is stable. On average, since World War II, changes in the rate of inflation one year have carried over to the next year with between ¼ and ½ power. This means that a 4% rise in consumer prices this year would bring further increases in the cost of living of 1%–2% next year and ½%–1% two years from now. After two years, however, no matter how large the initial jump, the momentum dissipates and the subsequent changes in inflation cycle around zero.

The carry-over effect reflects that administered pricing and collective bargaining are importantly influenced by last year's price trends. However, though this influence is significant, it is far less than what it would take to make our economy's pricing system explosive. There is a momentum in inflation, but it is not explosive, cumulative, or even constant. It comes to nothing after two years. Rather, no matter what triggers it and however rapid it becomes, money supply changes are decisive to whether inflation accelerates or is checked and subsides.

Recessions

Both money supply and velocity play important parts in recessions and recoveries. Specifically—

• Slowing money growth sharply for any prolonged period weakens the economy and increases the risk of recession. For a time, however, velocity increases sustain expansions even after money growth slows. But inevitably if money growth is retarded sharply for very long, confidence is undermined, the trend in velocity turns down, and recession follows.

• Once underway, recessions are aggravated by continuing to retard money growth.

• Money supply expansion during and immediately after recession promotes recovery. Recession tends to last as long as the trend in velocity is down. But if money growth is kept commensurate with our production potential, inevitably confidence builds, the velocity trend turns up, and recovery builds.

Real GNP

The staff also quantified how yearly percentage growth of real or constant dollar GNP was affected by contemporaneous changes in money supply, past inflation and other factors as here described during the 1953–1975 period.

It was found that the springboard for this year's real growth performance was built on past inflation performance and unemployment. Specifically

• For each 1% unemployment a year ago, real GNP increased during the 1953–1975 period, on average, by 1.2% in the current year. In other words, in the post Korean War period, there has been a natural tendency for our economy to rebound from recessions.

• A *jump* in the rate of inflation primed small increases in real GNP two and three years later. But the stimulus provided by inflation jumps was minor and dissipated quickly. We can't inflate our way to full employment. To the contrary, the results warn that trying to do so can make things worse. For each 1% rise in the CPI in the current year, on average, real GNP decreased 1% in the next year.

In this connection, the report tested whether real GNP is affected differently by increases in import prices than by increases in domestic prices. The answer is "not significantly." Increases in import prices cause the CPI to rise concurrently, and a year later real growth falls the same as it would following a rise in domestic prices.

• During the period which the staff studied, 1953–1975, both monetary and fiscal policy affected our real growth performance contemporaneously.

(1) For each 1% increase in money supply, real GNP increased on average by .73% the same year. This does not mean, however, that we can increase real growth in any permanent sense by printing money. Because of feedback from money's inflationary effects, the staff found that the rise in real GNP growth, which initially accompanies increased money growth, recedes quickly after three years and doesn't differ significantly from zero after five years.

(2) The High Employment deficit was found to have only a small and marginally significant impact on real GNP. On average, a deficit equal to 1% of potential GNP generated a ½% rise in real GNP the same year. Today, this means $15–$20 billion stimulus is required to raise real growth just ½%

Let me turn now to the question of how well the Subcommittee's results fit actual experience. The answer, as shown by Exhibits 5 and 8, is "very well." Exhibit 5 charts actual year to year inflation rates from 1947 to 1975 and inflation as predicted by the cornerstone statistical equation of our research. Exhibit 8 does the same thing for actual and predicted yearly percentage changes in real GNP. For convenience, Exhibits 5 and 8 are duplicated here. There would appear no need for me to elaborate on what they show.

Only time will tell whether our results will continue to closely track changes in inflation and real GNP. Given the information that we now have about the variables which were used to estimate changes in the CPI and real GNP in the research, the staff points out that it is a 2 to 1 bet that in 1976 the CPI will rise 3.1%–5.5%, and also 2 to 1 that real GNP will increase 3.9–5.7%. Further, in 1977, conditional upon import prices rising only moderately, it is a 2 to 1 bet that inflation will decline further to 2.6%–5.0%. Finally, if 1977's M–1 growth and High Employment deficit repeat 1976's money growth and fiscal policy, real GNP will repeat this year's predicted 3.9%–5.7% growth.

In regard to these predictions, however, let me stress that they assume that the M–1 statistics now published for 1975 and 1976 are correct. A recent Federal Reserve study indicates that M–1 growth may be understated by .6% in 1975 and 2.0% in 1976. To the extent that this is true, the forecasts would have to be revised upwards, as follows: 1977 inflation by .4% and 1976 real GNP growth by 1.5%.

Current Policy Implications

We have two major policy tools for attempting to affect economic performance. One is monetary policy, the other is fiscal policy. The staff report finds that fiscal stimulus does not have significant impact on the course of inflation, perhaps because the stimulus itself dissipates quickly; but does have

a small, marginally significant impact on real GNP, perhaps because in the past we have achieved such stimulus largely by cutting taxes, which spurs both investment and work. Monetary policy, on the other hand, powerfully influences real growth in the short run and inflation in the long run. Given the current need both to check and reduce inflation and to revive and sustain the faltering recovery, what can be done?

• With respect to monetary policy, the report demonstrates that in the context of economic conditions as experienced since World War II, faster money growth generates both increased real GNP growth and accelerated inflation. The good news comes quickly, in the same year as money growth is increased. Inflation accelerates only after a lag. Worse, the rise in inflation causes real GNP to recede; and five years after money growth accelerates, the growth of GNP, for all practical purposes, is back where it started. Worse still, we are left with the problem of reducing inflation. To do it requires reducing money growth, which risks recession.

Thus, although we now need additional stimulus to put new life into the recovery and reduce unemployment, the staff report indicates that there is little point and considerable risk in providing for substantial extra monetary stimulus. In this regard, I recognize that many people argue that our capacity to produce is so underutilized that we needn't fear that faster money growth will lead to higher inflation. They advise more rapid money growth on the ground that, at the present time, only good news would come from stepping up money growth. I can't agree. There are awesome bottlenecks which warn against following such advice. We have no spare capacity in food, in energy, or in medical care to cite three important sectors where increased money growth surely would cause higher prices.

Fortunately, the evidence which staff has assembled indicates that we can fight inflation and unemployment at the same time. It shows that for each 1% drop in the rate of inflation, we can achieve now, we can expect, on average, a 1% rise in the rate of real GNP growth next year. Thus, bringing inflation down will increase production and employment and reduce unemployment. In fact, initially a 1% drop in the rate of inflation has a larger effect on output and employment than a 1% rise in M–1 growth. Thus, there is no need to choose rapid money growth; moderate growth will achieve a better economic performance all around.

Specifically, the report recommends 4%–6% M–1 growth at the present time—or about the same as the Federal Reserve currently plans to provide, i.e., 4½%–6½% between the summer of 1976 and the summer of 1977. Together with further deceleration of inflation, this policy will provide the foundation for sustained economic expansion.

• Finally, the staff report recommends $15–$20 billion of new fiscal stimulus to give the economy a small, extra push now. This recommendation is made in recognition that the recovery has slowed down and, however firm the underlying monetary foundation is for sustaining expansion while reducing inflation, economic growth now needs a bit of a prod. In recommending fiscal stimulus, the staff report points out that such stimulus dissipates quickly and, therefore, is not likely to be inflationary. The report does not choose between tax cuts and additional spending. It points out, however, that tax cuts can stimulate production by providing new incentives to work and investment. At the same time, the staff emphasizes that structural labor market problems, which have been growing for years and persist even during vigorous expansions, cannot be solved by tax cuts. They require judicious spending programs to upgrade the skills of the hard-core unemployed.

The report was prepared by Robert Weintraub, Staff Director, with the assistance of Linda Lord and Carl Mintz.

STEPHEN L. NEAL, *Chairman, Subcommittee on Domestic Monetary Policy.*

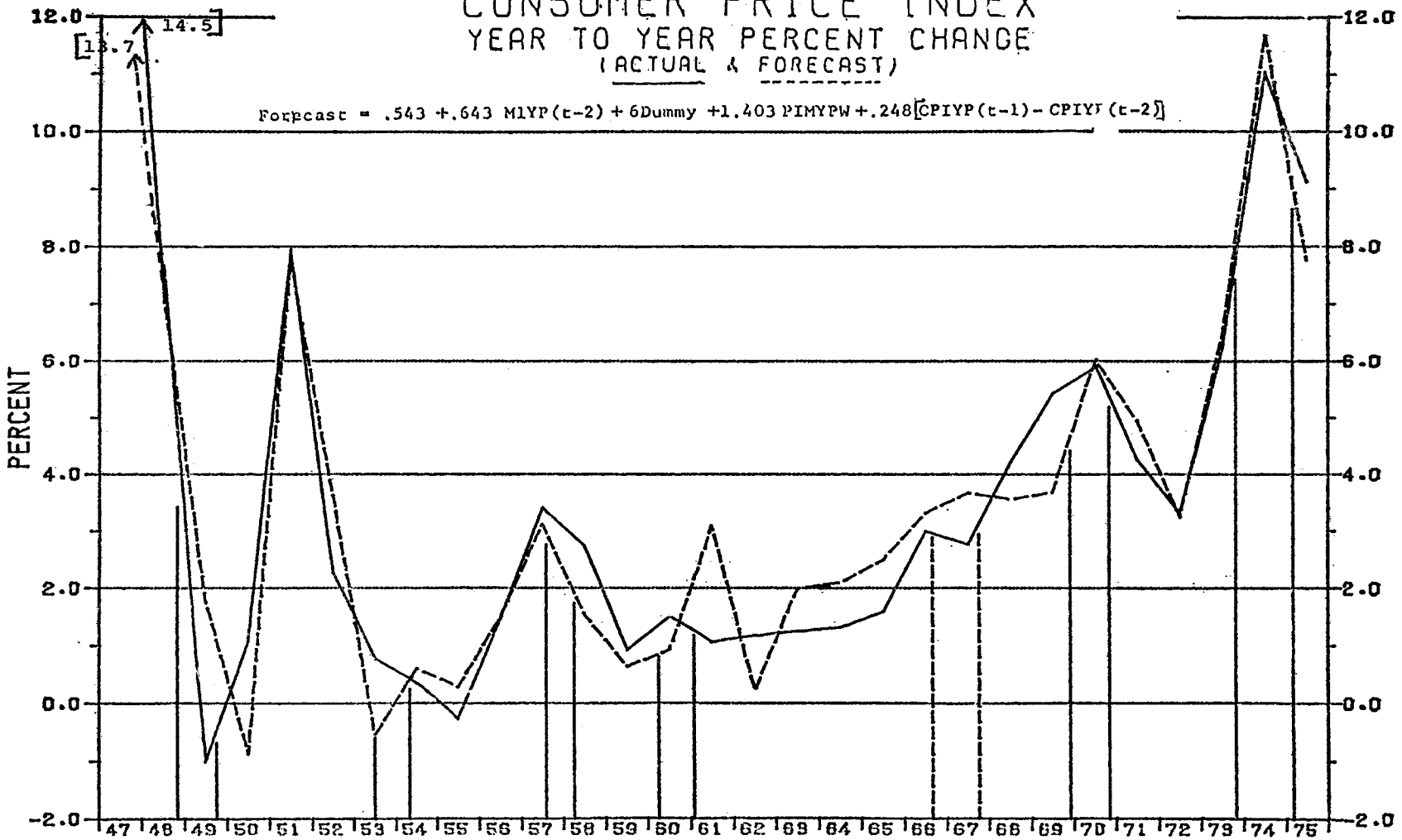
EXHIBIT 5

CONSUMER PRICE INDEX

YEAR TO YEAR PERCENT CHANGE

(ACTUAL & FORECAST)

Forecast = .543 +.643 M1YP(t-2) + 6Dummy +1.403 PIMYPW +.248[CPIYP(t-1) - CPIYP(t-2)]

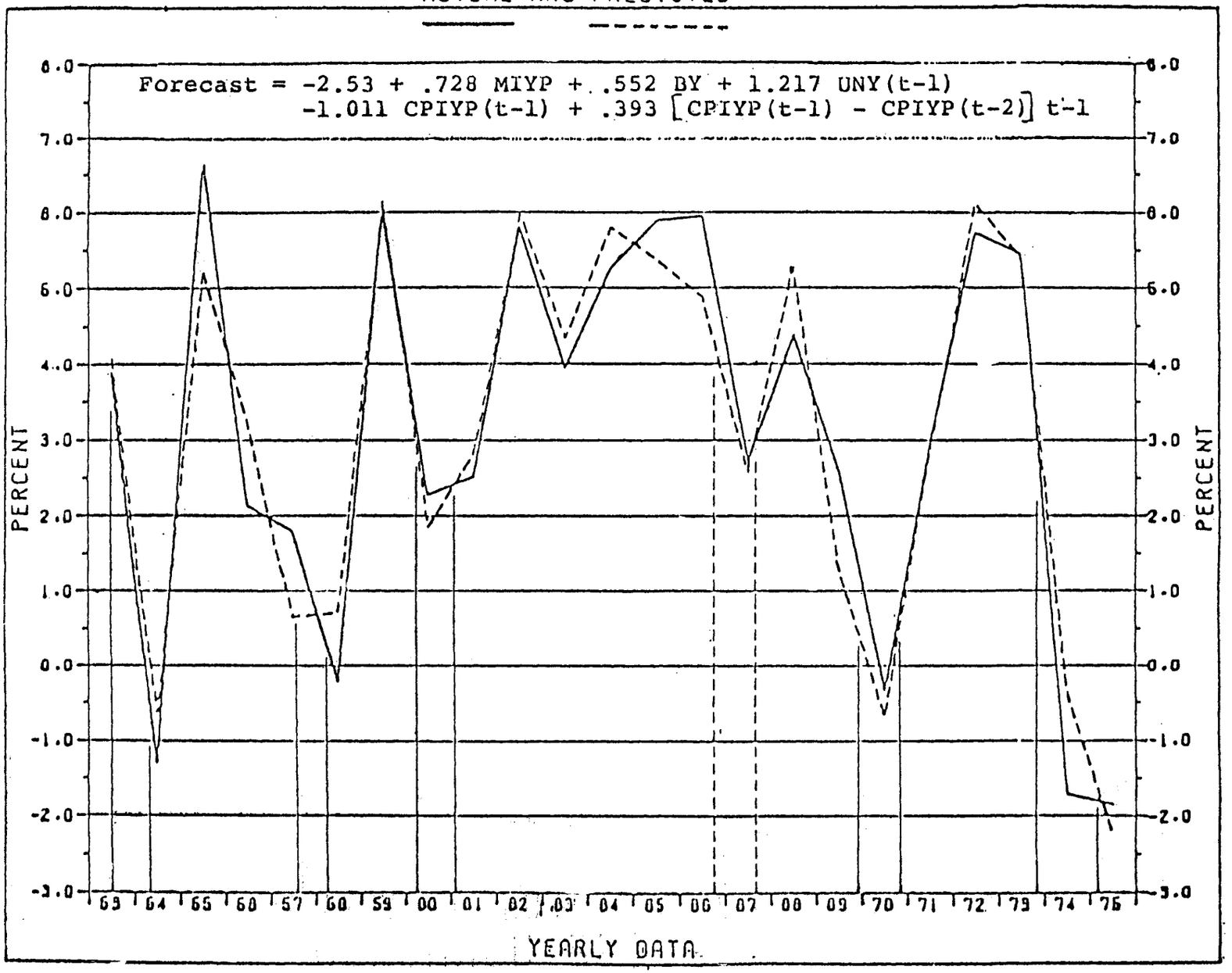


Lines from the time axis delineate recession periods.

VII

EXHIBIT 8

GROSS NATIONAL PRODUCT (IN CONSTANT $)
PERCENT CHANGE YEAR TO YEAR
ACTUAL AND PREDICTED



Lines from the time axis delineate recession periods.

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In March 1975, the Congress passed House Concurrent Resolution 133. Under the Resolution, the Federal Reserve discloses money growth rate targets for the next year. These estimates are updated quarterly at hearings before the House and Senate Banking Committees. The Resolution further expresses the Sense of Congress that the Fed maintain long-run money growth—"commensurate with the economy's long-run potential to increase production, so as to promote effectively maximum employment, stable prices and moderate long-term interest rates."

This report is intended to provide the full Committee, the Congress and the public with information and analysis of the Fed's money policies, thereby, permitting better oversight and greater accountability of these critical operations.

Background and Summary

Measured by the twin goals of full employment and stable prices, our economy has been far healthier since World War II than before it. But from 1973 to 1975, we slipped significantly.

In 1973, the cost of living, measured by the average of the consumers' price index (CPI) for the entire year, rose 6.23% from the 1972 average. The rise was 11.04% in 1974 and 9.13% in 1975. Unemployment followed, though not in lock-step. Unemployment averaged 4.85% in 1973, 5.62% in 1974 and 8.48% last year.

Compared to earlier post World War II years, that record is abysmal. With respect to inflation, the yearly CPI rose more than 6% only in the immediate post-war years, 1946–1948, and in 1951 immediately after the Korean War began. Unemployment never averaged more than 7% until 1975. The complete record is set forth in Table 1.

TABLE 1.—UNEMPLOYMENT RATES AND CHANGES IN THE CONSUMERS' PRICE INDEX (CPI), ANNUAL OBSERVATIONS, 1947–75

Year	CPI percent changes	Unemployment	Year	CPI percent changes	Unemployment
1947	14.47	3 90	1962	1.17	5.57
1948	7.67	3.75	1963	1.25	5.64
1949	—.99	6.05	1964	1.32	5.16
1950	1.06	5.21	1965	1.59	4.51
1951	7.94	3.28	1966	2.99	3.79
1952	2.28	3.03	1967	2.78	3.84
1953	.77	2.93	1968	4.21	3.56
1954	—.35	5.59	1969	5.42	3.49
1955	—.26	4.37	1970	5.90	4.98
1956	1.47	4.13	1971	4.26	5.95
1957	3.40	4.30	1972	3.31	5.60
1958	2.73	6.84	1973	6.22	4.85
1959	.92	5.45	1974	11.04	5.62
1960	1.51	5.54	1975	9.13	8.48
1961	1.07	6.69			

So far in 1976, there has been improvement. Unemployment has dropped below 8%. The per annum rise in the cost of living has decelerated to the 6% level.

By historical standards, these are still very high unemployment and inflation rates. It is important to ask whether the recent slip in our economic performance is permanent. Some believe that it is; that structural changes in our economy require us, from now on, to accept high inflation or high unemployment, if not both. We recognize that there have been important structural changes in our economy since the 1930's. But these changes do not require accepting either high unemployment or high inflation as a permanent feature of economic life. Both the current level of unemployment and rate of inflation are unacceptably high. We can do better on both counts. To do so, we have only to recognize how the economy went wrong in the past and be willing to learn from those errors.

A major part of our current levels of unemployment and inflation reflect past mistakes in public policy. Such mistakes will have to be avoided in the future if we are to achieve full employment and stable prices on an enduring basis. We recognize that public policies (monetary, fiscal and regulatory) are not the only factors that shape our economy's price and employment performance. Other factors such as collective bargaining, administered pricing and import prices always influence and sometimes dominate economic performance. But the pattern of exogenous shocks is random, not recurrent, and their influence dissipates in time. Thus, in general, public policies dominate our economy's price and employment trends.

This report focuses on the part that monetary policy has played and should play in our economy's performance. Though it isn't all that matters, monetary policy matters very, very much. In summary, the record shows that throughout the post World War II period, time and again excessively sharp, prolonged cuts in money growth helped to turn economic expansions into recessions. Between 1965 and 1973, a new twist was added. Sustainable expansions were turned into unsustainable inflations before monetary policy moved to cut them down. In this regard, a full Committee staff report issued in August 1973, before the oil price boost, has proved to be sadly prophetic. That report warned:

> Beginning early in 1972, money supply growth was again accelerated to 8 percent per year and in the latest quarter, Spring 1973, has zoomed to nearly 11 percent per year. Inflation, which had tapered off, has resumed and prices are now advancing faster than before. Interest rates are skyrocketing. Financial disintermediation is again underway. The future is even more bleak. Soon the Federal Reserve, in order to end the inflation it has fueled, will again cut back the growth of the money stock too sharply and too long. Interest rates will rise to still unseen heights. Credit will become nearly unavailable to home buyers. consumers, small business and local governments. Economic activity will decline. Unemployment will rise.

We know now that this bleak monetarist scenario came true. Money growth was decelerated beginning in the second half of 1973, and sharply so after mid-1974. Caught in a vice between accelerating inflation and decelerated money growth, interest rates soared. In the summer of 1974, the three-month Treasury bill rate averaged 8.3%, the Federal funds rate 12.1%, the rate on Moody's Aaa corporate bonds 9.0% and the FHA new home mortgage rate 9.9%. Then, in the six months from September 1974 to March 1975, industrial production fell more than 15 percent. In May 1975, unemployment reached 8.9%.

Despite such monetarist scenarios coming true, monetary policy remains a mystery to most Americans. As stated by Representative Stephen L. Neal, Chairman of the Subcommittee on Domestic Monetary Policy in the hearings held by this Subcommittee described below,

> Most Americans do not know how important money policy is to the prices of the goods they buy, the interest rates they pay, their job opportunities, wages and profits.

Understanding these relationships is essential for objective analysis and successful oversight of current monetary policy. To increase public understanding, the Subcommittee held hearings on June 8, 9, 10 and 24, 1976 to determine how the Federal Reserve's policies affect our economy's performance.[1] These hearings have been printed and are available for public distribution upon request. In addition, Chairman Neal asked the Subcommittee staff to analyze the data on the relationships between monetary policy and economic performance. The results have now been compiled. Together with the hearings' testimony, they provide a record which should prove helpful in the monitoring and oversight of the conduct of monetary policy. The record is reviewed in this report, divided into four parts. Part I discusses money growth trends. Part II presents the results of our computer analyses of U.S. inflation. Part III focuses on recessions and unemployment. Part IV evaluates monetary policy under House Concurrent Resolution 133.

[1] See, "The Impact of the Federal Reserve's Money Policies on the Economy."

PART I

The Money Supply Roller Coaster

Some observers judge monetary policy by trends and patterns in interest rates, others by money supply. We use the basic money supply, M–1, as our measuring rod. Monetary aggregates are more reliable indicators of the thrust of monetary policy than interest rates. "Interest rates," as Federal Reserve Board Governor J. Charles Partee testified, "are particularly exposed to the influence of many variables external to the scope of monetary policy." In consequence, using interest rates as a yardstick involves a large risk of measurement error.[1]

Among the several monetary aggregates, M–1 appears to be at least as good a yardstick as any other. M–1 equals the sum of publicly held coin, currency and commercial bank demand (check) deposits. It measures very closely the stock of media that can be exchanged for goods and services. Close identification with our stock of exchange media provides a powerful reason for choosing M–1 to measure the thrust of monetary policy. In the final analysis, our concern is with the impact of Federal Reserve actions on spending and thereby on prices, production and employment. Other stores of value such as savings deposits must be exchanged for coin, currency or check deposits before they can be used to purchase goods and services.[2]

THE ROLLER COASTER

Exhibit 1 graphs the yearly percentage growth in M–1 from 1945 to 1975. Each bar indicates the percentage change in M–1 from the previous year, computed by dividing last year's average money stock into this year's average and subtracting 1. The exhibit shows that the growth of our M–1 money supply from World War II until now has moved up and down like a roller coaster. Furthermore, from 1945 to 1953, the money supply roller coaster was angled sharply downward. Since 1963, it has been tilted upward. Both the "tilts" and the "rolls" had important effects on our economy's performance during the past 30 years. Broadly speaking—

- The sharp downward tilt in M–1 growth after World War II broke the inflation that followed the termination of wartime price and wage controls in 1946.
- The upward tilt after 1963 helped to produce the two waves of inflation which we experienced since then.
- We suffered recessions in the months surrounding the bottoming of M–1 growth in 1949, 1953, 1957, 1960, 1967 (a mini-recession), 1970 and 1975.

