Collection: Council of Economic Advisers: Staff Economists Files
Folder Title: Steve Brooks Chron June 1981 (3)
Box: OA 04000

Evans Model Summary

Variable Count

646 total variables

418 Endogenous

of which:

218 stochastic

200 identities

228 Exogenous

Remarks: The Evans model documentation is not very good. Moreover the documentation is dated in many respects, in particular, the financial sector only has the old money concepts. The model has numerous cases where there are separate (and independent) behavioral equations for both a total and its pieces. The consumption sector is the most glaring example of this. Other examples are federal transfers, money, industrial production, etc.

FINAL DEMANDS

A. Consumption

There are four basic equations which determine total consumption (autos and parts, other durables, nondurables, and services). There are, however, some 16 other separate equations for the various pieces of total consumption which are all determined without reference to the total!

The key feature of this sector is the interest rate impact on consumption. An after-tax interest rate less a long-lagged CPI inflation term appears in each equation. The after-tax rate is the Moody's AAA corporate bond rate times one minus the "basic federal personal tax rate." Evans claims that this rate is an average of marginal tax rates weighted by income shares.

The key income term is a long, weighted moving average of real disposable income. In the two durable equations this term is net of transfers and deflated by the CPI rather than the PCE deflator.

The key autos equation determines new car sales. The PCE category runs off of it. Neither it nor the other durables equation is a stock adjustment equation.

There are no apparent wealth terms.

Several of the equations use an "index of credit rationing" (ICR) to reflect tightness in credit markets. The ICR is explained below in the financial sector section.

B. Housing

There are three key equations (singles, multis, and mobile home shipments). Singles are a function of real nontransfer disposable income (net of proprietor income), FHLBB advances, the ICR, a variable to reflect monthly payments (insurance, property taxes, principal, and interest), and a house-price appreciation term.

Multis are a function of FHLBB advances, the same disposable income term, the ICR, the CPI rental price index relative to a mix of the residential construction prices and energy costs, and the excess stock of multis.

Mobile home shipments are a function of real nontransfer disposable income, the ratio of nonwage, nontransfer income to wages and salaries, the ICR, relative price, the unemployment rate, and the excess stock of multis.

There is a separate equation for additions and alterations. It is a function of the ICR and the monthly cost index (see above). There also are other simple equations for new home sales and housing construction put in place.

C. Business Fixed Investment

There are two basic BFI equations (for structures and producers' durable equipment). PDE is driven mostly by new orders for total manufacturing. Other minor determinants are goods consumption spending, and a rental price measure multiplied by the pollution abatement share of BFI. Orders are a function of a PPI-inflation term (which is triggered when capacity utilization rates are greater than 85 percent), the PCE term mentioned above, defense production, the "basic" corporate profits tax rate, the present value of depreciation allowances divided by one minus the corporate tax rate and the change in the ITC multiplied by the capacity utilization trigger. Thus, the rental price determinants are present both in the orders equation and in the ultimate BFI equation. Is this double-counting?

The structures investment equation is a function of the PCE accelerator term described above, the unemployment rate, the corporate tax rate, the stock market, and a rental price measure for structures that is similar to that of the PDE equation.

D. Inventories

There is one equation for nonfarm inventories. The farm piece is, presumably, exogenous. Nonfarm inventory investment is a function of orders, the change in orders, the lagged stock of inventories, increases or decreases in the PPI for industrial commodities, and the PCE demand term.

E. Government

Purchases and other nontransfer expenditures, except Federal net interest paid, are exogenous for both sectors (federal and state and local (S&L)). There are two equations for transfer payments: the total and the unemployment piece. The total is a first difference equation running off the change in the CPI, indexes for social security benefit increases, the number of unemployed, and the change in the number of unemployed. The unemployment piece is run off the number of unemployed and an average wage measure.

Taxes. Federal personal taxes are determined as the product of an average rate and the taxable base, both endogenous. There is a separate equation for overwithholding. The tax rate equation is essentially a constant (.18) plus a CPI term with additional dummies reflecting rebates and surcharges. Taxable income (?) is run off of an NIPA aggregate which is defined incorrectly due to the double counting of personal social insurance contributions. Overwithholding depends on dummies and the income term described above.

Federal corporate taxes are estimated from the implicit identity between the taxes and the product of profits before tax and the "basic federal corporate tax rate." The investment tax credit's impact on receipts is also captured in the equation.

Personal and employer contributions for social insurance are run off the statutory rate base and average wage variables.