These effects are discussed in more detail in Parts II and III.

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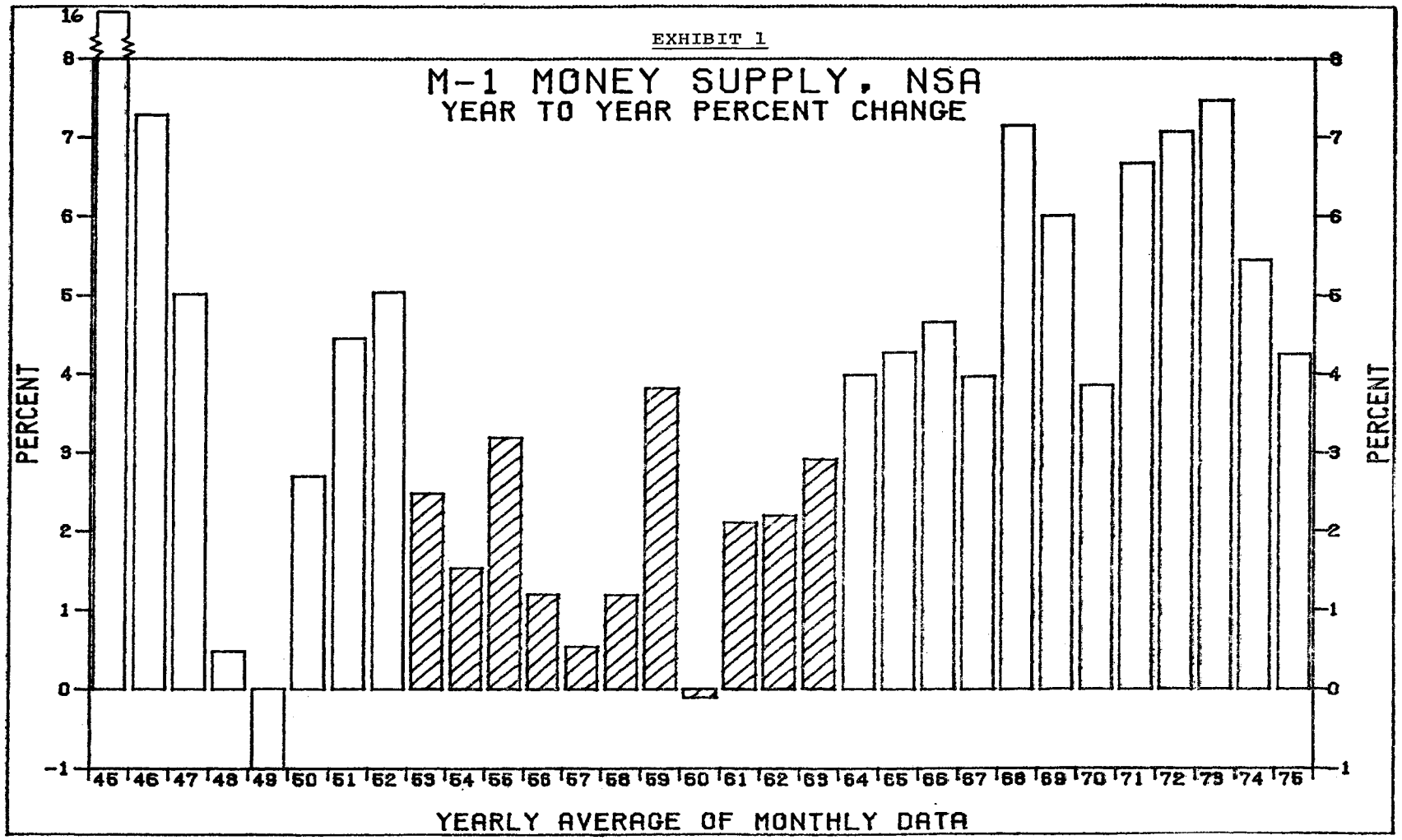
[1] It is easy to be fooled if interest rates are used as the yardstick. During inflations, interest rates tend to rise and money growth tends to be rapid. The former because credit demand rises and lenders demand inflation premiums. The latter because banks use their reserves relatively intensively. Corrective policy would call for slowing money growth which would lead to further interest rate increases for a time. If money growth doesn't slow, money watchers will know the Fed hasn't been acting aggressively enough to slow it. But those who watch interest rates can be fooled because interest rates can rise in inflation even though money growth hasn't slowed.

In the same way, during recessions, money growth is usually slow. Corrective action in this case would be to accelerate it, and money watchers will conclude that the Fed is acting to stimulate the economy only if money growth speeds up. They can't be fooled. Interest rate watchers, on the other hand, can be fooled into thinking the Fed is fighting recession when it isn't. This is because correct anti-recession policy calls for decreasing interest rates and decreases can occur even though the Fed has done nothing to bring that about.

[2] Another reason for picking M–1 as our yardstick is that its GNP velocity or turnover (GNP/M–1) is at least as stable as other GNP monetary velocities. Since 1960, the GNP velocity of M–1 has fluctuated less around its trend than the velocities of M–2, which includes savings and time deposits other than certificates of deposit, and the other aggregates have fluctuated around their trends.

EXHIBIT 1



Controlling Money Growth

Some argue that money growth moved up and down with the economy. They observe that M–1 growth acclerated during expansions and inflatioary periods, and slowed in recessions. They hypothesize that our economy's cycles cause money growth to cycle. The argument contains a grain of truth. This is because historically, the Fed has accommodated money growth to the economy's cycles. The pro-cyclical pattern of money growth did not, however, result from conscious decisions to put M–1 growth on a roller coaster in tune with the economy's cycles. Rather, it happened this way. In expansions, loan demand rose and banks sold Treasury bills and bid aggressively for reserves in the Federal funds and other money markets. As a result interest rates rose. The Fed often tried to resist these rises in interest rates. In doing so, they supplied the reserves that accommodated increased money growth.

Conversely, in recessions, with loan demand weak and banks buying Treasury bills and selling Federal funds, interest rates fell. In turn, the Fed, satisfied because interest rates were falling, slowed the supply of reserves and allowed money growth to fall. Thus, as Professor William Dewald of Ohio State University has written, "Monetary growth rates have been above average during booms and below average after booms peak out and recessions develop."

Although past money growth has rolled with the economy, it needn't have done so. Ours is a managed money supply system. Economic cycles can't cause cycles in money growth unless the Federal Reserve lets it happen.

The Federal Reserve has ample powers to control money growth reasonably closely. To accelerate money growth, the Fed can increase its open market purchases of Treasury securities, reduce discount rates or lower reserve requirement ratios, or employ a combination of these alternatives. If one degree of policy change doesn't work, the Fed need only push the levers harder. Some degree of open market purchases and (or) reductions in discount rates and reserve requirements will do the trick. The same can be said if a slowing of money growth is desired.

The fact that the Federal Reserve has the power to control money growth has been attested to by many Federal Reserve officials. In a 1964 colloquy between the present chairman of the House Banking Committee Representative Henry S. Reuss and Federal Reserve Board Governor George Mitchell, Mr. Reuss asked, "It is a fact, is it not, that the Federal Reserve System can control the money supply?" [3] The ensuing dialogue follows:

Mr. Mitchell. Well, let me say first that the purpose or the objective of both fiscal and monetary policy is to effect the growth of the economy and try to moderate economic fluctuations. The whole discussion of public policy, as it relates to monetary policy and fiscal policy, is to effect the rate of growth and to minimize cyclical fluctuation. * * * Well, I think monetary policy can make a contribution in this direction; yes.

Mr. Reuss. Agreed. Is it not also true that monetary policy can control the money supply? Whether that, in turn, will produce the beneficent results on employment and production that we all want is another matter, but you can control the money supply, can you not?

Mr. Mitchell. Well, it is at times difficult. The money supply grows in a very lumpy fashion, and this is because the initial action which we take, in providing reserves, does require a response from the banking system and from individuals—

Mr. Reuss. But the banking system is either going to make loans or buy investments—

Mr. Mitchell. You can eventually do something with the money supply but in the course of doing this you may cause some things to happen that you believe are undesirable and, therefore, the goal of just making the money supply move, if followed relentlessly, could have an impact upon credit conditions and expectations that might be totally undesirable.

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[3] Source: "The Federal Reserve System After Fifty Years," Volume II, 1964, House Banking and Currency Committee.

Mr. REUSS. Yes, but you must answer my question, which was not whether it is good to make the—

Mr. MITCHELL. Oh, I think I am answering your question.

Mr. REUSS. (continuing). Not whether it is good to make changes in the money supply the sole goal of monetary policy. There you have indicated you disagreed with Friedman, who says it is, but my question is whether you can—

Mr. MITCHELL. Ignoring all other consequences, absolutely.

Precisely the same point was brought out in the Subcommittee's recent hearings when Chairman Neal questioned Governor Partee.

Mr. NEAL. You state that without an increase in the money supply during these years, [1953–1975], we could not have increased our Gross National Product and so on. There is no question about that. But could the Fed have kept the growth of money supply on a more even keel if it so desired?

Governor PARTEE. Yes. It could have been done; that is, in abstraction.

Further, in interviews conducted by House Banking Committee staff in 1973 with the 12 Federal Reserve Bank presidents and 5 of the 7 Federal Reserve Board Governors, all agreed that they had ample power to control money growth. Excerpts from 3 of the responses are provided below: [4]

Reserve Board Governor Robert Holland, asked whether there would be any difficulty controlling money growth from year to year, responded,

> If we were giving that top priority, if we decided that the goal of hitting that target overrides everything else we could do, I think we could probably come fairly close from one year to the next in achieving the M–1 growth that we decided we wanted to create in the economy.

President Darryl Francis of the St. Louis Reserve Bank, asked if a year were long enough to control money growth, answered,

> Well, certainly a year, and of course, I believe we can do it effectively on a quarterly basis.

President Bruce MacLaury (Minneapolis), asked how money supply could grow, "just because the economy wants it to grow, unless the Federal Reserve supplies the base [reserves] for it," answered,

> The way you put that, it could not. It could not. We have the ultimate control and the question is, of the growth of the monetary base. I agree with you on that.

Chairman Burns has not explicitly agreed that the Federal Reserve can control year-to-year money growth. However, on occasion he has stated that the Federal Reserve would not allow money to grow at certain specified rates. For example, in 1975 hearings before the Senate Banking Committee, he said, "Maybe you want us to increase the money supply, as you may define it, at an 8 or 10% rate. We have no intention of doing that, not as long as I am the Chairman." [5] In stating that the Federal Reserve will not allow money to grow at such and such rates, the Chairman is, of course, substantiating that the Federal Reserve has ample power to control money growth.

Finally, we would point out that it would be a mockery for the Federal Reserve to set money growth targets as it does pursuant to House Concurrent Resolution 133, if its officials did not believe that they could stay within those ranges, and would do so unless new economic developments emerged that required changing the targets.

In summary, the Federal Reserve, not the economy, controls the pattern of money growth. The Fed may choose to accommodate and reinforce an economic trend. But it doesn't have to do so. The roller-coaster pattern of money supply growth shown in Exhibit 1 need not have occurred. The role it played in shaping our economic experience over the last thirty years is detailed in Parts II, III, and IV. Our inflation experience is considered in Part II, recessions in III, and our experience under H. Con. Res. 133 in Part IV.

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[4] Source, "The Federal Reserve and Inflation and High Interest Rates," hearings before the House Banking Committee, July and August 1974.

[5] Source: "Monetary Policy Oversight," on Senate Concurrent Resolution 18, February, 1975, Senate Banking Committee.

PART II

INFLATION

There may be as many theories about inflation as there have been inflation episodes. Events and actions that cause inflation can be classified by whether they result in (1) increased spending or (2) a larger part of current dollar or nominal GNP being allocated to prices and a smaller part to production. In turn, events and actions that increase spending can be classified by whether, directly, they cause (a) accelerated money growth or (b) increases in the velocity at which money circulates (measured as current dollar gross national product or GNP divided by M–1).

The Federal Reserve affects the rate of inflation because its policies and actions, like it or not, change the rate at which money supply grows. Fiscal policy (government deficit spending financed by the sale of securities) might enter directly by bidding up goods and services prices or indirectly by changing velocity. Incomes policies enter by affecting the division of GNP between production and prices. This part of the report identifies the roles played in our inflation history since 1947 by public policies—

- Monetary (Federal Reserve).
- Fiscal.
- Incomes, and also, the following non-policy developments:
- Korean War buying trends.
- Velocity changes outside the Korean War period.
- Import prices.
- Inflation momentum released in administered pricing and wage settlements.
- Monopoly wage and price setting not reflected in inflation momentum.
- Unemployment and production.
- Changes in agricultural and raw materials supplies.

IN SUMMARY

In regard to money growth.—On average, the rate of inflation rose 1% two years after each 1½% rise in money supply from one year to the next. Put another way, two years after the Fed increased the rate of money growth 1%, measured year to year, the CPI rose on average by .64%. Changes in money supply, moreover, were decisive to whether inflation endured however virulent it began and whatever the original cause.

In regard to velocity.—A buying spree, which started right after North Korea invaded South Korea, on June 25, 1950, and shows up in historically extraordinary increases in the velocity at which money circulated, was primarily responsible for the brief but virulent Korean War inflation; and though this may seem a paradox, for the lull that followed. Apart from this period, changes in velocity have not played a major role in our inflationary experience since 1947.

Government deficits do not appear to have had significant inflationary impact independent of money growth. (Though, unquestionably, large deficits created imposing money supply management problems for the Federal Reserve.)

In regard to the division of GNP between production and prices.—Commodity supply reductions do not appear to have been a significant inflationary factor at any time in the period since World War II. On the other hand, large increases in agricultural and raw material supplies appear to have played a significant part in the fall of the consumers' price index (CPI) in 1949.

Our results point also to these conclusions:

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• Our economy's pricing system is not explosive. It is stable. On average, since World War II, changes in the rate of inflation for each year have carried over to the next year with only about ¼ power. That is, a 4% rise in the current inflation rate was associated, on average, with a further 1% rise the next year. However, the average may be misleading. Pricing behavior during the Korean War years reduced the 1947–1975 average carry-over significantly. Since the Korean War period, changes in the rate of inflation one year have carried over to the next year with (rounding up) ½ power. Using this measure of momentum, a 4% jump in the base inflation rate this year (whatever the source) causes jumps of 2% next year, and 1% a year later. After that, the momentum of inflation reverses and the carry-over effect cycles around zero with decreasing amplitude.[1]

The existence of a carry-over effect indicates that administered pricing and collective bargaining in the current year are importantly influenced by price trends in the preceding year, and in turn play important parts in the determination of the current year's prices. Though this influence is significant, it is far less than what it would take to make our economy's pricing system explosive. There is a momentum in inflation, but it is not cumulative or even constant. Rather, it reverses after two years, then cycles around zero and gradually plays itself out.

• Apart from the carry-over effect, administered pricing and collective bargaining do not appear to have been significant factors in our post World War II inflationary experience. However, the wage-price freeze in the second half of 1971 appears to have dampened inflation that year, and the Kennedy-Johnson guidelines may have done so from 1963 to 1967.

• Increased import prices were very important in 1973, 1974 and 1975. They caused consumers' prices to rise about 1½% in 1973, 5% in 1974, and 1% in 1975. Increases in import prices weighted by the value of imports relative to GNP, were reflected roughly percent for percent in increases in the CPI. There was no significant multiplication of domestic prices when import prices increased.

• Finally, neither unemployment nor production appear to have had significant independent influence on inflation trends during the post World War II period. Nor did unemployment trends and levels significantly affect the part that money supply played in our inflation experience since World War II. Unemployment had affected this relationship in the middle and late 1930's.

We used econometric analysis to quantify the inflation effects of *money growth*, deficits *Korean War buying trends*, velocity changes outside that period, *import prices*, *inflation momentum*, unemployment and production. Of this group, variations in money growth, import prices and the momentum of past inflation, and buying trends in the Korean War, proved to be statistically significant. Together they explain 90% of year-to-year changes in the CPI in the 1947–1975 period. Money growth was the dominant persistent factor.

Inflation which could not be explained by our econometric analysis was analyzed qualitatively to determine the separable roles played by incomes policy, droughts and other uncontrollable events and monopoly pricing and collective bargaining which cannot be related to past inflation.

Initial Analysis

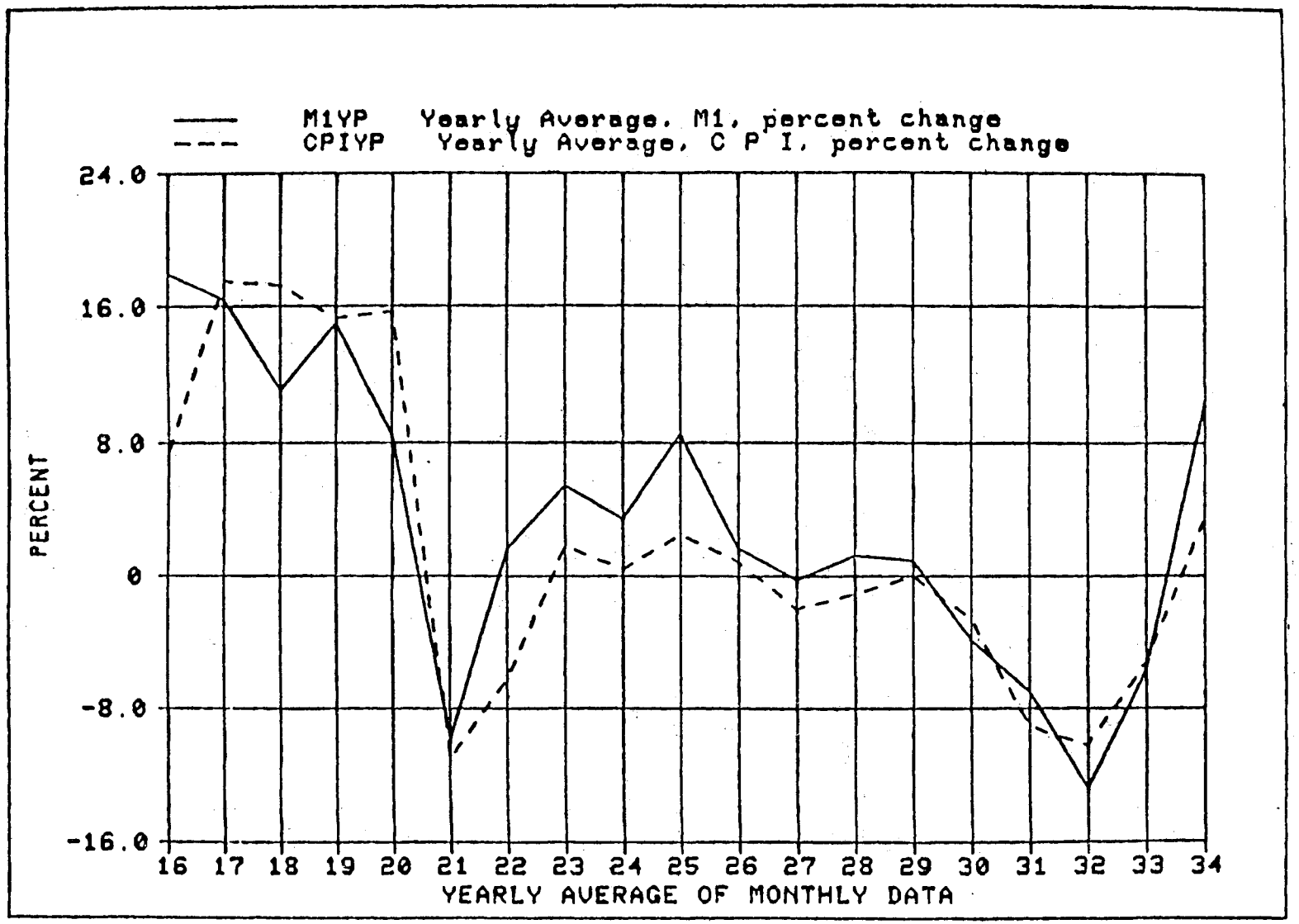
Prior to World War I and up to the mid-1930's, the relationship between money growth and inflation was concurrent. As shown in Exhibit 2, when M–1 growth accelerated, the rate of inflation increased. Conversely, when money growth decelerated, the rate of inflation decreased; and when the volume of money fell, prices also fell.

Since the mid-1930's, there have been important structural changes in our economy which have had the effect of delaying the impact of money growth on inflation. First, storable goods, which can be marked up and down easily as

[1] The first year after the 4% jump in base inflation, actual inflation exceeds base inflation by 2%. The second year, the difference from the base year is only 1%. Thus momentum reverses in the third year, since the change in the rate between years one and two is minus 1%.

EXHIBIT 2

YEARLY AVERAGES OF M–1 AND CPI PERCENTAGE CHANGES, 1916–1934



economic conditions change, have become less important as the economy has become increasingly service oriented. Second, the spread of collective bargaining has delayed wage adjustments by putting the wages of large numbers of workers under 2- and 3-year contracts. Similarly, the spread of contractual arrangements in raw materials and energy supplies has acted to delay price adjustments in these industries. In turn, the spread of wage, materials, and energy price contracts has operated to slow price changes in manufacturing industries characterized by oligopoly. Firms in concentrated industries tend to ignore demand shifts and change prices only when costs change. Thus, factors which delay the impact of changes in money growth on labor, materials and energy costs have the effect of delaying also adjustments in final product prices. Finally, new government policies have acted to delay price adjustments in the period since the mid-1930's. The spread of price regulation has had this effect directly. Adoption of counter-cyclical monetary and fiscal policies has generated delay indirectly. Because government now is expected to act counter-cyclically, businessmen have found it prudent to wait before changing prices in response to cyclical demand changes.

There is, therefore, good reason to assume that prices now respond to money growth with a lag. We analyzed the year-to-year percentage changes in monthly CPI and M–1 data in the 1953–1976 period to find the lag that best reflects the association between present inflation and past money growth.[2] We found that the correlation peaks when inflation is measured 23 months after M–1 growth changes. This does not mean that money growth changes influence prices only after a 23-month lag. Rather, it means that the association between current inflation and lagged M–1 growth is best at 23 months. There is moreover, very little difference in the values of the correlation statistics at lags between 16 and 30 months, and the peak value.[3]

THE INITIAL EXPERIMENT

Using data for the 1953–1976 period, we mapped on a scatter diagram, shown here as Exhibit 3, all points that pair inflation measured from the same month a year ago and M–1 growth in the year ending 23 months ago.[4] We then used computer analysis to find the regression or trend line that best fits this scatter. The straight line that fits best passes through the origin of the diagram where both inflation and money growth are zero, and rises so that for every increase of 1 percentage point in money growth (e.g., from 4 to 5%), inflation rises by 93 one-hundredths of a percent (e.g., from 3 to 3.93%).

TABLE 2.—REGRESSION RESULTS

[Dependent variable: CPIP, percent change in the CPI between corresponding months of adjacent years. Independent variable: M1P, percent change in M–1 between corresponding months of adjacent years, lagged 23 mo. Period: January 1953–April 1976.]

		M1P			Constant					
CPIP (month)	M1P (month)	Coefficient	T	SE	Coefficient	T	DW	SE	R^2	Adjusted R^2
All		.930	19.63	.995	.018	.09	.08	1.81	.603	.601
January	February	.912	5.35	.992	.028	.04	1.61	1.98	.589	.568
February	March	.880	4.88	.956	.149	.19	1.69	2.05	.543	.521
March	April	.804	4.60	.874	.431	.55	1.65	2.07	.515	.490
April	May	.810	4.43	.871	.444	.55	1.80	2.09	.495	.470
May	June	.847	4.68	.928	.239	.30	1.94	2.01	.536	.511
June	July	.896	5.02	.973	.092	.12	1.87	1.94	.570	.547
July	August	1.041	5.94	1.111	−.380	−.51	1.66	1.79	.650	.631
August	September	1.114	7.23	1.170	−.584	−.90	1.34	1.52	.733	.719
September	October	1.097	7.20	1.145	−.504	−.78	1.49	1.54	.732	.718
October	November	1.024	6.81	1.065	−.227	−.35	1.76	1.60	.709	.694
November	December	.961	6.57	.998	.008	.01	1.75	1.67	.694	.678
December	January	.886	5.39	.963	.125	.17	1.45	1.97	.592	.572
Range		.804 1.114	4.43 7.23	.871 1.170			1.34 1.94	1.52 2.09	.495 .733	.470 .719
Mean		.939	5.68	1.004			1.67	1.85	.613	.593

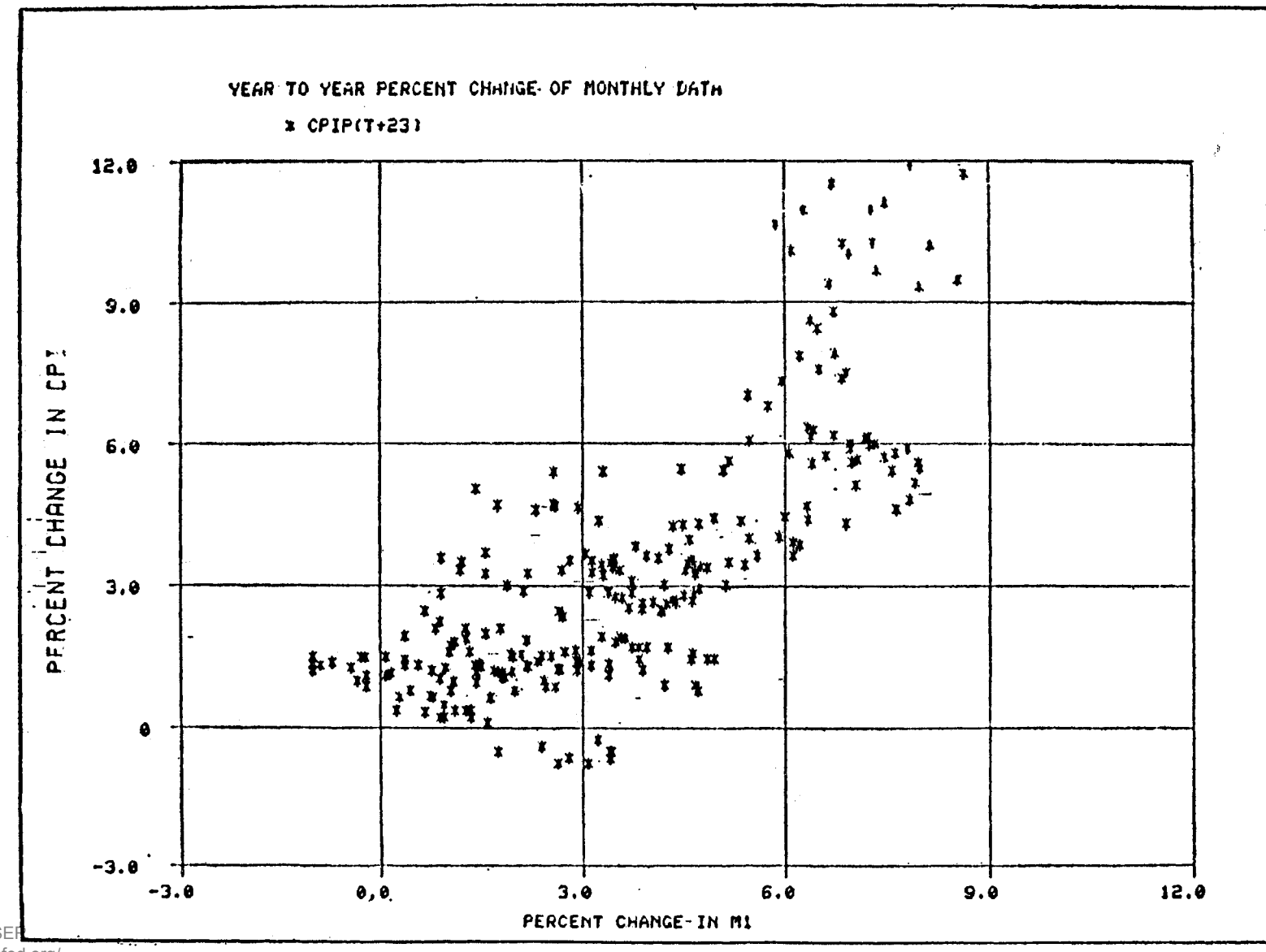
[2] We used the smallest sum of squared errors between actual percentage changes in the CPI and estimates of these changes made on the basis of percentage changes in M-1 to find the best association. This sum approaches zero as the correlation between the actual and estimated data rises.

[3] The peak value of the correlation coefficient is .776. At 16 months, it is .733. At 30 months it equals .732.

[4] The earliest observation point pairs M-1 percentage growth from February 1953 to February 1954 and the percentage change in the CPI between January 1955 and January 1956.

EXHIBIT 3

SCATTER DIAGRAM OF PERCENTAGE CHANGES IN CPI OCCURRING 2 YEARS AFTER CHANGES IN M-1 GROWTH



The regression results for this initial experiment are set forth in full in the top row of Table 2, labelled "All." They show in addition to the statistics discussed above, that the regression line explains 60% of the variance of observed inflation. To state this another way, the results show that on average, year-to-year changes in money growth 23 months ago explain 60% of current year-to-year changes in inflation, The major part of 1955-1976 inflation changes, which cannot be attributed to past money growth, occurred in 1973–1975 when inflation first rose and then fell substantially faster than could have been expected from M–1 growth 23 months earlier. Most of what happened then that can't be explained by M–1 growth 23 months earlier, can be explained by changes in import prices, as will be discussed later.

Exhibit 4 maps the fit for the full 1953–1976 period. It puts the scatter diagram in chronological order, overlaying for every possible 12-month period from 1953 to 1957 percent changes in the CPI on yearly percent changes in M–1 occurring 23 months earlier. Because the CPI and M–1 percentage changes were computed for all months of the year from the same month a year ago; January to January, February to February, etc., the exhibit provides an uninterrupted look at inflation and lagged (23 months) M–1 growth trends. The exhibit shows the two series generally rising and falling together.

Checks.—As revealed by the Durbin-Watson statistic (DW) in row 1 of Table 2, there is substantial common trend when overlapping periods are analyzed. What happens in the 12 months ending in, say, April 1976, is very closely related to that happened in the 12 months ending in March 1976. The two periods overlap for 11 months, and so there is bound to be a lot of common trend.

To test whether the overlap significantly affects our results, we ran the same experiment (regressing yearly percentage changes in the CPI on yearly percentage changes in M–1 lagged 23 months) using, however, only one month of each year. We did it for all possible pairings of the CPI and M–1, that is, January to January CPI changes with February to February M–1 data (lagged 2 years), February to February price data with March to March M–1 data (lagged 2 years), etc. This procedure eliminated the overlap in the data. The results are presented below the top row in Table 2. Other than with repsect to the DW statistic, they do not differ significantly from the results of the initial experiment reported in the top row.

Exhibit 4(a) provides graphic illustration that the relationship between current inflation and M–1 growth two years ago is not due to common trend. This exhibit graphs current percentage changes in yearly averages of monthly M–1 data and percentage changes in yearly averages of the CPI pushed back two years. Only one observation—the average—is used for each series each year. As in the case of Exhibit 4, this exhibit shows the two series (yearly percentage changes in CPI and yearly percentage changes in M–1 two years earlier) generally rising and falling together.

During the Subcommittee's June hearings, the witnesses were asked to comment on our results, as shown in Exhibit 4. Excerpts from the dialogue are given below.

Chairman NEAL. Let me ask you, if I can, to comment on the chart specifically. Do you have any problem with that relationship between money policy and inflation?

Mr. JORDAN (Vice President, Pittsburgh National Bank). No; I don't at all. The basic relationship is one that I think is correct.

Mr. FIEDLER (Vice President, National Industrial Conference Board). The relationship in the long run that you are referring to, it seems to me, is very well established.

There is a casual relationship, that is, a more rapid rate of increase in money over any decade is clearly going to be reflected on the average over that decade in a more rapid rate of price inflation.

I think most of the testimony you have heard here today is consistent with that long-term kind of relationship . . . .

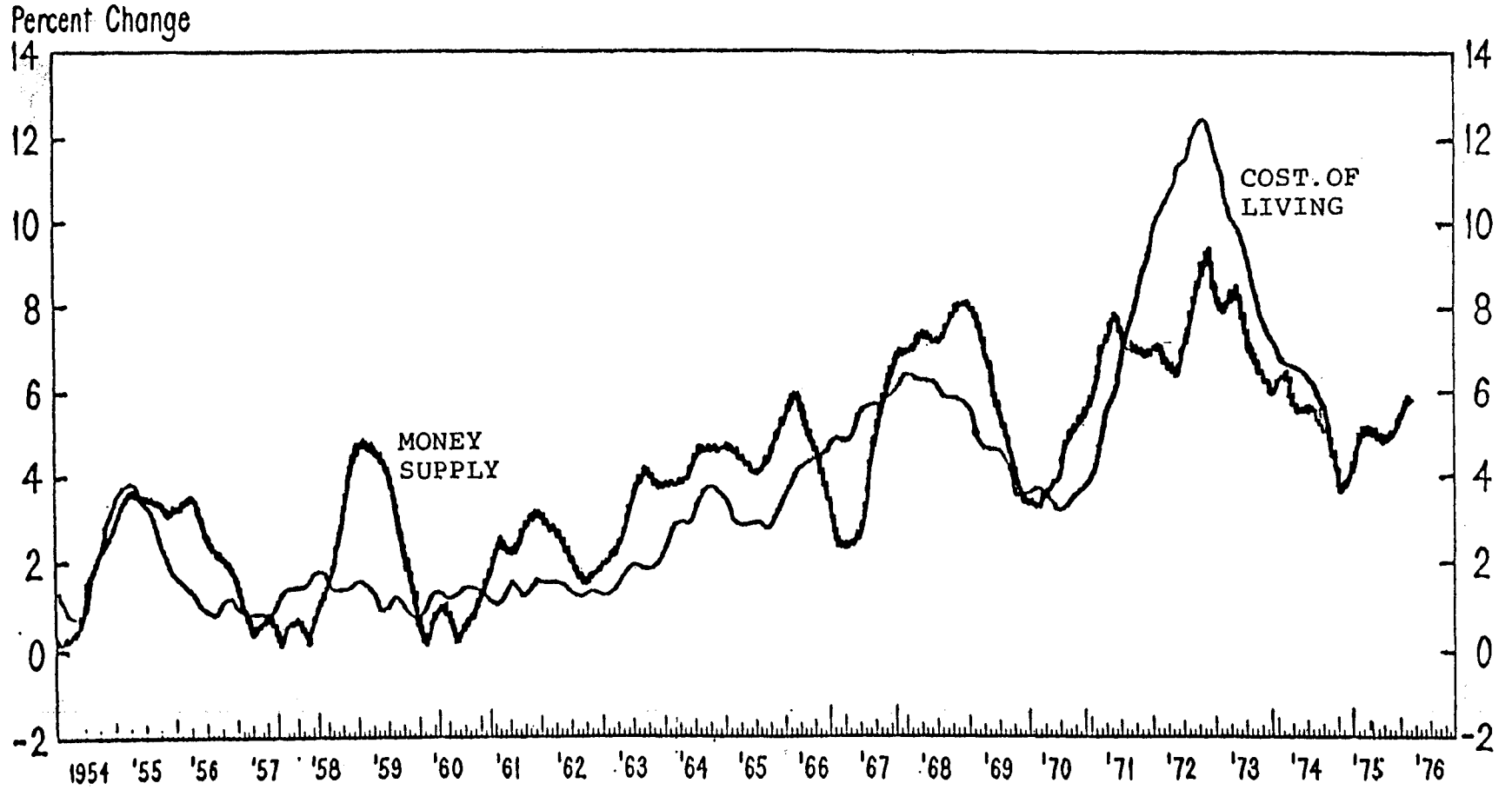
EXHIBIT 4

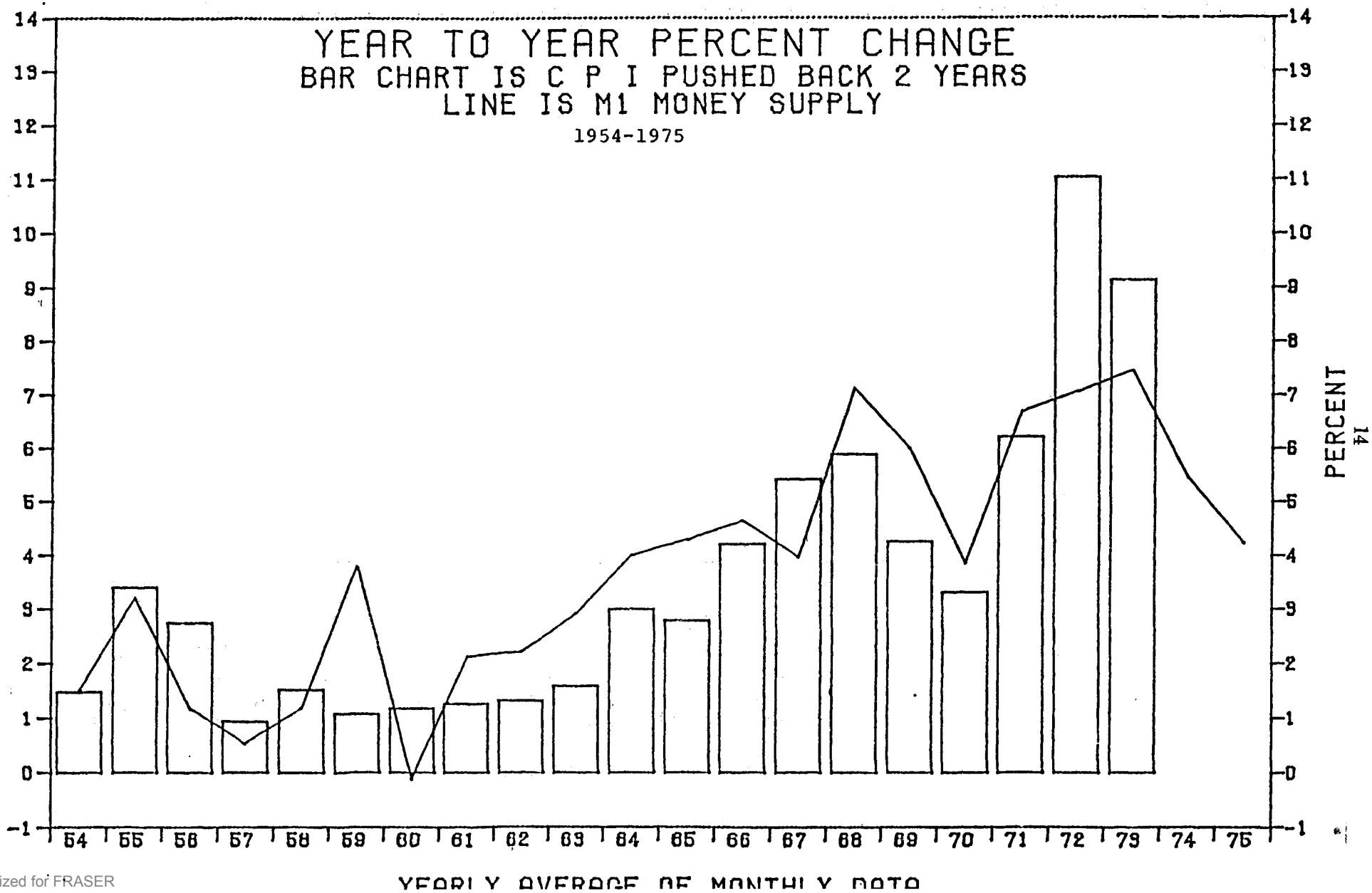
YEARLY MONEY SUPPLY CHANGES

Percentage Changes From One Month in One Year to the Same Month in the Next Year

YEARLY CHANGES IN THE COST OF LIVING OCCURRING 23 MONTHS LATER

1954-1976





It seems to me that the 23-month lag that you have built into the chart is something that you should not view as a highly specific, accurate, precise kind of a thing. Certainly the lag is variable. In one business cycle, it would be longer, and in another business cycle, it would be shorter, depending on a lot of different things.

There is no magic in that relationship.

Mr. PERRY (Senior Fellow, Brookings Institution). If you put the real state of the economy into an equation, and you do a conventional attempt to explain inflation—relying on how tight the market is, what is the history of inflation—you don't add to the explanation by adding the past money supply.

If Mr. Perry had stopped here, his testimony would have to have been regarded as contradicting our results. But he did not, and it is difficult to know how to interpret his assertion that "you don't add to the explanation by adding the past money supply" when it is viewed together with his further remarks on the question. Moreover, as will be disclosed, our further regression runs show that past money growth not only adds to the explanation of inflation in the context of the state and momentum of the economy, it is the single most important factor by far.

Mr. PERRY. (Continuing) Since money matters very much in determining GNP, you will still get a relationship between monetary growth and the subsequent inflation rate but you will not get a relationship that, as sometimes is suggested or implied, operates without affecting the real economy.

I would like to make this point as clear as I possibly can. Monetary policy matters very much. If monetary policy is very expansionary and pushes the economy very far very fast, the consequences of that will be more inflation. But the inflation arises because the real economy has been pushed too far too fast, not because of any magical property of the money supply.

Later, Mr. Perry added:

The point I am making is not that M_1 is not very important in this process. The periods when we have run ourselves into inflationary situations have usually been periods when M_1 has grown rapidly. In growing rapidly, it pushed the real economy up fast and far and ran us into inflation.

We have no quarrel with the thrust of these further remarks by Mr. Perry. Mr. Pierce (Professor of Economics, University of California, Berkeley) made essentially the same point. The role played by money supply should be analyzed and evaluated in the context of the state and momentum of the economy. More on this later.

Representative HANNAFORD. (Questioning Mr. Pierce). We have talked about the lags and we have talked in general terms about a 2-year lag in monetary policy and its effect.

Mr. PIERCE. The relationship that is being looked at is an average. It depends on the circumstances in the economy and how long that policy is pursued.

Later, Mr. Pierce told the Subcommittee:

Charts are simple things, and they have to leave out a lot of complexity, but the relationship is there.

There is a great deal of empirical evidence that says that there's a relationship between monetary policy and inflation, and that's borne out by the chart. There's also a great deal of evidence in the statistical literature which says that economic time series tend to have steady patterns in their behavior, so-called serial correlation in them, and that two series can appear to be related even though behaviorally they are not. I think there is some of that problem in that chart.[5]

[5] As already indicated, if only one observation a year is used, the chart pattern remains virtually the same as in Exhibit 3, and serial correlation is not a serious problem.

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But I would have to say that the chart dramatizes something that is very important to dramatize. There is a relationship between monetary policy and inflation.

All I would counsel you against doing is inferring that every time there is an expansion in money growth, that as night follows day we are going to have inflation 2 years from now. I don't know of any empirical evidence that allows one to make that assertion, because all we have is average relationships. On the average, the economy tends to be fairly highly employed, and if the economy is fairly highly employed and we have an expansion in monetary policy, then the only place that that increase in demand in the economy can go is in terms of bidding up prices. So, on average, there should be a relationship between accelerations in money growth and acceleration in prices, with a lag, because the economy tends toward full employment.

When the economy is not fully employed, then it doesn't follow that if we have a relatively rapid money growth for, say, two quarters, if we wait 2 years, we will observe prices going up. I reject that proposition theoretically and I reject it empirically. The important lesson is, though, don't keep it up.

Chairman NEAL. Have you had a chance to look at our exhibit?

Mr. MELTZER (Professor of Economics, Carnegie-Mellon University). Yes; I have looked at the chart.

Chairman NEAL. Do you see any problems?

Mr. MELTZER. I think in general the relationship is correct. It is a careful reproduction and extension of earlier work. What the chart shows is there is about a 2-year lag with no absolute precision or uniformity about the timing. Each time there is a ripple in money, as Dr. Pierce has said, it doesn't show up in price changes. However, it is certainly true that the main movements are shown on the chart. When the rate of monetary growth expands, on average 2 years later we have an increase in the rate of price change, and when the rate of monetary growth slows down, about 2 years later we have a slowdown in the rate of inflation. We are now experiencing the results of that process. We should be careful to avoid saying, and I think the paper accompanying the chart does, that the only thing that has any effect on the rate of price change is the rate in the growth of the money stock. A very large fraction of the rate of inflation is explained by past changes in the growth of the money stock.

Chairman NEAL. What is emerging here is fascinating to me. Our chart maps the increase in the yearly changes in the cost of living occurring 23 months after fluctuations in money supply—M_1. A consistent relationship is shown here, indicating that the sharp growth or contraction in M_1 is reflected in the level of prices.

Governor PARTEE. Mr. Chairman, I do not disagree with the thrust of that chart. I am sure that you will understand when I say that it is not an elaborate analytic chart. It is simply an arithmetic exercise. If one, say, were to have plotted the change in unit labor costs and compared them with the Consumer Price Index, you would find a high correlation also.

There are some possible statistical difficulties with the chart. But I think that it is true that a rate of increase in the money supply above a minimal rate that would be associated with real growth in the economy, given our limited capacity to increase output in real terms in the economy over the years will in time bring an inflation. . . . But I would point out that there is an entire process involved. If in looking at this chart, you tend to conclude that had the money supply not gone up we would not have had inflation—everything else would have been just the same and we would not have had inflation—that is a wrong conclusion. . . .

What would have to happen in order to reduce that rate of inflation 23 months hence is that wage increases, cost increases, price increases, and profit shares for companies would have had to be held down. That process is very difficult to deal with in our economy.

Chairman NEAL. You mentioned wage increases several times as being highly inflationary. Why were wage increases relatively moderate during the early sixties? What would explain that?

Governor PARTEE. That is a very interesting question. I have thought long and hard about how to reestablish those conditions. I think as a matter of fact that the economy is closer to doing so now than it has been for the whole decade that has gone by.

My view of the matter is that we had a period of very slow growth in the economy in the latter part of the fifties. We had a number of recessions—in 1953, 1954, and in 1957, 1958 and in 1960 and early 1961. It was a painful process—and I might say that monetary policy was very widely blamed for the poor performance of the economy in the latter half of the fifties. But, as a result of that process, expectations and aspirations did tend to fall back and expectations of inflation tended to moderate so that we found ourselves in the early sixties with moderate growth rates in wages, quite slow increases in consumer prices, good increases in profits based not on rising profit margins but on rising volume—a very decent situation. I think that is what we are trying to restore at this time.

Chairman NEAL. (Contrasting the early sixties to other periods.) Also during this period you had a very moderate and steady monetary policy.

Table 3 gives M–1 growth rates between corresponding quarters of adjacent years from 1961 to 1965.