S&L personal taxes are essentially the product of an exogenous rate and an income base. S&L corporate taxes are determined similarly. S&L indirect taxes are a function of the operating surplus and total expenditures reflecting budget constraint influences. S&L social insurance contributions are run off of total compensation.

F. Foreign Sector

There are six equations each for exports and imports. They determine census end-use categories. The export equations are all run off of relative price terms and foreign activity. The import equations seem to have a similar structure with domestic activity (disposable income, individual production, etc.) and relative prices the key driving variables.

OUTPUT

There are, in effect, five separate categories for output or production but, as in the consumption sector, there is some odd double-counting. There is an equation for the total industrial production index (driven by final demands, etc.). But there are independent equations for the manufacturing and the metals production indexes. (They are also driven by demand.) The remaining output categories are construction and government.

Two indexes of maximum output (one for manufacturing and one for mining) are also determined, based on investment flows. Capacity utilization in metals and manufacturing are derived from them.

EMPLOYMENT AND PRODUCTIVITY

The unemployment rate is the residual (sort of) derived from employment and the labor force. However, the equation for the rate is behavioral and includes an output-growth term, so that there are Okun's law type influences present even in the unemployment rate.

Employment is determined in three sectors, manufacturing, construction, and all other. The equations are basically inverted production functions with output captured by sector-specific industrial production or output, trend productivity and the capital stock, and tax rates. Average weekly hours are run off of the production indexes.

Productivity

See the attached paper by Ando.

WAGES AND PRICES

There are 3 separate average hourly wage equations (manufacturing, nonmanufacturing, and construction). All three are somewhat unusual Phillips curve equations driven by PCE inflation, average personal tax rates (defined, I believe, to include social insurance taxes), the unemployment rate, and an output term (industrial production for manufacturing, GNP structures for construction). (See the attached Braun article.)

The model also determines something called "implicit hourly wages". I could not find where they went.

A total of 17 PPIs are determined by a stage of processing approach using raw material prices, exchange rates, the unemployment rate, capacity utilization (or other measures of demand), and occasionally unit labor costs.

There are 22 CPIs determined in a similar stage of processing fashion, drawing on the PPIs, etc. The 20 deflators are also built up from the PPIs, exchange rates, etc. Here the GNP gap (potential as a percent of actual) is the most frequently used excess demand term; capacity utilization is also used.

INCOME DISTRIBUTION

After a quick glance, the income side is more or less uncontroversial. Compensation is derived from the wage and hour data. Corporate profits depend on revenues (nominal output), wages, interest, and unit labor costs. Thus, wages enter twice. The rest of the sector is fairly standard. The statistical discrepancy is the residual.

<u>FINANCIAL SECTOR</u>

The equations here are clearly dated and use old money concepts. There are separate equations for currency and currency plus demand deposits! There is no clear <u>money demand or supply equation</u>.

The index of credit rationing (ICR) is essentially a measure of loan demand relative to deposit flows. I couldn't find the equation.

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So long as the combination of the ITC and the present value of depreciation is less than expensing this second effect will outweigh the first.

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One final caveat. All of the analysis assumes that changes in the corporate tax rate will change neither the after-tax cost of capital or the rate by which the stream of depreciation allowances is discounted. That would greatly complicate the analysis and I am not certain how it would all go.

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One must not exaggerate, we cautioned. It is not quite correct, technically, to say that the committee intends to abolish the corporate income tax entirely. A certain vestige would remain.

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CCEA Working Group on Economic Statistics

Initial Meeting

4:30 p.m.,Tuesday
June 23, 1981

The chairman would like to review three particular matters which are either important at the moment or appear to raise some of the questions that will have to be considered frequently in the future. The chairman would also like to request that users and producers of economic statistics frame comments and suggestions about other areas of concern about statistics that can be taken up at later meetings.

The three particular matters that we would like to discuss Tuesday are the role of IRS statistics of income data in the GNP accounts, the value of BLS's data on labor turnover and work stoppages, and the effects of contracting sample size in the Census' reporting on wholesale trade.

The SOI are a key support to aggregate income estimates and to the final quotations on GNP after revision. The BLS labor turnover and stoppages data are used outside BLS (in the leading indicators, for instance) and are widely read as a supplement to the establishment and household basis employment data. The Census wholesale trade data support the BEA estimates of inventories in GNP and estimates of output by industry.