TABLE 3.—M-1 PERCENTAGE GROWTH BETWEEN CORRESPONDING QUARTERS OF ADJACENT YEARS, 1961-65

	1961	1962	1963	1964	1965
Quarter:					
1st	1.28	2.99	1.79	3.62	4.56
2d	2.29	2.60	2.34	3.59	4.39
3d	2.06	1.82	3.52	4.29	3.88
4th	2.82	1.44	3.97	4.48	4.35

FURTHER ANALYSIS

In the simple linear regressions that comprised our initial tests, factors other than past M–1 growth were not considered explicitly. The initial tests, thus, should be viewed as providing only a rough first approximation of the inflation/money relationship. These results could be misleading. Changes in lagged money growth might affect inflation only if there is full employment, for example. Also, the measured impact of money growth on inflation could be magnified spuriously if inflation is gaining momentum, or if import prices are increasing concurrently. Further analysis was required to check these possible complications and obtain a more complete understanding of inflationary processes in general, and the inflation/money nexus in specific.

We used multiple linear regression analysis to analyze the inflation effects of changes in money growth together with other factors that are widely held to be inflationary. In essence, this standard econometric procedure permits quantifying the partial and combined inflation effects of the diverse factors that are assumed to cause inflation. Using this standard procedure, we quantified the inflationary impact of money growth together with the parts played by the following factors.

- Buying trends that were set off by Korean War.
- Velocity trends outside the Korean War period.
- Import prices.
- The momentum of past inflation.
- Production.
- Unemployment.
- Federal budget surpluses and deficits.

Specification of these variables is discussed below in conjunction with our results.

We analyzed CPI data covering the 1947–1975 period. The data were assembled in yearly series by averaging intra-year data. Where monthy data

were available, they were used. Quarterly data had to be used in the cases of import prices, the deficit, and constant dollar GNP. Use of yearly statistics avoids most seasonal adjustment problems as well as the overlapping data problem. On the other hand, it should be recognized that when data are blocked off in years, relationships that tend to be continuous can be distorted. Our results thus should not be judged by how well they explain isolated years. Rather they must be looked at as statements of average tendencies over the long haul, and judged by their over-all or average predictive power.

Results

The results of our futher analyses are summarized in Tables 4–8.

Table 4

Table 4 presents three series of analyses, with the second and third building on the first. In all series, the basic period of CPI changes covered was 1947–1975. Three subperiods also were covered: 1951–1975, 1956–1975, and 1947–1970. The first series relates yearly percentage changes in the CPI to (a) yearly percentage changes in M–1 two years ago [6] and (b) Korean War buying trends. The second series adds percentage changes in import prices to the list of causal factors (weighted by the ratio of current dollar imports to current dollar GNP). The third adds the momentum of recent inflation (as determined by the change in the CPI inflation rate last year).

Table 4

Regression Coefficients and Standard Errors

Dependent variable: Yearly percentage change in the CPI computed using yearly averages of CPI levels, denoted *CPIYP*.

Independent variables: M1YP (t—2); yearly percentage change in M–1 (two years ago). *Dummy;* 1951=1, 1952=—.02, 1953=—.38, 1954=—.48, 1955=—.28. *PIMYPW;* yearly percentage change in import prices weighted by imports as a percent of GNP. [*CPIYP (t—1)—CPIYP (t—2)*]; the change in the yearly inflation rate last year.

	1947–75 (n=29)	1951–75 (n=25)	1956–75 (n=20)	1947–70 (n=24)
Series 1:				
Constant	[1].017	[1] —.162	[1] —.137	[1].105
	(.515)	(.553)	(.674)	(.448)
M1YP(t–2)	[2].916	[2] 1.012	[2] 1.010	[2].827
	(.102)	(.137)	(.156)	(.094)
Dummy: coefficient	[2] 8.864	[2] 9.233	--------	[2] 8.514
	(1.474)	(1.280)	--------	(1.279)
Adj R^2	.771	.757	.682	.805
SE	1.723	1.421	1.570	1.487
DW	1.959	1.667	1.665	2.457
Series 2:				
Constant	[1].116	[1].470	[1].535	[1].105
	(.410)	(.422)	(.510)	(.448)
M1YP(t–2)	[2].767	[2].691	[2].677	[2].827
	(.089)	(.121)	(.137)	(.094)
Dummy	[2] 7.284	[2] 7.047	--------	[2] 8.514
	(1.235)	(1.037)	--------	(1.279)
PIMYPW	[2] 1.413	[2] 1.367	[2] 1.392	--------
	(.351)	(.296)	(.329)	--------
Adj R^2	.856	.874	.836	.805
SE	1.368	1.024	1.127	1.487
DW	2.185	1.606	1.594	2.457
Series 3:				
Constant	[1].535	[1].554	[1].836	[1].461
	(.367)	(.406)	(.439)	(.410)
M1YP(t–2)	[2].643	[2].645	[2].538	[2].714
	(.084)	(.118)	(.125)	(.091)
Dummy	[2] 6.000	[2] 6.328	--------	[2] 7.364
	(1.109)	(1.073)	--------	(1.188)
PIMYPW	[2] 1.403	[2] 1.347	[2] 1.296	--------
	(.296)	(.283)	(.277)	--------
[CPIYP(t–1)—CPIYP(t–2)]	[2].248	[1].166	[2].465	[2].218
	(.074)	(.095)	(.162)	(.086)
Adj R^2	.898	.885	.885	.843
SE	1.153	.978	.943	1.285
DW	2.523	1.935	2.139	2.623

[1] Coeficient is not significant.
[2] Coeficient is significant.
Note: Standard errors are in parentheses below the coefficients.

[6] This means that the 1947 percentage change in the CPI was related to 1945 M–1 growth, etc.

KOREAN WAR BUYING TRENDS

The buying trends set off by the Korean War were put into the equations by using a so-called dummy variable. In econometric research, dummy variables are used to measure the impact of unique, unexpected exogenous shocks. The invasion of South Korea on June 25, 1950, was such an event. Its effects on the U.S. domestic economy flowed, most importantly, from a buying spree which started almost immediately and continued into the second quarter of 1951, when wage and price controls became effective.

To understand the necessity for using a dummy to cover Korean War buying trends, and its specification, we have to go back to World War II. During World War II, the necessity of allocating enormous resources to the war effort caused major shortages to develop. Demand arising from wartime monetary expansion was "pent-up" until after the war by rationing programs. Termination of wartime price and wage controls and rationing in mid-1946 released it. Prices were bid up 29% between June 1946 and June 1948. When the Korean War began, memories of shortages, controls, rationing and subsequent huge price increases were of sufficiently recent vintage to impel an immediate buying spree which production could not match. So in contrast to World War II, when buying had to be postponed until after the war, the Korean War was marked by an immediate buying spree. The GNP velocity of M–1 jumped phenomenally in the next year. It increased 10% in the summer or third quarter of 1950 over the year-earlier figure, and 14% in each of the next three quarters from year-earlier velocities. These increases *exceed* the highest increase that can be expected to occur with 95% probability, based on velocity changes between the same quarters from one year to the next from 1948 to 1976. Using yearly averages, the increase in velocity was 10.47% in 1951, a rise that also exceeded what can be expected by chance 95% of the time. There can be no doubt that the *outbreak* of the Korean War caused an unusual spending spree in the United States.

The first effect of the buying spree was to quickly bid up prices. Using yearly CPI data, this effect shows up in 1951. A second and quite different effect followed. In subsequent years, there was less buying than would otherwise have occurred. Just as pent-up demand must sooner or later lead to a buying spree, as after World War II, so too must a buying spree which begins without warning, as at the outset of the Korean War, lead later to a buying lull. Put another way, when buying is postponed, demand later increases. When there is forward buying, demand later decreases.

To capture both effects, we constructed a weighted dummy for the 1951–1955 period.[7] Our hypothesis is that the invasion of South Korea caused an immediate buying spree, followed by a period during which household and business inventory levels attained during the buying spree were maintained at above-normal levels in fear that the war would yet cause shortages. Finally, when the war ended in mid-1953, demand subsided and a buying lull occurred. The weights we used in constructing the dummy are 1 for 1951, —.02 for 1952, —.38 for 1953, —.48 for 1954 and —.28 for 1955.[8]

[7] Because we used a weighted dummy rather than separate ones for each of the years we weighted, the number of degrees of freedom implied by the number of observations minus independent variables is overstated by four in all regressions where the dummy is used. But this is not crucial. Inspection of the results shows that the roles played by our independent variables does not depend on whether significance is tested with the number of degrees of feeedom implied by the tabulated data, or four less.

Use of the weighted dummy rather than separate dummies for each year, 1951–1955, allowed us to keep the tabulation of the results simple.

[8] To determine the exact weights we regressed the yearly percentage change in prices on yearly percentage M–1 growth lagged two years and separate dummies (each equal to 1) for 1951, 1952, 1953, 1954 and 1955, and used the resulting regression coefficients. In specific, we arbitrarily set 1951=1 and constrained the 1952–1955 weights to equal their coefficients divided by the 1951 coefficient.

We also computed weights from a regression which included import prices and inflation momentum as independent variables. These weights are 1 for 1951, —.40 for 1952, —.06 for 1953, —.51 for 1954 and —.41 for 1955. They differ significantly in 1952 and 1953 from the weights used in the regressions reported in Table 4 and subsequently. However, for 1947–1975 they yield results that are not very different, actually providing a better statistical fit, than those in Series 3 of Table 4. Using the alternative weights, CPIYP=

Constant	+ M1YP(t−2) +	Dummy	+ P1MYPW +	[CPIYP(t−1)−CPIYP(t−2)]
.799*	.577*	5.660*	1.390*	.352*
(.326)	(.072)	(0.898)	(.270)	(.064)

Adj R^2=.914; SE=1.056; DW=2.409

*Coefficient is significant.

Standard errors are in parentheses below the coefficients.

Despite the marginally better results, we chose to continue using the weighted dummy which we constructed from the coefficients on the 1951–1955 dummies in the regression of CPIYP on only lagged money growth and the 1951–1955 dummies, without including either import prices or inflation momentum. We did so because it makes more sense for the 1952 weight to be closer to zero than the 1953 weight. We note, however, that the procedure we have used collects the carry-over of inflation changes in the dummy variable which lowers the coefficient on the carry-over variable.

Series–1.—The Series 1 Table 4 results indicate that changes in the CPI during the 1951–1955 period were powerfully affected by the buying spree that accompanied the invasion of South Korea and the subsequent, corollary buying lull. That period aside, the inflation rate was not affected by velocity changes but was powerfully affected by money growth lagged two years. The impact of lagged money growth is shown by its coefficients in the Table 4 data. That velocity played no further role is shown by inspection of Exhibit 7 (page 36) which graphs percentage changes in M–1's GNP velocity quarterly from year earlier quarters in the 1948–1975 period. Moreover, adding velocity to the independent variables in the 1947–1975 regression did not provide added explanatory power.

The full result of this regression is: CPIYP=

Constant	+	M1YP (t-2)	+	Dummy	+	Velocity
[1] .525 (.689)		[2] .906 (.101)		[2] 7.838 (1.698)		[1] .160 (.134)

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Adj R^2=0.771; SE=1.725; DW=1.545. Standard errors are in parentheses below the coefficients.

Series–2 and 3.—Series 2 of Table 4 introduces the role played by percentage changes in import prices. As noted above, import price changes were weighted by the ratio of current dollar imports to current dollar gross national product or GNP. Weighting was required because imports have fluctuated relative to GNP, tending on average to rise. The same percentage increase in import prices today is more important than in years past.[9]

Series 3 of Table 4 introduces the effect of the momentum of past inflation on present inflation. The momentum of past inflation is measured by the change last year in the CPI inflation rate from the year before.

Both of these new variables have a significant impact on inflation. As shown by the Series 3 results, *in combination,*

- M–1 growth lagged 2 years,
- Korean War buying trends,
- last year's change in the rate of inflation, and
- this year's change in weighted import prices

explain 90% of year-to-year changes in the CPI in the 1947–1975 period, 89% in the 1951–1975 and 1956–1975 periods and 84% in the 1947–1970 period.

The Series 3 regressions also quantify the separate contributions of the independent or explanatory variables. In regard to 1947–1975,

- On average, a 1% per year increase in money growth increased the rate of inflation by .643% two years later. Put another way, on average, a 1½% increase in money growth increased inflation by 1% per year two years later.
- The Korean War buying spree added 6% to the CPI in 1951. The subsequent corollary buying lull damped inflation by 2.3% in 1953, 2.9% in 1954, and 1.7% in 1955.
- The change in the rate of inflation one year tended to be carried over to the next year with roughly ¼ power. For example, the 4.8% jump in the rate of inflation in 1974 generated a further rise in the CPI of 1.2% in 1975.
- On average, import price rises (weighted by imports as a percent of GNP) increased the CPI inflation rate by a multiple of 1.4. However, subtracting one standard error reduces the coefficient to 1.1. The result, in other words, does not refute the hypothesis that percentage changes in import prices (weighted by the ratio of imports to GNP) cause roughly proportional changes in U.S. consumers' prices—percent for percent.

[9] In most years, the percentage change in weighted import prices was very small. Exceptions were 1974 when a 43% rise in import prices produces a 4.2% rise in the weighted variable; 1973 when the unweighted and weighted increases were 18% and 1.3%, respectively; 1951 when they were 21% and 1%; 1975 when they were 10.5% and .9%; and 1947 and 1948 when the weighted increases were .6%. In all other years, including those when import prices fell the weighted change was less than ½%. In nineteen cases it was less than .2%.

These results do not depend on our viewing the Korean War buying spree as later reversed. Using a dummy=1 in 1951 and 0 in all other years, i.e., ignoring all secondary effects of the Korean War buying spree, changes the 1947–1975 equation only marginally, as follows, CPIYP=

Constant	+	M1YP(t-2)	+	Dummy	+	PIMYPW	+	[CPIYP(t-1)−CPIYP(t-2)]
[1] .343 (.446)		[2] .615 (.095)		[2] 6.121 (1.517)		[2] 1.510 (.337)		[2] .310 (.083)

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Adj R^2=.861; SE=1.342; DW=1.945. Standard errors are in parentheses below the coefficients.

TABLE 5

To further check the inflationary impact of changes in import prices, we constructed an index of consumers' prices purged of import prices and related yearly percentage changes in this index to the independent variables of Series 3. The results are reported in Table 5.[10]

TABLE 5

REGRESSION COEFFICIENTS AND STANDARD ERRORS

Dependent variable: DCPIYP; yearly percentage change in domestic prices.

Independent variables: As specified in Table 4.

	1947–75 (n=29)	1956–75 (n=20)	1947–70 (n=24)
Series 1 (DCPIYP):			
Constant	[1] 1.485 (.435)	[1] 1.665 (.560)	[1] 1.436 (.384)
M1YP (t-2)	[2] .701 (.099)	[2] .630 (.159)	[2] .685 (.086)
Dummy	[2] 6.309 (1.314)	--------	[2] 6.493 (1.116)
PIMYPW	[1] .052 (.350)	[1] −.217 (.354)	--------
[CPIYP (t-1)−CPIYP (t-2)]	[2] .280 (.088)	[2] .695 (.207)	[2] .212 (.081)
Adj R^2	.828	.744	.853
SE	1.366	1.204	1.202
DW	2.214	2.204	2.283

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

[10] As a matter of logic, if the proportionality hypothesis is valid, domestic prices on average, will be unaffected by changes in import prices. The only other possibilities are that domestic prices will (1) fall or (2) rise. The rationale for asserting they will fall is that, by assumption, our demand for imported input such as sugar and oil is insensitive to price, and hence when import prices rise, we have less to spend on domestic goods and so their prices must fall. The usual assumption underlying the more widely believed hypothesis that domestic prices will rise is that prices equal costs plus a standard percentage mark-up. Thus as imported input are processed into final goods, prices rise higher and higher percentagewise at every stage in the process.

The cost plus thesis is illustrated by the following example. Panel A shows initial costs, percentage of mark-ups and sales prices in a four stage production process. Panel B shows costs and sales prices, using the same mark-ups, following a $2 rise in costs at Stage 1. Under cost plus pricing, a $2 rise in costs at Stage 1 generates a $7.50 price rise in final goods.

Panel and Stage Number	Costs	Percent markup	Sales price
Panel A:			
1	$10	50	$15.00
2	15	33⅓	20.00
3	20	50	30.00
4	30	25	37.50
Panel B:			
1	$12	50	18.00
2	18	33⅓	24.00
3	24	50	36.00
4	36	25	45.00

Our test tends to confirm the proportionality hypothesis. As reported in Table 5, domestic prices are unaffected by changes in import prices. This conclusion follows since none of the coefficients on the percentage change in import prices differs significantly from zero. It also is noteworthy that the coefficients on the other variables in the Table 5 regressions are about the same as the corresponding coefficients in Series 3 of Table 4.[11] The significance of the latter is that import prices might best be regarded as exogenous and used only to explain that part of our inflation experience which other variables cannot explain.

Table 6

Subperiods

The Table 4 Series 2 and 3 regressions for the subperiods provide two noteworthy results. First, the coefficient on the change in last year's inflation rate did not differ significantly from zero in 1951–1975. Second, in the 1956–1975 period, the coefficient on this same variable was relatively high and that on M–1 growth relatively low. The 1956–1975 statistics are the more interesting. The insignificance of the coefficient on inflation's momentum in 1951–1975 reflects only that last year's change in inflation played little role in wage and price decisions during the Korean War period. As already noted, decisions then were based on memories of World War II, rather than on occurrences of the most recent past.

The 1956–1975 coefficients on the other hand, are suggestive of a structural change affecting inflation momentum and the timing and/or force of the impact of money growth on inflation. Such a change would be disturbing if it has occurred. It woud mean the full period (1947–1975) coefficients are unreliable forecasters. There is, however, an alternative explanation for the 1956–1975 results. Inspection of Exhibits 4 and 4(a) reveals large offsetting errors in inflation rates predicted by 1959 and 1960 money supply changes. These misses are not totally unexpected because the swings in money supply in that period were unusually sharp and short, distorting the yearly statistics more than usually. The sharp run-up in M–1 growth reflected in the 1959 statistic, started in April, 1958, and was over a year later. The second half of 1959 was marked by negative money growth—a decrease in money supply. The fall in money supply continued into the first half of 1960, after which there was another sharp reversal—this time up.[12]

Inspecting Exhibits 4 and 4(a), it would appear that what happened to prices in 1961 and 1962, viewed together, or averaged, is reasonably well predicted by average M–1 growth in 1959 and 1960. To further test this hypothesis, we computed regressions for both 1947–1975 and 1956–1975 in which a dummy was used equal to 1 in 1961 and −1 in 1962. The results are set forth in Table 6. They provide added support for the view that the 1959 and 1960 M–1 statistics are predictably bad forecasters of later inflation because of the sharp intra-year changes in M–1 growth that occurred in 1959 and 1960. As a corollary, the Table 6 results also indicate that we can reject the hypothesis that there has been a structural change in the relationship of inflation to money supply. Taking into account the ephemeral nature of the sharp zig-zag in money growth in 1959–1960, the 1956–1975 coefficient on lagged money growth is shown to be almost identical to the 1947–1975 coefficient.

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[11] Twelve of the 13 coefficients in Table 5 are within one standard error of their values in the corresponding time period in Series 3 of Table 4. The exception is the coefficient on the inflation momentum variable for 1956–1975. This is 1.2 standard errors larger in Table 5 than in Table 4.

[12] In summary, M–1 rose sharply from $136.4 billion in April, 1958, to $143.3 billion a year later, reached $144.9 billion in July, 1959, and then dropped to $143.4 billion in December, 1959, and $142.6 billion in May, 1960. After May, it again increased and reached $144.2 billion in December 1960.

TABLE 6

REGRESSION COEFFICIENTS AND STANDARD ERRORS

Dependent variable: CPIYP.
New independent variables 1961–1962 dummy; 1961=1, 1962=−1.

	1947–75 (n=29)	1956–75 (n=20)
Constant	[1] .445	[1] .546
	(.355)	(.394)
M1YP (t–2)	[2] .664	[2] .630
	(.081)	(.113)
Korean war dummy	[2] 6.107	
	(1.063)	
PIMYPW	[2] 1.382	[2] 1.179
	(.283)	(.243)
[CPIYP (t–1)—CPIYP (t–2)]	[2] .244	[2] .457
	(.071)	(.139)
1961–62 dummy	[1] −1.516	[2] −1.553
	(.793)	(.608)
Adj R^2	.906	.915
SE	1.104	.811
DW	2.321	1.461

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

We also tested whether the inflation-money supply lag structure has changed by computing regressions for 1947–1975 and 1956–1975 using M1YP at (t–1) and (t–3) as well as at (t–2), together with the other variables of the Table 6 regressions. The coefficients on money (M1YP) are set forth below together with their standard errors. They show that the average lag remains 2 years. We conclude then that there has been no change in force or timing of the impact of money growth on inflation.

	1947–75	1956–75
M1YP(t–1)	[1] .161	[1] .242
	(.137)	(.150)
M1YP(t–2)	[2] .470	[2] .375
	(.148)	(.180)
M1YP(t–3)	[1] .124	[1] .094
	(.090)	(.144)

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

In regard to the structure of inflation momentum, however, the Table 6 results confirm that for the period since 1956, the carry-over of last year's change in the inflation rate to the current year is closer to ½ than to ¼. Our guess is that this reflects only that the full period result, ¼, was reduced by behavior during the Korean War, though we cannot dismiss the possibility that the scope of administered pricing and collective bargaining has increased in recent decades.

TABLE 7

The regressions reported in Table 7 add so-called real variables to the equations reported in Series 3 of Table 4. They were used singly, not in combination.

Series 1 of Table 7 adds the yearly percentage change in the industrial production index from the preceding year, in the 1947–1975 and 1956–1975 periods, and alternatively, the yearly percentage change in real GNP in the 1947–1975 period. No additional predictive or explanatory power was gained by adding these variables to the analysis. The coefficients on the new variables did not differ significantly from zero. They were dropped.

Series 2 added the change in the yearly average unemployment rate from a year ago, in the 1947–1975 and 1956–1975 periods, and alternatively, the yearly average unemployment rate itself in 1947–1975. The tabulated results show that inflation was not related to current levels or changes in unemployment in our sample period. Nor did lagging unemployment help explain inflation.

TABLE 7

REGRESSION COEFFICIENTS AND STANDARD ERRORS

Dependent variable: CPIYP.

New independent variables: IPYP; yearly percentage change in the industrial production index. *GNPPCON;* yearly percentage change in GNP measured in constant dollars. *UNY;* yearly average of unemployment. *UNY–UNY(t–1);* change last year to this year in the average unemployment rate.

	1947–75 (n=29)	1956–75 (n=20)	1947–75 (n=29)
Series 1:			
Constant	[1] .361	[1] 1.001	[1] .360
	(.403)	(.577)	(.615)
M1YP (t–2)	[2] .641	[2] .531	[2] .655
	(.083)	(.129)	(.092)
Dummy	[2] 5.795	--------	[2] 5.863
	(1.125)	--------	(1.193)
PIMYPW	[2] 1.424	[2] 1.320	[2] 1.423
	(.296)	(.289)	(.306)
[CPIYP (t–1)−] / [CPIYP (t–2)]	[2] .265	[1] .388	[2] .255
	(.076)	(.264)	(.078)
IPYP	.038	[1] −.029	--------
	(.036)	(.063)	--------
GNPPCON	--------	--------	[1] .036
	--------	--------	(.100)
Adj R^2	.898	.879	.894
SE	1.151	.968	1.175
DW	2.313	2.167	2.430
Series 2:			
Constant	[1] .500	[1] .848	[1] .900
	(.374)	(.465)	(.957)
M1YP (t–2)	[2] .656	[2] .534	[2] .640
	(.087)	(.132)	(.085)
Dummy	[2] 5.775	--------	[2] 5.929
	(1.164)	--------	(1.142)
PIMYPW	[2] 1.403	[2] 1.306	[2] 1.426
	(.299)	(.297)	(.306)
[CPIYP (t–1)−] / [CPIYP (t–2)]	[2] .250	[1] .446	[2] .247
	(.075)	(.226)	(.076)
UNY–UNY (t–1)	[1] −.142	.038	--------
	(.199)	(.302)	--------
UNY	--------	--------	[2] −.074
	--------	--------	(.179)
Adj R^2	.895	.878	.894
SE	1.165	.974	1.174
DW	2.373	2.151	2.479

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

Moreover, our results indicate that levels and changes in unemployment and production did not affect the relationship of inflation to money supply in the post World War II period. The coefficients on M–1 growth lagged 2 years in the regressions reported in Table 7 are virtually the same as in the regressions reported in Series 3 of Table 4. It would appear, as Mr. Pierce indicated in his testimony, that during the post World War II period, our economy has been close enough to full employment on average for money growth changes to be absorbed (after a lag) primarily in changes in the rate of inflation. We would caution, however, as the testimony did, that with sufficient unemployment, the relationship breaks down. Experience in the middle and late 1930's indicates that when unemployment exceeds 15% of the labor force, annual M–1 growth can average nearly 10% for 4 to 5 years without substantially increasing prices. We would like to know more about these trade-offs but (fortunately) our economy, excepting possibly in 1975 and 1976, has operated too close to full employment since the 1930's to permit gaining more insight.

Finally, it is worth briefly exploring why we failed to find a significant relationship between inflation and the "real" economy. The reason, we believe, is that the real economy affects prices in two distinct but opposite ways. First, when production and employment increase, prices tend to fall as increased supplies compete for the same monetary resources. Offsetting this effect, however, is that when production and employment increase, labor and materials markets tighten and prices tend to rise because the same monetary resources must compete for increasingly scarce supplies of labor and materials.

Similar offsets occur in recessions. Directly, reduced production and supplies tend to increase prices. Indirectly, reduced production loosens labor and materials markets, which in turn, acts to cause prices to fall.

The Table 7 results with respect to output and unemployment reflect these offsets. In both the full 1947–1975 period and the 1956–1975 subperiod, the downward impact on the CPI of increases in the supply of output tended to be offset by the fact that markets tighten and costs and prices rise as output expands. Conversely, the inflationary impact of output decreases were offset by deflationary effects of markets loosening in recessions as production falls.

Table 8

Table 8 reports the results of regressions which added the deficit to the explanatory variables of Series 3 Table 4. Following suggestions made by the Federal Reserve, we used the so-called "High Employment deficit" measured as a % of potential GNP. Scaling was necessary because $1 billion deficit today is not the same as ten and twenty years ago. We also tried the actual deficit as a % of potential GNP. The High Employment deficit series was provided to us by staff of the Federal Reserve for 1952–1975. We restricted our analysis to this subperiod.

The results that were obtained using the High Employment deficit lagged two years in respect to CPI changes are given in Series 1. The results that were obtained using the actual deficit (also lagged two years) are tabulated in Series 2. Neither of the deficit variables was significant. We also tried the High Employment deficit concurrently and at lags of one and three years in respect to CPI changes. The results of these experiments differ only marginally from those reported in Table 8 Series 1.

Table 8

Regression Coefficients and Standard Errors

Dependent variable: CPIYP.

New independent variables: BY(t–2), the High Employment deficit as a % of potential GNP two years ago. *B1(t–2):* the actual Federal deficit, as a % of current dollar GNP, lagged two years. Following convention, deficits were entered as positive numbers, surpluses as negative numbers.

Series 1:	*1954–75 (n=22)*
Constant	[2] 1.087
	(.491)
M1YP(t–2)	[2] .520
	(122)
Dummy	[2] 7.290
	(2.141)
PIMYPW	[2] 1.203
	(.278)
[CPIYP(t–1)–CPIYP(t–2)]	[2] .469
	(.156)
BY(t–2)	[1] .385
	(.326)
Adj R^2	.897
SE	.915
DW	2.336

TABLE 8.—Continued

Series 2:	1954–75 (n=22)
Constant	[1] .794
	(.427)
M1YP(t–2)	[2] .536
	(.123)
Dummy	[2] 6.227
	(1.908)
PIMYPW	[2] 1.192
	(.299)
[CPIYP(t–1)–CPIYP)t–2)]	[2] .522
	(.181)
B1(t–2)	[1] .194
	.242
Adj R^2	.893
SE	.932
DW	2.124

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

In analyzing the effects of public policy on inflation, attention usually is focused on the role played by deficits. It often is asserted and is widely believed that deficits are the principal cause of inflation. For example, Federal Reserve Board Chairman Arthur Burns, testifying before the full Committee last April declared:

> The fact is that the inflation started in the mid-1960's and was mainly caused by the large deficits, continued year after year, in the Federal budget. As a result of the excess demand created by a persistently loose fiscal policy, a spiral of wages and prices got under way in the private sector and the rate of inflation began to quicken.[13]

Our results refute the hypothesis that deficits, actual or High Employment, directly cause inflation. This is not surprising in the case of actual deficits for actual deficits reflect induced as well as purposeful elements. This clouds the relationship of actual deficits and inflation. As Mr. Perry testified—

> Big swings in the budget are largely induced swings. They are not changes that represent active movements in the budget designed to move the economy in a particular way. Rather, they reflect the automatic stabilizers of the budget. . . . So the budget deficits as actually experienced mirror the health or lack of it in the economy . . . they don't show the sort of correlation the public frequently imagines between inflation and deficits.

A different reason why actual deficits do not show up concurrently or later in higher inflation is that, *given the stock of money*, financing Government deficit spending by selling securities tends to cause compensating changes in private deficit spending. New Government borrowing "crowds out" private spending, and conversely, surpluses "fund" the private sector. Actual Government deficits will raise consumers' prices only to the extent that Government borrowing is financed abroad, or finances more consumption relative to investment than the private borrowing it replaces.

Neither the crowding out or automatic stabilizer arguments can be used, however, to explain why we did not find a significant inflationary impact in the case of High Employment deficits. The High Employment deficit is computed by eliminating induced elements from the actual deficit. Its relationship to inflation should not be clouded by the automatic tendency to run deficits in recessions and surpluses in inflation periods. Similarly, because actual borrowing bears little relationship to the High Employment deficit, the crowding out thesis can't be applied to the High Employment deficit. In 1974, for example, the High Employment budget showed a surplus of $25.4 billion while the actual budget was $11.7 billion in deficit. The puzzle is further complicated because, as will be discussed in the next part of the report, the High Employment deficit expressed as a percent of potential GNP, has a small, marginally significant effect on real GNP in the same year. Why then isn't the High Employment deficit a significant inflationary force? [14] Frankly, this

[13] Honorable Arthur F. Burns, Statement before the Committee on Banking, Currency and Housing, April 9, 1976 p. 5.

[14] As shown by the results in Series 1 in Table 8, the coefficient has the right sign but is less than twice its standard error, and hence must be regarded as not statistically different from zero. Deducting one standard error yields an inflationary effect only .06% for each 1% the High Employment deficit is of potential GNP.

puzzle remains to be solved. At the moment we can only provide a plausible speculation. To wit, deficits that would be run were the economy operating at high employment, are self correcting. Immediately, they can stimulate production either directly by purchases (to order) of new goods and services, or indirectly by reducing existing tax disincentives to work and investment. However, to the extent that the economy would be stimulated by these High Employment deficits, government revenues will rise and they will change into surpluses. Moreover, under the current tax rate structure, the reversal will happen very quickly in inflation. The result is that High Employment fiscal stimulus, holding the money supply constant, peters out before enough time can pass for prices to respond.

Actual deficits financed by creating new money are another matter. In this case, there is crowding out not only in financial markets, but in goods and services markets. Prices are bid up directly. We have, therefore, some sympathy for Chairman Burns' remarks. Deficits can create enormous problems for the Federal Reserve, and be transmitted to the CPI through Federal Reserve money supply policies. Definitely, this has happened at some points in the past. As Governor Partee told the Subcommittee:

> I think we must recognize that the Federal deficit's inflationary effect may well show up in monetary policy, in the monetary aggregates, because a large Federal deficit will, other things being equal, put substantial upward pressure on interest rates and it will tend to induce a faster rate of monetary expansion just in order to hold the system together. Therefore, a large Federal deficit may—not as a deliberate matter, and not because the Secretary of the Treasury says it must be so—it may give you a higher monetary growth rate, and then the monetary growth rate is later reflected in inflation.

The point, in short, is that M–1 growth is our economy's inflation conductor. To the extent that large deficits (actual) have compelled the Federal Reserve to accelerate M–1 growth in the past, as Governor Partee states, then, in some ultimate or first-cause sense, inflation is "mainly caused by the large deficits," as Chairman Burns asserts. However, the chain of causation from deficits to accelerated money growth to inflation contains weak links both as a matter of history and logic, as discussed next.

As a matter of historical record, years of large M–1 growth are not always years when deficits are large (relative to GNP). For example, in 1973, M–1 growth was 7.46%, higher than any other year in the 1952–1975 period, although the deficit was only ½ of 1% of GNP. (For the entire 1952–1975 period, the deficit averaged 1% of GNP.) In 1969, M–1 growth was 6.02%, fourth highest in the 1952–1975 period, although the budget was in surplus. Moreover, large deficits are not always associated with rapid M–1 growth. By far the largest deficit occurred in 1975 when M–1 growth averaged only 4.25%. Another large deficit occurred in 1958 when M–1 growth was only 3.05%. Thus there is strong evidence both that rapid money growth can occur in the presence of moderate and small deficits and even surpluses, and that large deficits need not lead to rapid money growth. Finally, as a matter of logic, there is no reason why the Federal Reserve's money policy should be shaped in any substantial way by the size of the Treasury's deficits. There is no statute requiring that the Fed accommodate or ease the Treasury's financing problems, and the evidence strongly indicates it shouldn't.

Predictions

The behavior of economic variables is determined by the joint and simultaneous operation of a number of economic relations. Our model, though admittedly a simplification of the complexities of reality, captures the crucial features of the inflation process. From the understanding that the model gives of the system, we may predict the future course of inflation, and possibly also control it to improve economic performance and welfare. For example, the regression that covers 1947–1975 which is reported in Series 3 of Table 4 may be applied. It closely tracks our inflation experience, year to year, throughout the post World War II period using only four explanatory variables, viz.

- M–1 growth 2 years earlier,
- Korean War buying trends,
- Import price changes, and
- The momentum of past inflation.

Exhibit 5 graphs year-to-year percentage changes in the CPI predicted by this equation and actual CPI percentage changes during the 1947–1975 period. The predicted and actual CPI inflation rates also are tabulated in Table 9 along with the differences between them from year to year.

TABLE 9.—PREDICTED AND ACTUAL INFLATION RATES USING THE 1947–75 SERIES 3 TABLE 4 REGRESSION

	CPIYP [1]	Predict [2]	Diff [3]	Diff 2 [4]
Year				
1947	14.47	13.65	.82	.67
1948	7.67	6.94	.73	.53
1949	.99	1.63	−2.62	6.88
1950	1.06	−.87	1.94	3.75
1951	7.94	7.75	.19	.04
1952	2.28	3.63	−1.35	1.81
1953	.77	−.52	1.30	1.68
1954	.35	.59	−.24	.06
1955	.26	.29	−.55	.30
1956	1.47	1.48	−.01	.00
1957	3.40	3.12	.27	.07
1958	2.73	1.52	1.21	1.47
1959	.92	.65	.28	.08
1960	1.51	.92	.59	.34
1961	1.07	3.09	−2.02	4.08
1962	1.17	.22	.95	.90
1963	1.25	2.00	−.75	.57
1964	1.32	2.11	−.79	.63
1965	1.59	2.49	−.90	.82
1966	2.99	3.33	−.34	.11
1967	2.78	3.68	−.90	.81
1968	4.21	3.55	.66	.44
1969	5.42	3.68	1.74	3.03
1970	5.90	6.00	−.10	.01
1971	4.26	4.94	−.68	.47
1972	3.31	3.24	.06	.00
1973	6.22	6.47	−.25	.06
1974	11.04	11.69	−.65	.42
1975	9.13	7.76	1.37	1.88
1976	------	------	------	------
Minimum	------	------	−2.62	.00
Maximum	------	------	1.94	6.88
Mean	------	------	−.00	1.10
Standard deviation	------	------	1.07	1.56

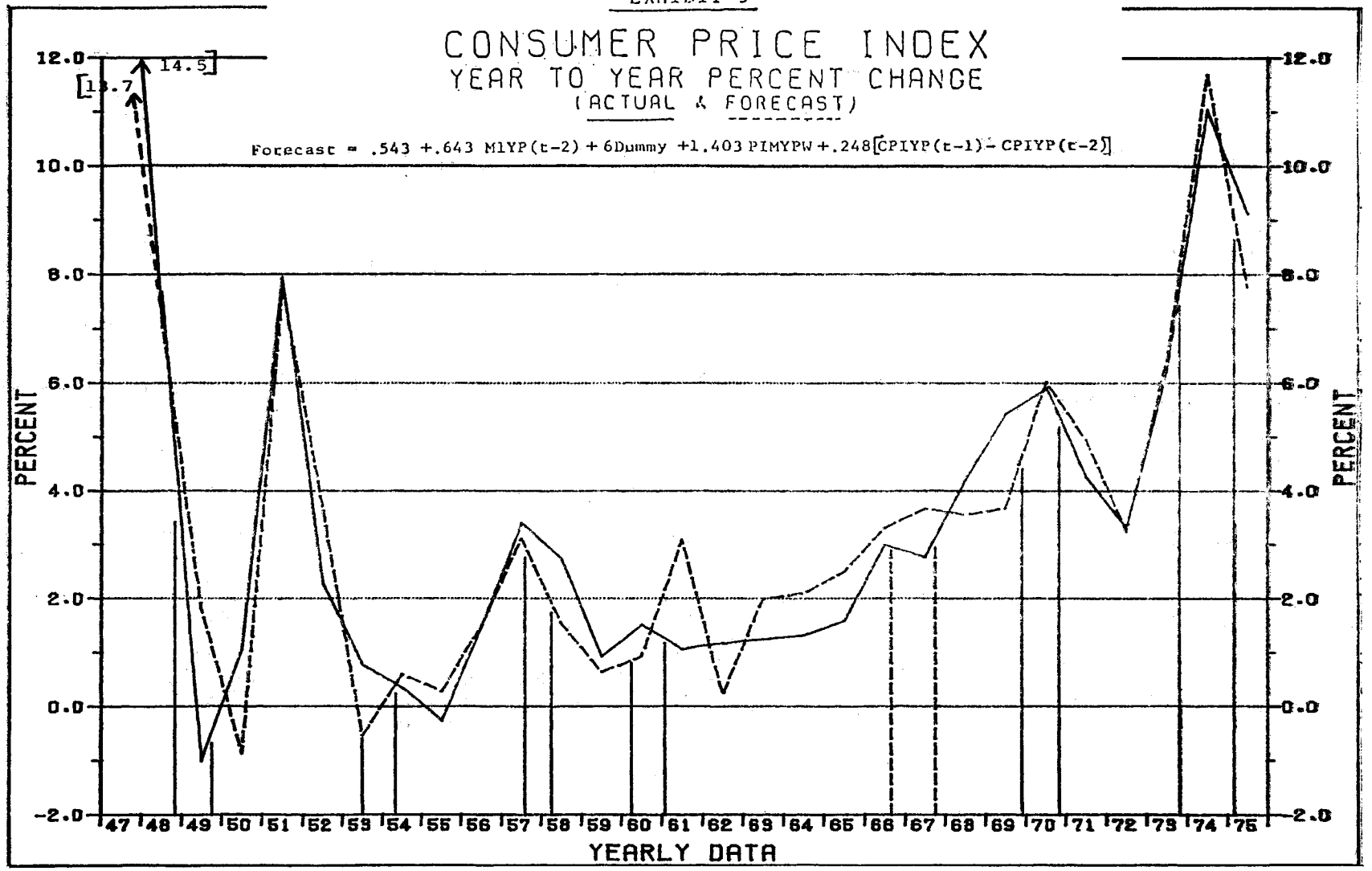
[1] Yearly average, CPI, percent change.
[2] .535+0.643×M1YP(t-2)+6×dummy+1.403×PIMYPW +0.248×[CPIYP(t−1)—CPIYP(t−2)].
[3] CPIYP—Predict.
[4] Diff×Diff.

The single largest error or difference occurs in 1949 when the equation overpredicts inflation by 2.62%. The reason for the overprediction is that 1949 was marked by sharp increases in agricultural and raw materials supplies which generated substantial exogenous and unpredictable downward pressure on the food and apparel and upkeep components of the CPI. These components fell 4% and 3.8% respectively, in 1949.

Further examination of the differences between actual and predicted inflation rates reveals no other years when exogenous supply changes played a major role in our post World War II inflation experience. Nor does such analysis provide evidence that administered pricing or collective bargaining exerted upward pressure on prices separate from the roles they play in generating inflation momentum, which is captured by the regression coefficient on last year's change in the inflation rate. On the other hand, the wage-price freeze in 1971 undoubtedly helps to account for overpredicting inflation that year. Also the persistent pattern of overpredictions from 1963 to 1967, averaging .75% per year, is consistent with the view that the Kennedy-Johnson Administration guidelines served to damp (or repress) inflation. We would caution, however, that the apparent success of the guidelines may have been due to the relatively low inflation base in the immediately prior years (1959–1962). Guidelines may be more difficult to implement successfully today because recent inflationary experience probably has made all of us less receptive to White House requests to hold the line on wages and prices.

As observed earlier, our results should not be judged by how well they explain individual years. They must be looked at as statements of average tendencies over the long haul, and judged by their overall or average predictive power. Only time will tell whether our regressions will predict and track future inflation as well as they approximate past inflation. Naturally, our bet is that they will.

EXHIBIT 5



Lines from the time axis delineate recession periods.

In this regard, it is important to stress that although our regressions can be used to predict ahead, any forecasts made with them are conditional and subject to a known range of error. Using the 1947–1975 Series 3 Table 4 regression to predict the CPI inflation rate in say 1980 we must know the percentage change in weighted import prices that year, the change in the CPI inflation rate between 1978 and 1979, and the percentage growth in M–1 in 1978. For 1976, we need M–1 growth of 1974 and the change in the inflation rate between 1974 and 1975, both of which are available now, and the change in weighted import prices in 1976 which is not. For next year (1977), only M–1 growth now is in hand. In using our regressions to forecast next year's inflation rate, however, we would also caution that the M-1 growth statistics now published for 1975 are likely to be revised upwards by about .6%.

Using the 1947–1975 cornerstone Series 3 Table 4 regression, and guessing that weighted import prices will rise ½% this year over 1975, our bold or precise estimate is that the CPI will average 4.3% higher in 1976 than in 1975. We are, moreover, 95% confident that the increase will range between 2% and 6.6% and would bet 2 to 1 that the rise in prices will range between 3.1 and 5.5%.[15] At the moment, it appears that the increases will be near the top of our 2 to 1 confidence interval. Assuming that this year's increase turns out to be 5.5%, and import prices (weighted) rise 1% in 1977, our 2 to 1 bet for 1977 is for inflation to taper off further to 3.8% plus or minus 1.2%.

Other equations might be used to predict future inflation. One is an adjusted version of the 1947–1970 Table 5 regression. The adjustment involves adding the change in weighted import prices to the regression forecast to obtain the final forecast.

The rationale for using this procedure is that, as previously discussed, our results tend to confirm the hypothesis that on balance domestic prices are not substantially affected by changes in import prices. This being true, it follows that import price changes can be regarded as exogenous and operating to cause the CPI to change exactly in proportion to the change in weighted import prices. We now know that import prices can affect the CPI (though not domestic prices). Using this knowledge together with the adjusted 1947–1970 Table 5 regression in the 1971–1975 subperiod, provides a post sample test of the usefulness of our results for forecasting purposes. Predicted inflation rates using this procedure are given in Table 10 along with actual CPI inflation for the 1971–1975 post-regression period. Also given are forecasts for 1976 and 1977, the former assuming weighted import prices rise only ½% this year, and the latter assuming a 1% increase in 1977, and that 1976 inflation equals 5.5%. Inspection of the 1971–1975 predictions reveals that this equation is useful for forecasting purposes now that we know substantially the role played by import prices.[16]

TABLE 10.—ACTUAL INFLATION RATES AND PREDICTIONS USING THE ADJUSTED 1947–70 TABLE 5 REGRESSION

	Actual	Predicted	Difference
1971	4.26	4.96	−.70
1972	3.31	3.18	.13
1973	6.22	6.15	.07
1974	11.04	10.08	.96
1975	9.13	7.45	1.68
1976	------	[1] 4.3	------
1977	------	[2] 3.6	------
Mean square error			.85

[1] The 95 percent confidence limits are 2 to 6.6 percent. It is a 2 to 1 bet that the CPI increase will range between 3.2 and 5.4 percent.
[2] The 95 percent confidence limits are 1.2 to 6 percent. The odds are 2 to 1 that the increase will range between 2.4 and 4.8 percent.

[15] The 95% confidence range equals the precise estimate (4.3%) plus and minus two regression standard errors (1.15%). The 2 to 1 limits=4.3% plus and minus 1.2%.

[16] As was discussed earlier, the momentum of a change in inflation last year probably carries over to the current year with greater force than the .212 estimated by the 1947–1970 Table 5 regression. We are confident that the true value of the carry-over coefficient lies between .2 and .5, and would give odds that it is between .3 and .4. In most years, it does not matter very much whether the carry-over coefficient is .2 or .5. In recent years, however, the inflation rate has jumped up and down enough for it to matter very much whether momentum equals .2 or .5. Using .35 to estimate the carry-over, for example, increases predicted inflation rates in 1971, 1974 and 1975 to 5.03, 10.49 and 8.12 percents respectively, and decreases them to 2.96, 6.02, 4.00 and 2.63 percents in 1972, 1973, 1976 and 1977. For the 1971–1975 period, the mean square error is .42, which is substantially better than obtained using the adjusted 1947–1970 Table 5 regression. However, the comparison may not prove so favorable to the higher carry-over assumption after the results for 1976 and 1977 are known. Time and further research are needed to find a carry-over coefficient whose value we can be confident about.

CONTRIBUTIONS

Finally, we set forth in Table 11 the specific yearly contributions to inflation in the 1947–1975 period of lagged M–1 growth, import prices, the momentum of past inflation and the Korean War buying spree as assigned by the cornerstone regression covering 1947–1975, which is reported in Series 3 of Table 4, and the adjusted Table 5 regression for 1947–1970. These data show that M–1 growth is the key to understanding and controlling inflation. In specific,

- M–1 growth in excess of our economy's potential to increase production can cause inflation by itself.
- Virulent inflation can't endure without corresponding M–1 growth.
- Inflation will persist and gain momentum no matter how it starts if it is accommodated by M–1 growth in excess of our economy's potential to increase production.

During the 1947–1975 period, we experienced four separate waves of inflation—1947–1948, 1951, 1966–1971, and 1973–1975. The first had its roots in World War II. It subsided rapidly because M–1 growth declined rapidly after 1945. The second was triggered by the Korean War. It lasted only a year because M–1 growth was not rapid enough to sustain it. The third wave of inflation began to build up with escalation of the Vietnam War in the middle 1960's. It gained momentum throughout the late 1960's, peaked in 1971 and quickly tapered off. The course of the Vietnam War inflation was almost entirely predictable by looking at past M–1 growth.