In view of the particular items to be discussed at this meeting not all the producing and using participants who have attended past meetings of the working groups prior incarnations are asked to come. However, we would like to ask all to frame suggestions for future agenda items and direct these to CCEA.

SB 6/18/81

Names

CBO

Bill Beeman, Assistant Director
Rosemary Marcuss (Taxes)
Frank Russek (HEB)
Steve Zeller (Modeling)

BEA

Chuck Waite
Joe Wakefield
Frank deLeeuw (HEB)
Tom Holloway (HEB)
Thad Park

Commerce

Bill Cox

IMB

Ted Beza

OECD

Sylvia Ostrey
Kjell Anderson
Derek Chambers

Fed

Lyle Gramley; Steve Axilrod; Jim Kichline
Jerry Zeisel*
Helmut Wendal*
Mike Prell*
Larry Slifman*
Peter Clark
David Lindsey
Dick Porter
Larry Promisel

Fed (Continued)

Model Group

Jerry Enzler
Flint Brayton*
Doug Battenberg*
Bill Lee
Eileen Manskopf

Government Finance

Darrell Cohen (HEB)*
Wolf Romm (HEB)

Treasury

Craig Roberts, Asst. Sec. for Economic Policy
Steve Entin, Deputy Asst. Sec. for Economic Policy
Jim Russell (Modeler)
Peter Bidwell (Modeler)
James Girola (Modeler)
John Wilkins, Deputy Asst. Secretary
Larry Dildine, Depreciation issues
Don Curtis (International)
Scott Brown (International)
Ron Hoffman
Tom Vasquez, (Revenue estimates)
Cynthia Wallace, (Revenue estimates) (wp tax)
Karen Silver, (Revenue estimates) (oil fee/gas tax)

OMB

Larry Kudlow, Chief Economist
Ahmad Al-Samarrie
Michael Hamburger
John Holmes
Mike Gavin, Jr.
Jerry Shipley, Sr.
Bill Dinkelacker

Dave Mathiasen, Chief, Financial Analysis Branch
Darwin Johnson*
Bob Kilpatrick* WEFA
Hugh Connolly
Doug Norwood
Mary Barth (revenue)

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20506

June 17, 1981

MEMORANDUM FOR: Jerry Jordan

FROM: Steve Brooks

SUBJECT: Comments on the AHP proposal

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The basic control problem is to minimize some loss function (unemployment, inflation, growth, etc.) by altering policy "levers" (taxes, spending, monetary policy etc.) subject to the constraint imposed by the model. What the authors propose is to define weights in the loss function (that is, the relative importance of unemployment and inflation, etc.) through a survey of policy makers. The model, the relationship between policy changes and changes in the "target" variables, would also be based on the judgement of informed observers, allowing alternative views of the multipliers to have weight in the decision.

Some of the notions (in particular the method of selecting weights for the loss function) are intriguing, but I think that on the whole this proposal will have limited relevance to the forecasting and policy making process at the CEA. I am very uncomfortable with the highly mechanistic, engineering approach to policy making embodied here.

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COUNCIL OF ECONOMIC ADVISERS

WASHINGTON, D.C. 20506

June 1, 1981

MEMORANDUM FOR: Jerry Jordan

FROM: Steve Brooks

SUBJECT: Money Demand

This memo is an effort to consolidate and record my modest efforts on money demand. The first section discusses Hamburger's equation with focus on its theoretical justification, its forecasting accuracy, and the importance of its estimation period. The second section proposes a very simple alternative to the Hamburger approach and uses it to try to make statements about implied shifts in the demand for money that are imbedded in forecasts, or model simulations, etc. This final section is the follow-up promised in my earlier memo (April 24).

The Hamburger Equation

The basic equation is taken from his Journal of Monetary Economics article (1977, pp 265-288). It is shown in Table 1 along with error statistics from a dynamic post-sample solution. The equation has several notable features.

- o the money concept is old M1,
- o it is estimated from the second quarter of 1955 to the fourth quarter of 1972,
- o the long-run elasticity of money demand with respect to nominal GNP is constrained to equal 1.0,
- o the relevant competing-asset yields are the dividend-price ratio, the long-term government bond rate, and the commercial-bank time deposit rate.