TABLE 11.—CONTRIBUTIONS TO INFLATION, 1947–75

Year	M1YP (t-2)		Dummy		Import prices		Inflation carryover	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1947	10.49	11.15	0	0	1.09	0.78	1.54	1.31
1948	4.42	4.99	0	0	.50	.36	1.49	1.27
1949	3.05	3.43	0	0	−.27	−.19	−1.69	−1.44
1950	.30	.32	0	0	.44	.32	−2.15	−1.84
1951	−.66	−.71	6.00	6.49	1.37	.97	.51	.44
1952	1.73	1.84	−.13	−.14	−.21	−.15	1.71	1.44
1953	2.86	3.05	−2.25	−2.44	−.27	−.19	−1.40	−1.20
1954	3.24	3.45	−2.89	−3.13	.09	.06	−.37	−.32
1955	1.59	1.70	−1.73	−1.87	−.01	−.01	−.10	−.09
1956	.98	1.04	0	0	.13	.09	−.15	−.13
1957	2.05	2.18	0	0	.10	.07	.43	.37
1958	.77	.82	0	0	−.25	−.18	.48	.41
1959	.34	.37	0	0	−.07	−.05	−.17	−.14
1960	.76	.81	0	0	.08	.06	−.45	−.38
1961	2.46	2.62	0	0	−.05	−.03	.14	.12
1962	−.07	−.07	0	0	−.13	−.09	−.11	−.09
1963	1.36	1.44	0	0	.08	.06	.02	.02
1964	1.41	1.50	0	0	.14	.10	.02	.02
1965	1.87	1.99	0	0	.07	.05	.02	.01
1966	2.56	2.73	0	0	.16	.11	.07	.06
1967	2.75	2.93	0	0	.03	.02	.35	.30
1968	3.00	3.19	0	0	.08	.06	−.05	−.05
1969	2.55	2.72	0	0	.23	.17	.36	.30
1970	4.60	4.90	0	0	.58	.41	.30	.26
1971	3.87	4.12	0	0	.42	.30	.12	.10
1972	2.48	2.64	0	0	.63	.45	−.41	−.35
1973	4.29	4.57	0	0	1.87	1.33	−.24	−.20
1974	4.55	4.84	0	0	5.89	4.20	.72	.62
1975	4.80	5.11	0	0	1.24	.88	1.19	1.02

Note: (1) .643×M1YP (t-2); (2) .685×M1YP (t-2); (3) 6×Dummy; (4) 6.493×Dummy; (5) 1.403×PIMYPW; (6) PIMYPW; (7) .248 ×[CPIYP (t-1)−CPIYP (t-2)]; (8) .212×[CPIYP (t-1)−CPIYP (t-2)].

As shown in Table 11, actual inflation and inflation predicted by M–1 growth moved together from 1966 to 1972 excepting only in 1969.[17]

The fourth wave of inflation began in 1973. It became exceedingly virulent in 1974 and began to subside in 1975. The pattern of this latest inflation episode (through 1975) has been dictated primarily by changes in import prices, and to a lesser extent by its own momentum. The underlying trend, on the other hand, throughout the 1973–1975 period was based on past M–1 growth. From 1971 to 1973, yearly M–1 growth ranged between 6.7% and 7.5%. These rates will accommodate so-called "steady state" or continuing yearly CPI increases averaging 4.6% to 5.1% and ranging up to 6.7%.

It is widely believed today that our underlying or base inflation rate is 6%–7%, and that other factors will increase inflation next year and in 1978 to the 8%–9% range. Our results require us to disagree on both counts. The base inflation rate may have been 6%–7% last year. Such a range can be obtained by adding the precise estimates of inflation expected as a result of 1973 M–1 growth (5.0%–5.3%) to the expected contribution from the 1974 acceleration of inflation (1.0%–1.2%) and the constant term (.4%–.5%). But that was last year. The momentum is now down not up, and furthermore, M–1 growth was reduced after 1973. Using the relevant M–1 growth (1974–1975) and taking into account that the momentum is now down, we believe that our base domestic inflation rate is now 3%–5% and will drop to the 2%–4% range in 1977. However, for 1978, using M–1 statistics now published for 1976, our analysis leads us to forecast an increase in base inflation back to the 3%–5% range because M–1 growth accelerated a little more than 1% in 1976. To the extent that currently available 1976 M–1 statistics are revised upwards, our 1978 inflation forecast will be low. Present indications are that M–1 will be revised upwards 1%–2% this year, which would require raising the prediction of base inflation in 1978 by ½% to 1%. Looking beyond 1978, our forecast is for gradual reduction of the base domestic inflation rate to the 1%–3% level, if, in contrast to 1965–1973, the Federal Reserve follows a non-inflationary course, gradually reducing money growth from the present 4½%–6½% range to 2%–4% beginning gradually in 1977 as unemployment recedes.

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[17] The relevant data are as follows:

	Actual inflation (percent)	Inflation attributable to lagged M–1 growth (percent)	
		Column 1 [1]	Column 2 [2]
Year:			
1966	2.99	2.56	2.73
1967	2.78	2.75	2.93
1968	4.21	3.00	3.19
1969	5.42	2.55	2.72
1970	5.90	4.60	4.90
1971	4.26	3.87	4.12
1972	3.31	2.48	2.64
Average	4.12	3.12	3.32
Percent of the average actual inflation rate attributable to lagged M–1 growth		75.7	81.0

[1] Source: Col. (1) of table 11.
[2] Source: Col. (2) of table 11.

PART III

Recession

Since 1947, this country has suffered through six recessions and one mini-recession. The first of these episodes began in November 1948 after the rapid and severe inflation of 1946–1948 had been broken. It ended eleven months later in October 1949. The latest episode began in November 1973, picked up force after mid-1974 and ended in March 1975. The dates and major characteristics of U.S. recessions in the 1947–1975 period are given in Table 12. To show these episodes in proper context, we also have set forth the dates and major characteristics of the great depression of 1929–1933.

Sharp prolonged decreases in money growth preceded each recession episode. Moreover, sustained monetary expansions helped to promote recovery in each case. These fundamental facts are shown in Exhibit 6. This exhibit plots percentage changes in M–1 growth between the same months from one year to the next from 1948 through September 1976, and delineates recession periods with lines from the time axis. It provides powerful graphic evidence that trends in economic activity are closely related to trends in money growth. Specifically, (1) slowing money growth sharply for any prolonged period weakens the economy and increases the risk of recession; (2) once underway, recessions are aggravated by continuing to retard money supply growth; and (3) monetary expansion in and immediately after recessions, promotes recovery. Money supply, however, is not the only determinant of economic activity.

TABLE 12.—RECESSION DATES AND MAJOR CHARACTERISTICS, 1947–75, AND THE GREAT DEPRESSION OF THE 1930's

Dates	Duration (months)	Largest 4-quarter decline in GNP		Peak unemployment	
		Percent	Terminal quarter	Rate (percent)	Date
November 1948 to October 1949	11	−1.35	1949–4	7.9	October 1949.
July 1953 to May 1954	10	−3.29	1954–2	6.1	September 1954.
July 1957 to April 1958	9	−2.5	1958–1	7.5	July 1958.
April 1960 to February 1961	10	−.55	1961–1	7.1	May 1961.
October 1966 to October 1967	12	(1)		4.0	October 1967.
December 1969 to November 1970	11	−.57	1970–4	6.1	December 1970.
November 1973 to March 1975	16	−5.63	1975–1	8.9	May 1975.

[1] Growth slowed but did not fall. It slowed from 7.70 percent for the 4 quarters ending 1965–4 to 4.29 percent in the 4 quarters ending 1966–4, and to 2.56 percent in the 4 quarters ending in both 1967–1 and 1967–2.

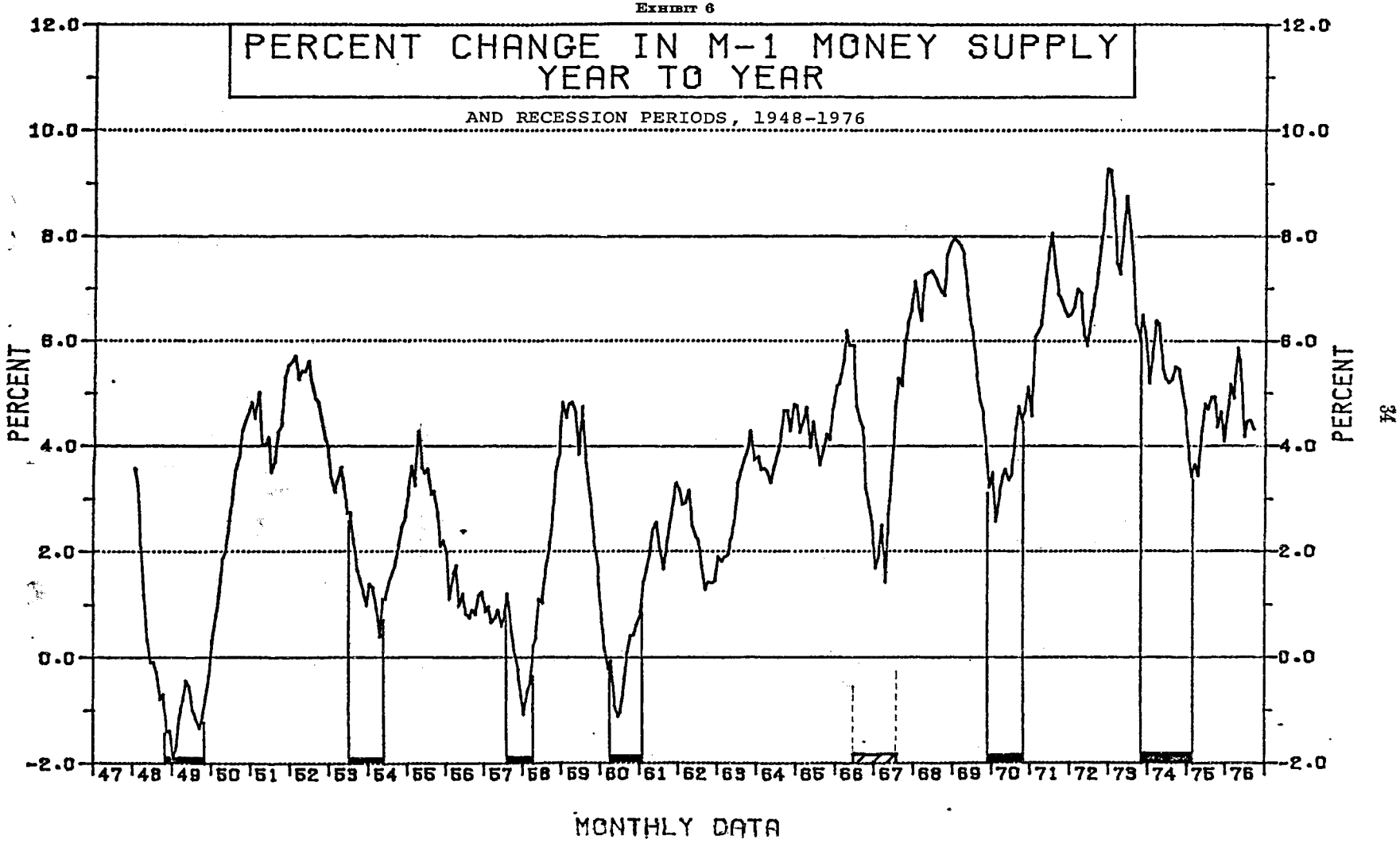
The Great Depression	Duration (months)	Largest calendar year decline		Yearly average	
		Percent	Year	Rate (percent)	Year
August 1929 to March 1933	43	[1]−13.49	1932	24.9	1933

[1] This fall followed decreases of 9.26 percent in 1930 and 7.48 percent in 1931.

Velocity

Changes in money's velocity also play an important part in recessions. Exhibit 7 charts yearly percentage changes in M–1 velocity between the same quarters from one year to the next from 1948 to 1976. As noted earlier, velocity equals current dollar GNP divided by M–1. The chart shows the extraordinary rise in velocity during the early stages of the Korean War, and a roller-coaster pattern much like that exhibited by M–1 growth thereafter. However, changes in velocity did not tilt upwards as did money growth in the late 1960's and early 1970's, when inflation was relatively high. As was observed earlier, aside from the Korean War period, price trends were not related to velocity trends. The impact of velocity changes showed up rather in changes in economic activity.

EXHIBIT 6



As depicted in Exhibit 7, changes in velocity have been pro-cyclical. The trend in velocity moved sharply down together with economic activity in every recession, though the downturns in 1969–1970 and 1973–1975 were not nearly as severe as in earlier recessions. Also in every episode, the trend in velocity changed from down to up very nearly coincident with recovery. The upturn was especially powerful in 1975, and appears to have been the dominant force underlying recovery from the 1973–1975 recession.

To obtain a more comprehensive picture of the forces at work in economic cycles, changes in velocity must be looked at in conjunction with money supply changes. Several conclusions emerge from studying Exhibits 6 and 7 together. In specific—

- Year to year money growth slowed well in advance of the recession periods, while changes in year to year velocity peaked in the same quarter that economic activity did in 1957, 1966, 1969, and 1973; and one quarter earlier in 1953 and 1960.[1] It would appear from these data that for a time rising velocity will sustain an expansion even in the face of a slowdown in money growth. Inevitably however, a sharp prolonged slowdown in money growth undermines confidence, which in turn causes the trend in velocity to peak and a recession to follow.
- Year to year money growth and velocity accelerated together at the same time that economic activity turned up in 1949, 1954 and 1975. In 1958, money growth accelerated one quarter before the trend in velocity turned from down to up and economic activity rose. In 1961, 1967 and 1970, money growth turned up well in advance of the trend in velocity and economic activity. It would appear from these data that recessions endure as long as the trend in velocity is down. However, if money growth is maintained commensurate with the economy's production potential, inevitably confidence is restored, the velocity trend bottoms, and recovery begins.

In summary, during the 1948–1975 period, the effects of money supply and velocity changes on economic activity usually have been procyclical. To their credit, Federal Reserve policymakers usually acted quickly to accelerate money growth in recessions. By repairing the economy's monetary foundation, they increased the likelihood of a strong recovery occurring when, inevitably, the trend in velocity turned up, whether by chance or because confidence inevitably returns with resumption of monetary growth. On the other hand, seven times in the past thirty years, the Fed caused or failed to prevent money growth from slowing sharply for a period long enough to undermine the economy's monetary foundation and increase the risk of recession. Moderate, stable money growth might not have prevented these recessions, but it most certainly would have greatly diminished their severity.

Determinants of Changes in Real GNP

To further our understanding of how recessions develop and end, we used linear multiple regression analysis to quantify the effects on real or constant dollar GNP of concurrent changes in money supply and the following other factors:

- Percentage changes in the CPI, and alternatively in domestic and import prices; all lagged one year.
- The change in the inflation rate last year, lagged a year, and alternatively, entered concurrently.
- Unemployment lagged one year.
- Concurrent changes in the high employment Federal deficit scaled by potential GNP.

As in the case of our inflation regressions, the data were assembled in yearly series by averaging intra-year data. Changes were measured as percentages from the year earlier average. The results are given in Table 13.

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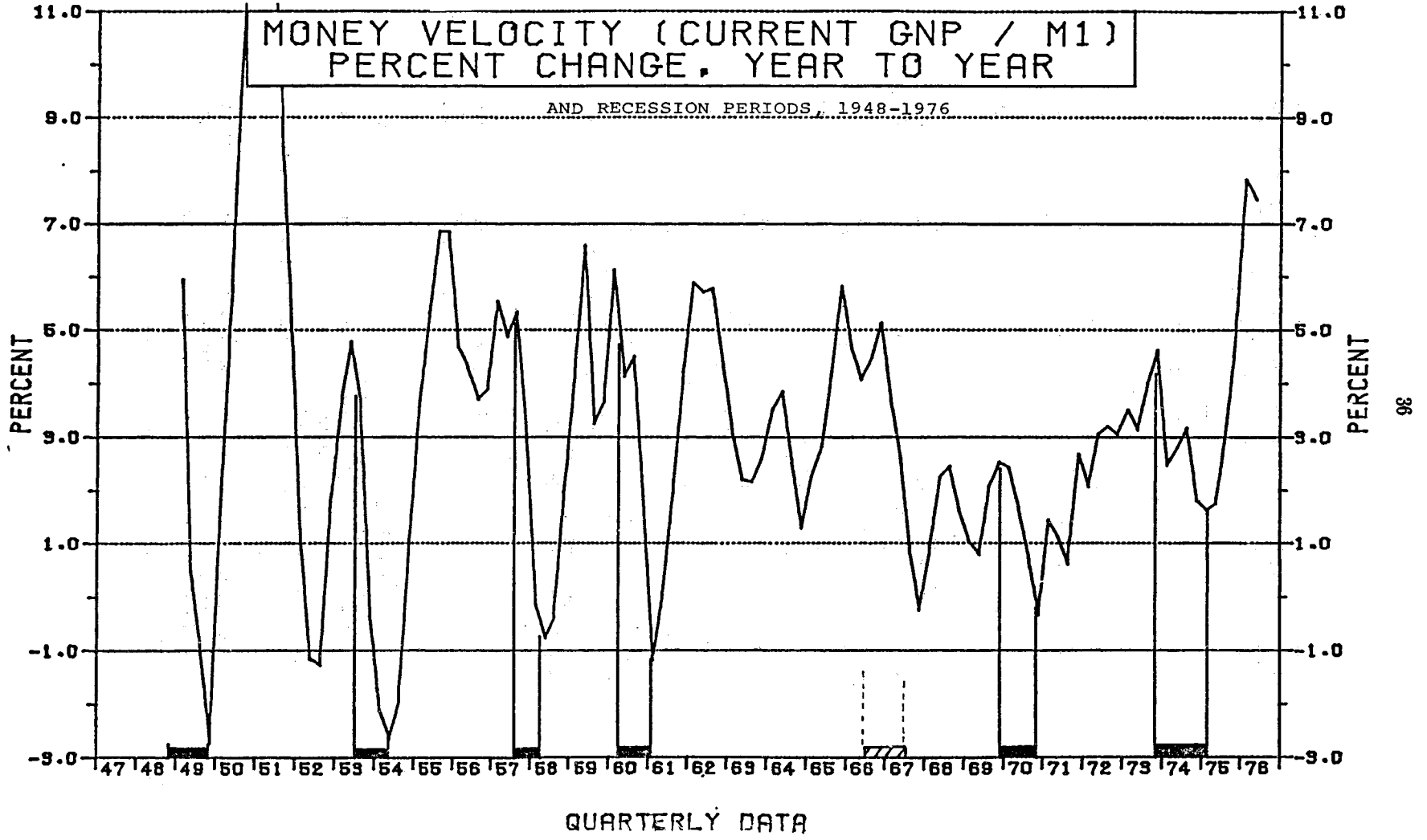
[1] Data limitations prevent determining the timing of the change in velocity's trend in relation to the 1948–1949 recession.

EXHIBIT 7



Series 1

The Series 1 Table 13 regressions relate yearly percentage changes in constant dollar GNP to (1) concurrent yearly percentage changes in M–1; (2) the yearly average unemployment rate lagged a year; (3) yearly percentage changes in the CPI lagged a year; (4) inflation momentum as measured by the change in the inflation rate last year, entered concurrently and alternatively lagged a year in relation to constant dollar GNP; and (5) the High Employment Federal deficit scaled by potential GNP and entered concurrently.

Series 2

The Series 2 Table 13 regressions replace changes in the CPI with changes in the domestic and import components of prices. The sole purpose of this series was to test whether increases in import prices cause recession as well as inflation.

TABLE 13

REGRESSION COEFFICIENTS AND STANDARD ERRORS

Dependent variable: GNPPCON, as already defined.

Independent variables: As already defined, *MIYP*, *CPIYP*$(t-1)$, [*CPIYP*$(t-1)$—*CPIYP*$(t-2)$]$(t-1)$, *UNY*$(t-1)$, and *BY* in Series 1, and *DCPIYP*$(t-1)$ and *PIMYPW*$(t-1)$ in Series 2.

	1953–75 (n=23)	1953–75 (n=23)	1953–75 (n=23)	1953–75 (n=23)	1953–75 (n=23)
Series 1:					
Constant	[2]2.550	[1]−2.293	[2]−2.880	[2]−3.046	[2]−2.528
	(.769)	(1.421)	(1.210)	(1.239)	(.896)
MIYP	[2].806	[2].747	[2].656	[2].640	[2].728
	(.199)	(.156)	(.134)	(.137)	(.101)
CPIYP(t−1)	[2]−.870	[2]−.850	[2]−.888	[2]−.805	[2]−1.011
	(.174)	(.135)	.114	(.155)	(.090)
[CPIYP(t−1)−CPIYP(t−2)]	--------	--------	--------	[1].148	--------
				(.180)	
[CPIYP(t−1)−CPIYP(t−2)]−1	--------	--------	--------	--------	[2].393
					(.098)
BY	--------	--------	[2]1.003	[2].875	[2].552
			(.336)	(.374)	(.272)
UNY(t−1)	--------	[2]1.033	[2]1.325	[2]1.317	[2]1.217
		.275	(.251)	(.253)	.187
Adj R^2	.548	.727	.807	.803	.895
SE	1.803	1.402	1.177	1.190	.868
DW	2.510	2.309	2.674	2.567	2.846
Series 2:					
Constant	--------	[1]2.663	[2]−3.514	--------	[2]−2.650
		(1.564)	(1.316)		(.983)
MIYP	--------	[2].738	[2].614	--------	[2].749
		(.173)	(.148)		(.113)
DCPIYP(t−1)	--------	[2]−.780	[2]−.727	--------	[2]−1.022
		(.257)	(.212)		(.171)
PIMYPW(t−1)	--------	[2]−1.234	[2]−1.437	--------	[2]−1.312
		(.409)	(.342)		(.251)
BY	--------	--------	[2]1.043	--------	[1].530
			(.335)		(.276)
UNY(t-1)	--------	[2]1.094	[2]1.437	--------	[2]1.243
		(.293)	(.265)		(.199)
[CPIYP(t−1)−CPIYP(t−2)]−1	--------	--------	--------	--------	[2].402
					(.101)
Adj R^2	--------	.722	.812	--------	.900
SE	--------	1.414	1.162	--------	.847
DW	--------	2.408	2.807	--------	2.825

[1] Coefficient is not significant.
[2] Coefficient is significant.

Note: Standard errors are in parentheses below the coefficients.

Last year's unemployment rate is especially important for analyzing changes in real (constant dollar) GNP. Inclusion of this variable in the analysis substantially improves our ability to explain changes in real GNP, as shown by comparing R^2 values in columns 1 and 2 of Series 1. Confirming that since World War II, the economy has not imploded, the higher unemployment was a year ago, the more, on average, real GNP rose in the current year. Vice versa, the lower unemployment was a year ago, the less it rose in the current year. Specifically, for every percentage point of unemployment a year ago, the regressions show that output increased, on average, in the current year by 1.2%. For example,

with a base past unemployment rate equal to 4%, real GNP will tend to grow by 4.8% in the current year, abstracting from other influences. Higher base unemployment means that, on average, the economy will grow even faster.

The Table 13 regressions also throw substantial light on how year to year changes in real GNP are affected by changes in money supply, inflation, the Federal deficit, and import prices. In specific—

(1) *Increases in import prices* (weighted by GNP) cause real GNP to fall a year later. The percentage fall almost exactly equals the percentage rise that occurs in the CPI the year that import prices rise. As estimated by the regressions in Series 2 of Table 13 and Series 3 of Table 4, for each percent yearly increase in weighted import prices, on average, the CPI rises the same year by 1.3%–1.4% and a year later real GNP falls 1.3%. Neither change differs significantly from 1%.

Thus our results confirm that increases in import prices cause both inflation and recession in equal degree. The CPI rises roughly proportionally to import prices weighted by imports as a percent of GNP in years when import prices rise. Real GNP decreases roughly proportionally a year later.

(2) *The High Employment Federal deficit* scaled by potential GNP was a marginally significant determinant of real GNP in the 1953–1975 period. In years when the deficit equalled 1% of potential (current dollar) GNP, real GNP tended to rise by .55%.

(3) *In regard to the impact of changes in money supply:* Using the column 5 regression in Series 1 of Table 13, for each 1% that money supply grows yearly, real GNP increases on average by .728% concurrently. In subsequent years, however, the rise in output which is induced by accelerated money growth recedes sharply. Based on our results, it levels off at .06% after eleven years during which it averages .21%. The fall-back comes largely from feedback from the inflation effects of money growth.

INFLATION FEEDBACK

In our model, yearly real GNP growth is affected by inflation in two ways. It falls very nearly at the same rate as the CPI rose the previous year, and it rises the year after the inflation rate rises. These effects are quantified using the regression results in column 5 of Series 1, Table 13, together with the cornerstone regression of Series 3 Table 4. As shown by that equation, the rate of inflation rises on average by .643% two years after a 1% rise in yearly money growth. The results given here in Table 13 show that for each 1% rise in the CPI in the current year, real GNP falls on average by a little more than 1% (1.011%) next year. Because of this feedback, the initial .728% rise in real GNP which results from accelerating M–1 growth by 1% recedes by .65% three years later.

The scenario becomes quite complicated from then on. This is because inflation has momentum, and the carry-over has complicated feedback. On the one hand, as the Table 13 results show, the momentum of inflation provides a spur to output, boosting it two years later by .393% for each 1% jump in the rate of inflation. On the other hand, increases in the inflation rate this year cause a further rise in inflation next year which, in turn, causes new depressing effects on output the year after that. Both these effects, however, are ephemeral. In time, inflation carry-over reduces to zero and we are left with only the direct effects. For a 1% yearly increase in M–1, the direct effects add to a yearly increase of .078% in real GNP (.728%–.650%). We estimate that it takes eleven years to reach the equilibrium. During this period, real GNP rises yearly, on average, by .26%. Table 14 summarizes the model's direct and inflation feedback effects from a 1% increase in yearly M–1 growth.

Further downward adjustments both in the equilibrium and average rate of rise in real GNP are required to take into account that unemployment is decreased by output increases and, in turn, this constrains future output increases. We estimate the unemployment adjustments reduce the yearly average increase in real GNP to .21% and the final equilibrium rate of rise to .06%.

TABLE 14

DIRECT AND FEEDBACK EFFECTS OF 1% YEARLY M-1 GROWTH

Year	Direct Effects on GNPPCON CPIYP	Effect of Direct CPIYP Change on GNPPCON	CPIYP Carry-over	Effect of Added Inflation on GNPPCON	Change in CPIYP	Effect of CPIYP Change on GNPPCON	Sum GNPPCON	Unemployment Adjustment on GNPPCON
t	.728						.728	
t+1							.728	-.295
t+2		.643			.643		.728	-.176
t+3			.159		.159		.078	-.224
t+4		-.650	.039	-.161	-.120	.253	.170	+.060
t+5			-.030	-.040	-.069	.063	.101	-.094
t+6			-.017	+.030	.013	-.047	.061	-.002
t+7			.003	+.017	.020	-.027	.068	-.024
t+8			.005	-.003	.002	.005	.080	-.018
t+9				-.005		.008	.081	-.026
t+10						.001	.078	-.022
Average							.26	

Explanatory notes:

(1) The direct effects are given by the column 5 regression of Series 1 Table 13 and the cornerstone regression in Series 3 Table 4.

(2) The effect of CPIYP equals -1.011 times .643, where -1.011 is the CPIYP coefficient in the Series 1 Table 13 column 5 regression.

(3) In (t+3), CPIYP carry-over equals .248 times the increase in inflation in (t+2). This was .643, the direct effect of increasing yearly money growth 1%. Thus, the carry-over equals .159 and the incremental inflation from time zero rises to .802. In (t+4), carry-over equals .248 times the jump in inflation in (t+3). This was [.802 - .643] or .159. Thus, the carry-over equals .039 and incremental inflation from time zero drops to [.643 + .039] or .682. In (t+5), carry-over equals .248 times the change in inflation in (t+4). This was [.682 - .802] or -.120. Thus the carry-over equals -.030 and incremental inflation from time zero drops to [.643 - .030] or .613. Etc.

(4) The effect of added inflation equals -1.011 times the estimate of added inflation a year ago.

(5) The effect of the change in CPIYP equals .393 times the change in CPIYP two years ago, where .393 is the column 5 Series 1 Table 13 estimate of the spur to GNPPCON from a change in the rate of inflation.

(6) The unemployment adjustment equals minus one-third sum GNPPCON in the prior year times 1.217, the unemployment effect on output.

It is interesting finally that in our model, abstracting from carryover, the effects of which dissipate in time, 1% per year money growth generates .77% yearly inflation and .24% yearly real GNP growth. The inflation result is taken from the 1947–1975 regression in Series 2 of Table 4. The estimated change in real GNP is taken from the column 1 regression in Series 1 Table 13.

Predictions and Contributions

Year by year percentage changes in real GNP, as assigned by the column 5 regression of Series 1 Table 13 to our independent variables, individually and in combination, are set forth in Table 15, along with the 1953–1975 history of percentage changes in real GNP. Actual and predicted changes (using the regression in its entirety) are graphed in Exhibit 8. The data in Table 15 indicate both the significance of last year's unemployment rate in the sense that the worse things are the better they are likely to become, and the important part played by past inflation which, on net, suggests that the worse things are the worse we have to expect them to become before they get better. These data also show that past changes in real GNP have been related strategically to money supply changes and marginally to the High Employment deficit.

PREDICTIONS

Our real GNP regressions can be used to forecast future percentage changes in constant dollar GNP. As in the case of the inflation regressions, such forecasts necessarily are conditional and subject to error. This year's forecast requires knowing this year's macro-policy parameters—money growth and the High Employment deficit, as well as past inflation and unemployment rates. Past inflation and unemployment provide the base on which this year's money growth and deficit build. Using the column 5 Series 1 regression of Table 13, the stage for 1976 was set as follows.

Source		*Predicted GNPPCON*
−1.011 times 1975 inflation (9.13%)	=	−9.2
.393 times jump in inflation 1974 (4.82%)	=	1.9
1.217 times 1975 average unemployment	=	10.3
Constant	=	−2.5
Net change		.5

TABLE 15.—REAL GNP PREDICTIONS AND CONTRIBUTIONS

Year	Gnppcon	Predict	Diff	G1	G2	G3	G4	G5
1953	3.89	4.08	−.19	1.80	.73	−2.31	2.70	3.68
1954	−.30	−.63	−.67	1.11	.24	−.78	−2.23	3.56
1955	6.70	5.25	1.45	2.32	−.40	−.36	−.59	6.81
1956	2.14	3.23	−1.09	.87	−.52	.26	−.17	5.31
1957	1.81	.65	1.16	.39	−.50	−1.49	−.24	5.02
1958	−.21	.70	−.91	.86	−.11	−3.43	.68	5.23
1959	6.02	6.15	−.13	2.78	−.42	−2.76	.76	8.33
1960	2.28	1.86	.42	−.08	−.98	−.93	−.26	6.63
1961	2.51	2.84	−.33	1.53	−.68	−1.52	−.71	6.74
1962	5.80	5.97	−.17	1.60	−.39	−1.08	.23	8.14
1963	3.95	4.34	−.38	2.12	−.67	−1.18	−.17	6.77
1964	5.26	5.81	−.55	2.90	−.21	−1.26	.04	6.87
1965	5.89	5.38	.51	3.11	−.18	−1.33	.03	6.28
1966	5.95	4.89	1.06	3.39	.11	−1.60	.03	5.49
1967	2.72	2.59	.13	2.89	.53	−3.02	.11	4.61
1968	4.38	5.28	−.91	5.21	.18	−2.81	.55	4.68
1969	2.57	1.27	1.29	4.38	−.57	−4.26	−.08	4.33
1970	−.32	−.68	.36	2.81	−.30	−5.48	.56	4.25
1971	2.99	2.90	.10	4.86	−.02	−5.96	.48	6.06
1972	5.74	6.12	−.38	5.15	.38	−4.30	.19	7.24
1973	5.46	5.41	−.04	5.43	−.32	−3.34	−.64	6.82
1974	−1.70	−.39	−1.32	3.97	−1.06	−6.29	−.37	5.90
1975	−1.84	−2.25	.41	3.10	.36	−11.16	7.15	6.84

Note: (1) Gnppcon, Pct(AGNP,1); (2) Predict, −2.528+.728*M1YP+.552*BY−1.011*CPIYP(t−1)+.393*A(t−1)+1.217*UNY(t−1); (3) Diff, Gnppcon—Predict; (4) G1, .728*M1YP; (5) G2, .552*BY; (6) G3, −1.011*CPIYP(t−1); (7) G4, .393*A(t−1); (8) G5, 1.217*UNY(t−1). A=[CPIYP(t−1)−CPIYP(t−2)].

With 1976 M–1 growth now forecast to be about 5.5% and the High Employment deficit about .5% of potential GNP, our precise 1976 forecast is for 4.8% real GNP growth. This year's M–1 growth contributes 4% and the High Employment deficit contributes .3%. We are 95% confident that the

increase in real GNP this year will range between 3.1% and 6.5%. The odds are 2 to 1 that the increase will range between 3.9% and 5.7%. A further cautionary note is required, however. There are indications that this year's M–1 statistics are understated by as much as 2%. If true, our precise forecast becomes 6.3% and the limits of the forecast ranges also rise, both bottom and top, by 1.5%.

We are likely to start 1977 in much the same position as we began 1976. The push which this year's estimated 7.6% average unemployment will provide to real growth next year will be almost fully offset by the depressing effects of this year's inflation, the fall in inflation a year ago, and the constant term. Thus, if 1977 M–1 growth and High Employment deficit repeat 1976's monetary and fiscal policies, our analysis forecasts that real GNP growth in 1977 will repeat the forecasted 1976 rise; i.e., 4.8% plus or minus 1.7% (at the 95% confidence level). Additional stimulus will be required to achieve higher growth if that is desired.

As in the case of our inflation analysis, only time will tell whether our analysis of changes in real GNP captures in significant and substantial degree the essentials of the underlying macro-economic processes. We shall know by future experience. If real GNP changes are tracked well, on average, over the next 5, 10, etc., years by our regressions, we can be reasonably confident that we have found the heart of these processes. There can be individual years when actual experience departs substantially from what our analysis forecasts. The essential point is that the forecasts do well on average.

Policy Implications 1977–1978

With unemployment above 7%, it would appear highly desirable to aim for real growth higher than 5% next year. To achieve it requires accelerating M–1 growth and/or increasing the High Employment deficit.

A permanent tax decrease aggregating $15–20 billion would provide mild stimulus.[2] Perhaps most importantly it could reduce present high disincentives to work and investment, and thereby increase output by increasing incentives to produce. Alternatively, or even additionally, spending on job-creating programs can be considered. A major advantage of such a program would be that it would begin long-needed structural reform on the supply side of the labor market. A major aim would be to upgrade skills and work habits among young persons now unwilling (in part because they have little future without skills) to take work, or unable (in part because they lack even minimal skills) to find it.

In regard to monetary policy, our analysis warns that faster M–1 growth could prove a risky and illusory cure. Our analysis indicates both that faster money growth this year tends to increase inflation two years from now, and that higher inflation largely erodes the immediate gains in real GNP from current money growth. Thus we would recommend an upper limit of 6% on M–1 growth in 1977, and aim at 5%.

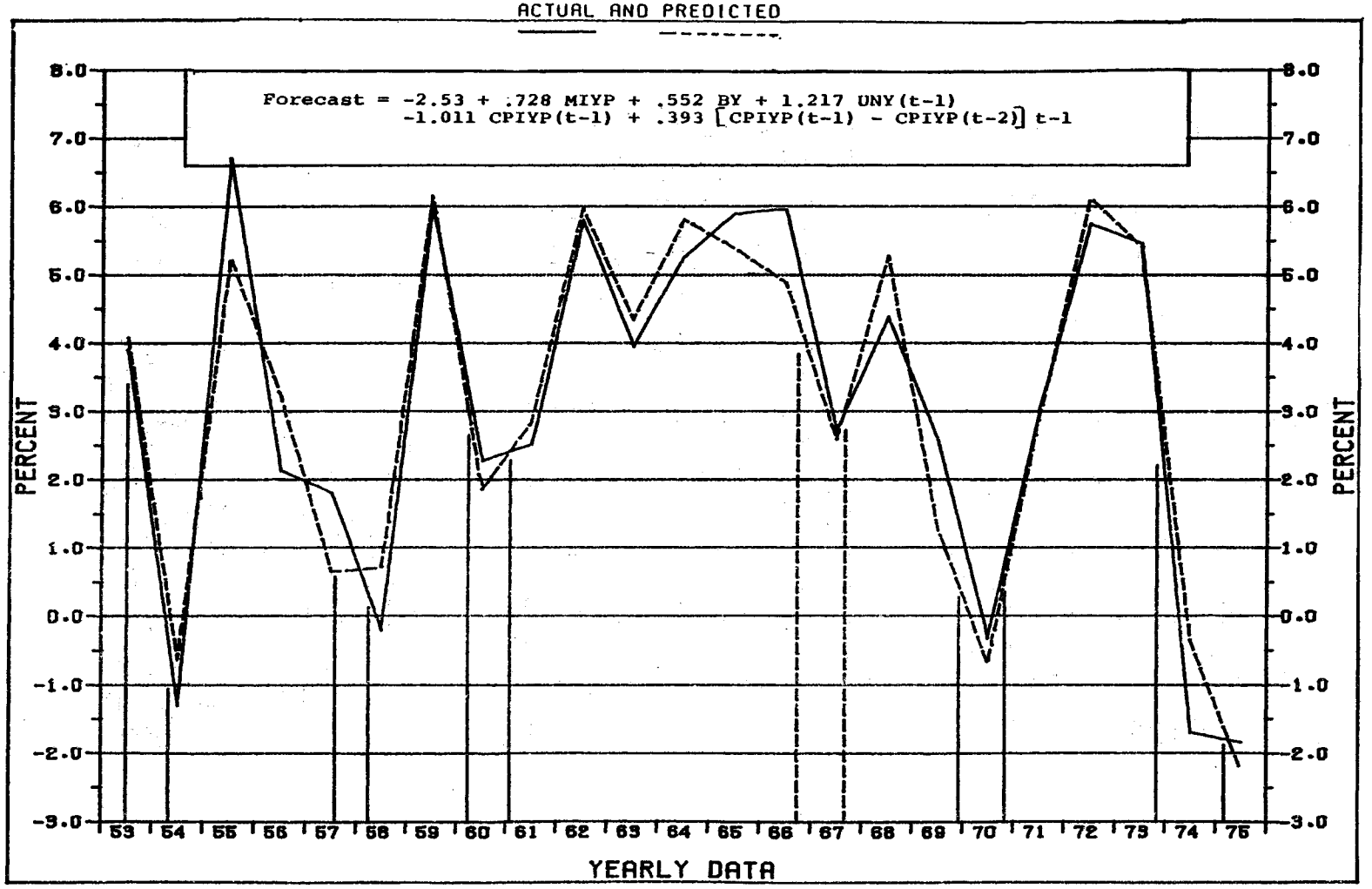
SOME LONG–RUN POLICY IMPLICATIONS

Our results have important implications for long-run economic policy. To begin with, our results show that fluctuations in prices abroad are destabilizing domestically. Increases in import prices raise the CPI concurrently and operate to decrease real GNP the following year. To the extent that policies can be designed to avoid increases in import prices, the problem of achieving economic stability—full employment with minimal inflation—will be greatly eased. At first glance, this might seem to suggest returning to a fixed exchange rate regime in international trade. But this does not follow at all. On the contrary, a fixed exchange rate system requires us to be "price takers" in importing

[2] Given that our results show that the High Employment deficit (scaled by potential GNP) has a significant, albeit small and marginal, impact on production but not on prices, it is a fair question to ask why taxes shouldn't be reduced $60 billion, or even more. There are two reasons why. One is that the actual as well as the High Employment deficit would rise, creating mammoth pressures and problems in financial markets. The second is that a decrease of this order of magnitude would put the High Employment deficit, as a % of potential GNP, substantially outside the range of past experience. From 1952 through 1975, there have been only eight High Employment deficits, and the highest was only 1.4% of potential GNP, in 1953. A $60 billion High Employment deficit would equal nearly 4% of 1977 potential GNP. It is wise to move slowly, if at all, where we have not been before. This is especially true here, since our results provide some warning that a large High Employment deficit relative to potential GNP could be inflationary. As reported in Table 8, the coefficient of the High Employment deficit has the right sign though it is statistically insignificant.

EXHIBIT 8

GROSS NATIONAL PRODUCT (IN CONSTANT $)
PERCENT CHANGE, YEAR TO YEAR
ACTUAL AND PREDICTED



Lines from the time axis delineate recession periods.

goods from abroad. If for whatever reason, prices rise abroad, the prices of the goods that we import must rise commensurately as long as exchange rates are fixed. With flexible rates, however, increases in prices abroad will tend to be offset by decreases in the rates at which foreign currencies exchange for U.S. dollars. The effect of England's ongoing inflation on prices we pay for English goods and services, for example, has been largely, if not fully, offset by a continuing fall in the dollar price of the pound. Under flexible exchange rates, England cannot export the problems its monetary policies have been creating. Under fixed exchange rates, it could.

Flexible exchange rates, moreover, have the further advantage of allowing gradual adjustments to underlying disequilibrating trends. If U.S. labor productivity increases more slowly than productivity abroad, the dollar will slowly depreciate with flexible exchange rates and the prices that we pay for imports will rise only gradually. Under fixed rates, such trends are treated with "malign" neglect until they no longer can be ignored. Sooner or later, however, the pressures of such trends can no longer be contained. Exchange rates and import prices change all at once—sharply and traumatically.

To avoid sharp traumatic increases in import prices, it is essential that we pursue monetary and fiscal policies that avoid inflation. Such policies cannot of course prevent foreign cartels such as OPEC from raising import prices. Only the development of alternative supplies can do that. Monetary and fiscal policies can, however, prevent our having to pay higher import prices because of falling demand for dollars. This is strong reason for understanding what monetary and fiscal policies we have to put in place to avoid fueling inflation in the future.

In regard to monetary policy, the lesson of our analysis is that the Federal Reserve must provide for moderate and steady M–1 growth. Our analysis, however, sheds little light on the optimal rate. Based on our regression results, on average, 64% of annual M–1 growth was absorbed in price increases during the period since 1945. Only 26% served to finance current output increases. To some this will suggest that the optimal equilibrium long-run growth rate for M–1 is between 0 and 2% per year on the ground that, on average, real GNP increased 4% per year during the post World War II period and .26 of 4% equals 1%, half way between 0 and 2%. However, we would regard this range as well below optimal.

If money growth is limited to 0–2% per year, utilization of the normal expansion of our capacity to produce would require price deflation unless velocity increases commensurately. Since World War II, velocity has trended up, so that we could have had substantially lower yearly money growth on average, than we had without price deflation. But rising M–1 velocity is by no means a permanent fixture in U.S. economic life. From the Civil War to World War II, velocity trended down not up, and this happened despite the spread of checkbook money after 1865. Thus from the historical perspective, it would not appear prudent to bet that M–1 velocity will continue to rise in the indefinite future. Moreover, it is far from far-fetched to believe it won't despite existing interest rate incentives to economize on holding currency and demand deposits. This is because holding currency and demand deposits is a "luxury" which can be indulged in more easily as incomes rise. Moreover, if in the future Congress repeals the prohibition against paying interest on demand deposits, this would tend to decrease M–1 velocity by reducing the interest rate incentives which now impel minimizing holding currency and checking deposits. We do not and cannot know whether M–1 velocity will tend to rise or fall over the next 25 years. Our point is that we cannot count on velocity continuing to rise, and hence in full employment should keep M–1 growth 2%–4% per year, "commensurate with the economy's long-run potential to increase production," as Congress resolved in H. Con. Res. 133. This range of money supply growth will provide the monetary framework for sustained full employment real growth without inflation.

Finally, our results indicate that in the context of past deficits, fiscal policy is *not* a very powerful macro-policy tool. As Mr. Meisselman (Professor of Economics, Virginia Polytechnic Institute and State University at Reston) testified, "when allowance is made for the quantity of money, the short-run

stabilization impact of changes in fiscal policy, that is variations in the size of the budget or in the schedules of tax rates have been either minor or absent."

The impact of deficits, independent of monetary policy, is marginal at most—statistically insignificant in respect to prices, small and barely significant in respect to the nation's output or real GNP. Our results cast no light on whether a tax cut or spending is the more efficient and effective way to increase real GNP. But however created, our results indicate that today a $30 billion High Employment deficit is required to raise real GNP 1%. Trying to spend our way out of recessions thus would appear to be extremely difficult. Spending programs of a size that could change the deficit by enough to have a substantial impact on GNP cannot speedily be legislated and implemented. If one with merit, for example, one that would upgrade work habits and skills, is on the table, or can be speedily designed and, if passed, implemented, it should, of course, be adopted. On the other hand, if quick fiscal stimulus is desired, and there is no meritorious spending proposal on the table or in the wings, a tax cut can be speedily legislated and implemented.

Our results also indicate that those who would put the blame on deficit spending for inflation are misplacing their emphasis. Deficits generate significant inflation only to the extent that they are financed by increasing money supply. In this regard, there is no law that requires the Federal Reserve to monetize deficits and our results indicate it is risky to do so. Whatever the deficit is next year, it would be a mistake to allow M–1 to grow more than 6%. Over the longer run, *as* we return to full employment (not after), annual money growth must be gradually reduced to the 2%–4% level, commensurate with our potential to increase production at full employment regardless of fiscal policy.

In summary, our results indicate that a complete change in attitude about Government spending and deficits is in order.

(1) The Federal budget should be analyzed as an instrument for allocating the nation's resources, broadly speaking, between unmet family and unmet public needs. It should not be viewed as a macro-policy tool. Each new spending proposal, and indeed all existing programs, should be evaluated, funded, beefed-up, cut or eliminated based on their intrinsic merit, not by some perceived need to stimulate (or restrain) the economy.

(2) Tax cuts can be legislated if it is desired to give the economy a quick jolt and no meritorious spending proposal is on the table.

(3) Finally, money supply growth should be completely divorced, in practice as well as principle, from the Treasury's financing needs. M–1 growth should be planned and pursued without regard to the size of the deficit to be financed next week, next month, and next year.

PART IV

POLICY UNDER H. CON. RES. 133

Testimony received by the Subcommittee at its June hearings often was critical of Federal Reserve policies up to the 1973–1975 recession. At the same time, the testimony was relatively laudatory in regard to policy since March 1975. Coincidentally, March, 1975, marks both the bottom of the 1973–1975 recession and the month when the Congress passed House Concurrent Resolution 133. The resolution expressed the sense of Congress—

> That the Board of Governors of the Federal Reserve System and the Federal Open Market Committee—
>
> (1) pursue policies in the first half of 1975 so as to encourage lower long term interest rates and expansion in the monetary and credit aggregates appropriate to facilitating prompt economic recovery; and
>
> (2) maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long term interest rates. Pursuant to this resolution, and taking into account the international flows of funds and conditions in the international money and credit markets, the Board of Governors shall consult with Congress at semiannual hearings before the Committee on Banking, Housing and Urban Affairs of the Senate and the Committee on Banking, Currency and Housing of the House of Representatives about the Board of Governors' and the Federal Open Market Committee's objectives and plans with respect to the ranges of growth or diminution of monetary and credit aggregates in the upcoming twelve months.

BEFORE THE RESOLUTION

Referring to an exhibit showing the rolls and tilts of M–1 growth since the Korean War, Chairman Neal asked the witnesses who appeared before the Subcommittee on June 8 and 9, "If you think that Fed policies have been well administered over these years?" The question was put first to Senator Buckley. His response was unqualified.

Senator BUCKLEY. My answer would have to be no.

Mr. Jordan and Mr. Meisselman were similarly critical.

Mr. JORDAN. I think that money policy in the post-war period was procyclical making the inflations worse than they would have been, making the recessions and the unemployment worse than they would have been.

Mr. MEISSELMAN. I am in general agreement with Mr. Jordan's analysis. I would like to add that we now have a great deal of inflation already built into the system because of poor public policies in the past.

Congressman Adams singled out the early 1960's when M–1 growth ranged from 1.5% to 4.5% as years which could serve as future norms. He told the Subcommittee:

> If you will look at the period between 1960 in the middle of your chart and continue up through the beginning of the Vietnam War, which was February of 1965, you will see that we had a rate of inflation that ran below 3 percent. Our unemployment rate was coming down . . . we were trying to come out of the recession period of 1958. You also had at that time a relatively low deficit and you had a low interest rate. I am saying that that condition of low unemployment and low interest rates can be repeated again and that is my personal goal.

Mr. Fiedler and Mr. Perry were less critical of past monetary policy.

Mr. FIEDLER. My judgment on the monetary policy of the past two decades is that it was very much better than the previous two decades. Monetary policy still left quite a bit to be desired and did, as Mr. Jordan suggested, on occasions make some things worse than they otherwise would have been.

Monetary policy has been part of the process over the past decade where we have had a continuous acceleration in this base, built-in, rate of inflation where we have gotten up from the early 1960's rate of 1 percent, or virtually zero, and now we are up to 5 percent or 6 percent.

That is unfortunate, but perhaps we should have some sympathy for policy authorities who are dealing with very difficult processes which are not well understood.

Mr. PERRY. I would say that monetary policy has been conducted reasonably well over the period you have charted. Its worse marks probably come during periods of recession when the Fed has allowed money growth to slow very sharply.

This has been a characteristic of all the recession periods we have had. It could have been fighting harder against downturns. In recent years, it has been confronted with impossible problems.

It has been asked to deal with inflation that it could not possibly deal with and the results have been very mixed. And, depending on how one views what is important, you can end up thinking the Fed has done very well or very poorly.

Our research, which was not completed at the time of the hearings, indicates that the increase in the "base, built-in rate of inflation" to which Mr. Fiedler alluded was in major part due to stepped up monetary growth. Nonetheless, we have some sympathy for Mr. Fiedler's "let's not be too critical" view. The Federal Reserve does not operate in a vacuum. As Mr. Jordan stated:

> There is a risk of asking too much from monetary policy—asking more than it can deliver in terms of offsetting the mistakes inherited from others, or trying to correct for some of the real shocks to the economy, such as agriculture, quadrupling of oil prices, and some other things.
>
> You can ask [only] that monetary policy actions not be destabilizing as they have been in the past. They have caused worse recessions and more unemployment than we otherwise would have had. I think it is possible to avoid destabilizing actions and Congress should use its oversight to hold the Fed accountable on that ground.

In specific, 1974 presented difficult if not "impossible problems." Our results indicate that the inflation then raging would by itself act to sharply reduce real GNP in 1975. At the same time, our results also show that by accelerating M–1 growth sufficiently the Federal Reserve could prevent the decline and allow the economy to grow the normal 4%. But if this were done, the day of reckoning with the depressing effects of inflation would only be postponed. Moreover, the problem would become more difficult to deal with as time passed because stepped-up money growth now generates still higher inflation later on. While recognizing the difficulty of the choice, we believe that the deceleration of M–1 growth, particularly after mid-1974, was unnecessarily rapid. Deceleration was in order. But it was overdone. Difficult problems are best handled by gradual adjustments of the policy levers.

Happily, Federal Reserve policymakers are not now unaware of the pitfalls in jumping quickly from one rate of money supply growth to a substantially different one even though the latter is a desirable long-run goal. Mr. Hannaford pursued this question with Governor Partee on June 10.

Mr. HANNAFORD Our testimony has indicated the general feeling that there is too much fussing done with monetary policy and short-term adjustments. . . . Do you think we do a bit too much of that fits-and-starts kind of adjustment?

Governor PARTEE. I would have to say in retrospect that there has been more variation in the rate of monetary growth over the post-war period than I think would have been desirable. That is, as I look back, if I could do it

over and I were the dictator, I would do it a little differently. There would be more stability than the chart that has been before us through these 3 days of hearings has demonstrated. I would rather have a little more stability than that shows.

Policy Since March 1975

On May 1, 1975, Chairman Burns testifying for the first time under House Concurrent Resolution 133 told the Senate Banking Committee that "The Federal Reserve System is presently seeking a moderate rate of expansion in the monetary and credit aggregates. We believe that the course we are pursuing will promote an increase in M–1 of between 5 and 7½ percent over the 12 months from March 1975 to March 1976." In appearances before the House and Senate Banking Committees since then, Chairman Burns has disclosed slight modifications of the target range. Exhibit 9 charts actual monthly M–1 levels from March 1975 to October 1976 against targeted levels which were computed by multiplying M–1 at the beginning of each target period by the percentage growth targeted for the period.

The Exhibit reveals three distinct trends in money supply since March 1975. The first ran from March to August 1975 and achieved the "expansion in the monetary and credit aggregates appropriate to facilitating prompt economic recovery," which the Resolution called for during the first half of 1975.

The second trend lasted from August 1975 to January 1976. It involved the necessary slowing of money growth from the relatively rapid rate in the March to August period. But the retardation of M–1 growth was overdone. As shown by Exhibit 9, there was virtually no growth from August 1975 to January 1976. The pause in the economic recovery that began in the spring quarter of 1976 was very likely exacerbated if not triggered by the excessive slowing of M–1 growth in the second half of 1975.

Finally, from January to October 1976, M–1 has grown along or zig-zagged around the lower limit of the target range. Most recently, in October, it has spurted up to the middle of the range. The steadiness of recent Fed money policy is commendable. As indicated earlier, we would be inclined to limit M–1 growth to 6 percent per year this year and next (aiming at 5%), and to drop it to 2%–4% per year very gradually as we return to full employment.

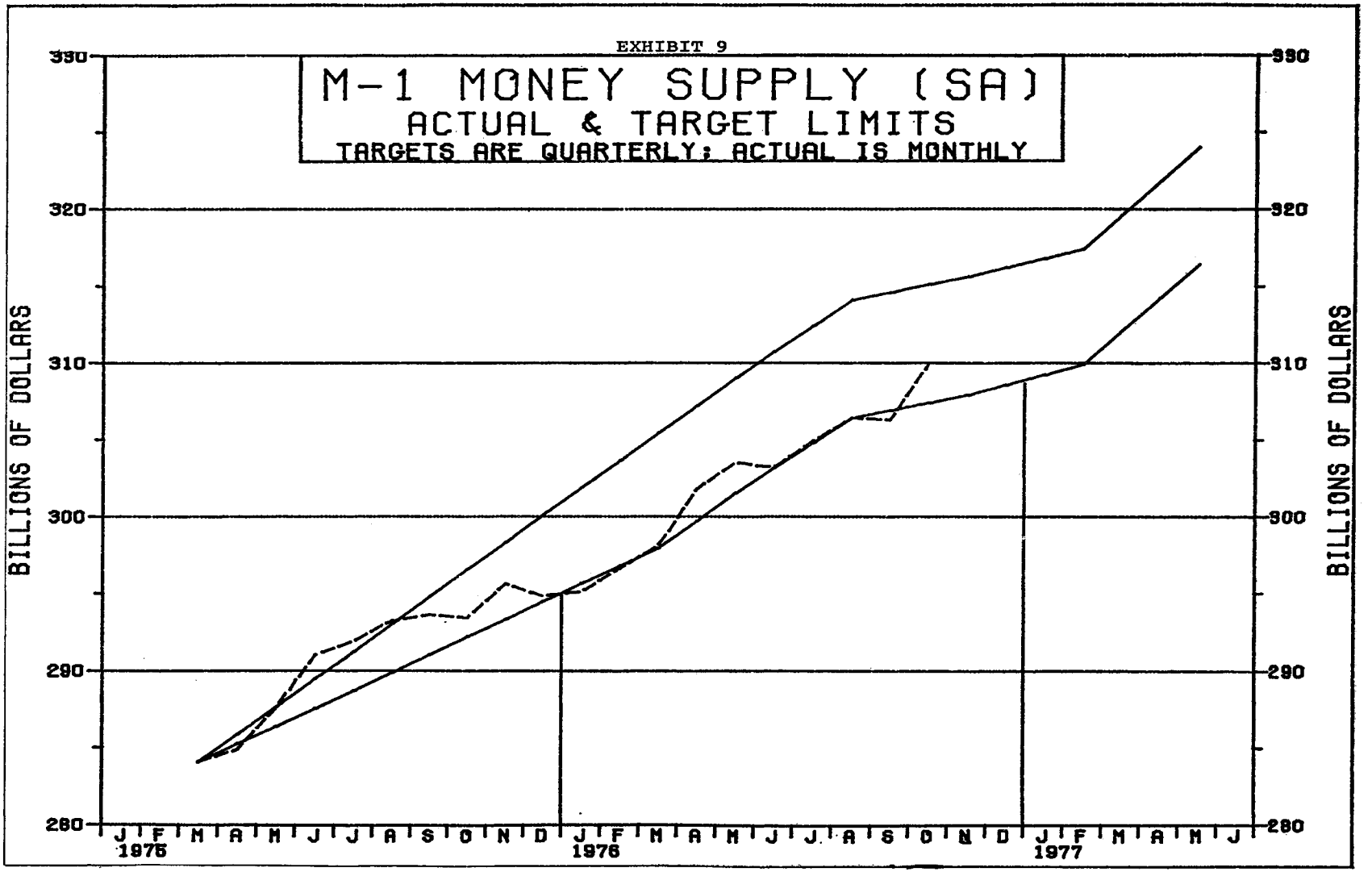
Closing Remarks

Most importantly, our research results stress the importance of controlling inflation and the critical role that money supply policy must play in the effort. Few of us have to be reminded that inflation erodes the purchasing power of our incomes and wealth. In addition, though it is not so widely understood, inflation causes interest rates to rise. As Governor Partee told the Subcommittee, "a high rate of inflation over a sustained period, and the expectation that there will be future inflation, does affect interest rates simply because lenders are not willing to see the real value of their wealth decline, and therefore they want an interest rate that will compensate for inflation. Borrowers are willing to pay the rate because they feel that what they invest in with the proceeds is going to go up in value, too."

These reasons are reason enough to make controlling inflation a high priority economic policy goal. But, moreover, our research shows that current inflation causes production to fall and unemployment to rise next year. Contrary to the conventional view that we can increase production and reduce unemployment by accepting more inflation, our analysis indicates that the way to promote and sustain recovery is to eliminate inflation.

Finally, there are fiscal policy reasons for bringing inflation under control as quickly as possible. A recent Congressional Budget Office study conducted for the Joint Economic Committee's Fiscal Policy Subcommittee entitled, "The Effect of Inflation on Federal Expenditures," documents that inflation increases both federal expenditures and tax revenues. These inflation induced changes make it more difficult both to achieve fiscal stability and to plan fiscal policy ahead.

EXHIBIT 9



Many federal spending programs, including social security, civil service and military retirement, food stamps, railroad retirement, the school lunch program, and federal civilian pay, are inflation indexed. The CBO study concludes:

> More than 60 percent of all federal expenditures increase explicitly with prices or implicitly through cost payments tied to the price level. Since the prices of these expenditure items rise on an approximately one-for-one basis with the CPI, an extra one percent increase in the price level automatically causes about a 0.6 percent increase in federal expenditures.

The effect of inflation on tax revenues is even greater. The CBO study points out:

> A 10% increase in the price level will increase expenditures by 5.8% in the short run and 6.3% in the long run, while increasing receipts by 12.3% in both the short and long run.

IMPORTANCE OF CONTROLLING MONEY GROWTH

Inflation-induced fiscal and economic pressures must be brought under control as quickly as possible. As the work of the Subcommittee on Domestic Monetary Policy shows, we can bring inflation under control and keep it in check by achieving moderate M–1 growth commensurate with our potential to increase production. With unemployment nearly 8%, our potential to increase production is higher than normal. For the remainder of 1976 and 1977, 4%–6% M–1 growth per year is appropriate. It will promote sustainable, reasonably rapid recovery in the months immediately ahead without adding substantially to inflation and the interest rate, production and fiscal policy problems that inflation generates in subsequent years.

But we must plan now to gradually reduce money growth to 2%–4% per year after 1977 to reduce inflation to the attainable 1%–3% rate. This is the major policy implication of the Subcommittee's research and hearings. As put by *Mr. Meltzer:*

No sustained inflation has ever been ended until the growth rate of money has been reduced.

Senator BUCKLEY. Under the resolution [H. Con. Res. 133] the Federal Reserve is directed to establish targets which are in line with the economy's long-term ability to grow. Our problem in the past is that the Federal Reserve's monetary policy has been constructed along lines which were only haphazardly related to this fundamentally important guideline. Monetary targeting which is set independently of the economy's growth potential produces the kind of erratic monetary growth policies which take us from inflationary rates to a constricting zero level, as was the case in the latter half of 1974.

Congressman ADAMS. . . . What we need in money supply is a matching of the money supply to the real growth in the economy.

Chairman NEAL. You would advocate a moderate and steady growth in the money supply——

Senator BUCKLEY. To match the average growth that we project for the economy.

As an added final note, we cite Mr. Pierce's explanation of the importance of controlling money supply for achieving interest rate stability.

Mr. PIERCE. Historically, the Federal Reserve, like other central banks, has exhibited a strong tendency to stabilize fluctuations in interest rates, particularly short-run fluctuations. The Fed's penchant for stabilizing interest rates has among other things helped produce a procyclical behavior in the growth of the money stock; that is, money grows rapidly during economic expansion and slowly during recessions.

The reason for this is clear enough: when the economy is expanding rapidly credit demands also expand, tending to put upward pressure on interest rates. The Federal Reserve attempts to constrain these interest rate increases by

providing more bank reserves through open market operations. The increase in bank reserves in turn leads to expansion in the money stock and underwrites an expansion in economic activity.

During recessions, credit demands decline and interest rates begin to fall; the Fed attempts to constrain the decline in interest rates by selling securities on the open market, therein reducing bank reserves and retarding growth in the money stock. The retardation of money growth and constraint on interest-rate declines tend to exacerbate the decline in economic activity. It seems clear that attempts to stabilize interest rates can and have produced greater cyclical fluctuations in income, production, employment, and inflation than would have been the case had the Fed not been so concerned about interest rate fluctuations.

If the Federal Reserve adhered more closely to a target growth for the money stock, interest rates would tend to move more quickly; that is, fall more rapidly in recession and rise more rapidly in expansion than has heretofore been the case. These sharper interest-rate movements would serve to moderate the fluctuations in economic activity. If interest rates were allowed to react more quickly, aggregate demand would be affected more rapidly and hence would not probably fluctuate so widely. As a result, it is likely that interest rates would themselves actually fluctuate less widely.

APPENDIXES

APPENDIX 1

Correlation Matrices

1. *For the cornerstone inflation regression, Series 3, Table 4, 1947–1975.*

	M1YP (t–2)	*Dummy*	*PIMYPW*	[*CPIYP (t–1)* − *CPIYP (t–2)*]
Dummy	−.248			
PIMYPW	.344	.204		
[CPIYP (t–1) − CPIYP (t–2)]	.402	.224	.245	
CPIYP	.702	.353	.661	.638

2. *For the real GNP regression, Series 1, Table 13.*

	M1YP	*BY*	*CPIYP (t–1)*	*UNY (t–1)*	[*CPIYP (t–1)* − *CPIYP (t–2)*]−1
BY	.252				
CPIYP (t–1)	.474	.220			
UNY (t–1)	.093	−.353	.009		
[CPIYP (t–1) − CPIYP (t–2)]−1	.112	.418	.365	−.032	
GNPPCON	.271	.078	−.503	.471	.106

Interpretation: Multi-collinearity is not a major problem.

APPENDIX 2

M1YP

Lag Correlation Analysis

1945–1975

Lag in Years	*Correlation*	R^2
0	1.00	1.00
1	.60	.36
2	.26	.07
3	—.04	.00
4	—.07	.00
5	.18	.03
6	.21	.04
7	.20	.04
8	—.10	.01
9	—.18	.03

Interpretation: Periodicity or cyclical regularity is not a major problem.

APPENDIX 3

Cochrane-Orcutt Regressions

1. *Cochrane-Orcutt version of the Series 3 Table 4 1947–1975 inflation regression.*

$$CPIYP = \underset{\text{Constant}}{} + \underset{M1YP\ (t-2)}{} + \underset{\text{Dummy}}{} + \underset{PIMYPW}{} + \underset{\left[\frac{CPIYP\ (t-1)}{CPIYP\ (t-2)}\right]}{}$$

Constant	$M1YP\ (t-2)$	Dummy	$PIMYPW$	$\left[\frac{CPIYP\ (t-1)}{CPIYP\ (t-2)}\right]$
[1] .448	.662	[2] 6.207	[2] 1.386	[2] .260
(.274)	(.068)	(.903)	(.236)	(.063)

Adj R^2=.917; SE=1.035

2. *Cochrane-Orcutt version of the Series 1 Table 13 real GNP regression.*

$$GNPPCON = \underset{\text{Constant}}{} + \underset{M1YP}{} + \underset{BY}{} + \underset{CPIYP\ (t-1)}{} + \underset{UNY\ (t-1)}{} + \underset{\left[\frac{CPIYP\ (t-1)}{CPIYP\ (t-2)}\right]-1}{}$$

Constant	$M1YP$	BY	$CPIYP\ (t-1)$	$UNY\ (t-1)$	$\left[\frac{CPIYP\ (t-1)}{CPIYP\ (t-2)}\right]-1$
[2] −1.785	[2] .749	[1] .480	[2] −1.040	[2] 1.057	[2] .373
(.804)	(.094)	(.276)	(.089)	(.173)	(.113)

Adj R^2=.868; SE=.974

[1] Coefficient is not significant.
[2] Coefficient is significant.
Standard errors are in parentheses below the coefficients.

Note: Comparison with the corresponding regressions in the text indicates that the Cochrane-Orcutt procedure yields marginally better results.

APPENDIX 4

Regressions Using M–1 as the Dependent Variable, 1946–1975

$$M1YP(t+2) =$$

Constant	+	*Dummy*	+	[*CPIYP (t–1)* − *CPIYP (t–2)*]	+	*PIMYPW*	+	*CPIYP*
[2] 3.790		[1] 1.325		[1] −.138		[1] .941		[1] −.142
(.768)		(2.233)		(.185)		(2.127)		(.261)

Adj $R^2 = -.054$; SE = 2.341; DW = .674

$$M1YP\ (t+1) =$$

Constant	+	*Dummy*	+	[*CPIYP (t–1)* − *CPIYP (t–2)*]	+	*PIMYPW*	+	*CPIYP*
[2] 3.295		[1] 2.247		[1] −.185		[1] .402		[1] .041
(.735)		(2.030)		(.167)		(.712)		(.204)

Adj $R^2 = -.026$; SE = 2.287; DW = .882

[1] Coefficient is not significant.
[2] Coefficient is significant.
Standard errors are in parentheses below the coefficients.

Interpretation: The chain of causation does not go *to* money supply changes.

APPENDIX 5

Inflation Regressions Using M–1 Ahead as an Independent Variable, 1946–1975.

$$CPIYP =$$

Constant	+	*M1YP(t+2)*	+	*Dummy*	+	*PIMYPW*	+	$\begin{bmatrix} CPIYP(t-1) - \\ CPIYP(t-2) \end{bmatrix}$
[2] 2.462		[1] −.089		[1] −.261		[2] 6.013		[2] .452
(.707)		(.164)		(1.784)		1.140		(.115)

Adj R^2=.689; SE=1.857; DW=1.045.

$$CPIYP =$$

Constant	+	*M1YP(t+1)*	+	*Dummy*	+	*PIMYPW*	+	$\begin{bmatrix} CPIYP(t-1) - \\ CPIYP(t-2) \end{bmatrix}$
[2] 2.660		[1] .041		[1] 2.210		[1] 2.210		[2] .486
(.832)		(.203)		(2.025)		(.553)		(1.39)

Adj R^2=.592; SE=2.279; DW=1.004.

[1] Coefficient is not significant.
[2] Coefficient is significant.
Standard errors are in parentheses below the coefficients.

Interpretation: Nothing is gained by leading M1YP in analyzing inflation.

APPENDIX 6

Regressions Using M–2 in Place of M–1

Dependent variable: CPIYP=

	1950–1975	*1951–1975*	*1956–1975*
Constant	[1] .998	[1] .768	[1] —.614
	(.540)	(.576)	(.632)
M2YP (t–2)	[2] .327	[2] .356	[2] .349
	(.106)	(.109)	(.109)
Dummy	[2] 3.990	[2] 4.734	
	(1.183)	(1.238)	
PIMYPW	[2] 1.609	[2] 1.524	[2] 1.311
	(.360)	(.363)	(.330)
[CPIYP (t–1)— CPIYP (t–2)]	[2] .230	[2] .240	[2] .627
	(.121)	(.118)	(.174)
Adj R^2	.806	.814	.848
SE	1.267	1.243	1.085
DW	1.640	1.399	1.488

Dependent variable: GNPPCON=

	1953–1975
Constant	[1] —2.238
	(1.338)
M2YP	[2] .487
	(.130)
BY	[1] .401
	(.432)
CPIYP (t–1)	[2] —.976
	(.139)
UNY (t–1)	[2] 1.070
	(.296)
[CPIYP (t–1)— CPIYP (t–2)]—1	[2] .421
	(.149)
Adj R^2	.766
SE	1.299
DW	2.331

[1] Coefficient is not significant.
[2] Coefficient is significant.
Standard errors are in parentheses below the coefficients.

Note: Comparison of these results with the Series 3 Table 4 and Series 1 Table 13 results indicates that the choice between M–1 and M–2 is not crucial, but that using M–1 yields marginally better results.

APPENDIX 7

INFLATION REGRESSION SEPARATING THE LAGGED CPIYP TERMS BRACKETED IN OTHER REGRESSIONS

Dependent variable: CPIYP =

Constant	+	M1YP(t-2)	+	Dummy	+	PIMYPW	+	CPIYP(t-1)	+	CPIYP(t-2)
[1].558		[2].645		[2]5.979		[2]1.414		[2].241		[2]-.255
(.396)		(.100)		(1.145)		(.304)		(.096)		(.083)

Adj. R^2 = .891; SE = 1.187; DW = 2.5

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[1]Coefficient is not significant.
[2]Coefficient is significant.

Interpretation: The lagged CPIYP coefficients are virtually the same, as is implied statistically when bracketing them. However, separating them tests a different proposition than bracketing them. The momentum hypothesis requires bracketing regardless of whether the coefficients on the lagged CPIYP terms are equal or different.