Table 1
Hamburger Equation
(using old M1)

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1955:2 TO 1972:4) 71 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MONEY/GNP) M-1

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	-0.0478877	0.02752	-1.740	CONSTANT
1)	0.895357	0.02927	30.59	LOG(MONEY\1/GNP)
2)	-0.0231751	0.008166	-2.838	LOG(DIV%PCMNNS) Dividend-Price Ratio
3)	-0.0241543	0.009208	-2.623	LOG(RMSD) Commercial Bank Time Deposit Rate
4)	-0.0207592	0.01152	-1.802	LOG(RMGBLNS) Long-Term- Government Bond Rate
	0.564497	0.1132	4.987	RHO

R-BAR SQUARED: 0.9993
DURBIN-WATSON STATISTIC: 1.7005
STANDARD ERROR OF THE REGRESSION: 0.004026 NORMALIZED: 0.002956

Dynamic Simulation, 1973-79
(actual-predicted)

	ERROR ($bill.)	%ERR
1973:1	-0.6	-0.2
1973:2	-2.5	-1.0
1973:3	-3.5	-1.3
1973:4	-4.5	-1.7
1974:1	-2.9	-1.1
1974:2	-3.0	-1.1
1974:3	-1.8	-0.7
1974:4	-0.2	-0.1
1975:1	-1.3	-0.5
1975:2	-0.9	-0.3
1975:3	0.2	0.1
1975:4	-2.4	-0.8
1976:1	-5.3	-1.8
1976:2	-6.7	-2.2
1976:3	-10.0	-3.3
1976:4	-10.8	-3.5
1977:1	-11.3	-3.6
1977:2	-11.5	-3.6
1977:3	-10.9	-3.3
1977:4	-10.6	-3.2
1978:1	-9.9	-2.9
1978:2	-8.2	-2.3
1978:3	-8.2	-2.3
1978:4	-11.3	-3.1
1979:1	-19.4	-5.4
1979:2	-18.4	-5.0
1979:3	-16.4	-4.3
1979:4	-16.0	-4.2

The equation wanders off by growing amounts and in 1979, the last year for which the old-money data are available, it overpredicts M1 by a bit less than five percent. While this is significant, it is much less than the error from a similar dynamic solution of a traditional Goldfeld-type equation. Had this equation been used to forecast the new M1-B it would have had an average error in 1979 of $-14.1 billion, somewhat smaller than the average $-17.6 billion error shown in Table 1 (that is to say, M1-B was about $3.5 billion greater than M1 in 1979).

We cannot use this basic form and interval (1955-1972) to estimate an M1-B equation (as opposed to the old-M1 equation) because the M1-B series begins in 1959. Table 2 shows the equation estimated on M1-B from the second quarter of 1959 to the fourth quarter of 1972. The two interest rates are insignificant over this sample period, and coefficient on the dividend-price ratio (DPR) has fallen from -.023 to -.033. The equation underpredicts M1-B demand by about four percent for the last two years.

We can reconstruct a plausible time series for M1-B for the period 1955 to 1959 by comparing the difference between M1 and M1-B in 1959-60 when data for both series are available. The difference is about $2.7 billion. This appears to be fairly stable. Our dummy M1-B series for 1955-59 is then M1 less $2.7 billion. Table 3 shows the Hamburger equation estimated over this longer period with the constructed M1-B series. The DPR coefficient is backup to -.023, and the interest-rate variables are both significant. The equation tracks history very well.

Thus, by simply including the four years from 1955-1958 (and assuming our made-up M1-B series is reasonable), we have changed coefficient values significantly and dramatically improved the equations tracking ability.

Was there something unusual about 1955-1958? The data certainly suggest it. Some relevant points about that period:

- I have taken the equation shown on Table 3 and performed two Chow tests, breaking the sample first in 1959 and then (so that the first sub-period has a few more data points) 1961. Both tests reveal a significant change in structure between sub-periods.

Table 2

Hamburger Equation*
(estimated 1959:2 to 1972:4, based on M1-B)

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1959:2 TO 1972:4) 55 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MNY1B/GNP)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	-0.0256053	0.03643	-0.7028	CONSTANT
1)	0.929142	0.04253	21.85	LOG(MNY1B\1/GNP)
2)	-0.0334383	0.01200	-2.787	LOG(DIV%PCMNNS)
3)	-0.0108685	0.01601	-0.6787	LOG(RMSD)
4)	-0.00869080	0.01296	-0.6704	LOG(RMGBLNS)
	0.345835	0.1506	2.297	RHO

R-BAR SQUARED: 0.9984
DURBIN-WATSON STATISTIC: 1.7746
STANDARD ERROR OF THE REGRESSION: 0.004437 NORMALIZED: 0.003081

Dynamic Simulation
(1973-1981:1)

	ERROR ($bill.)	%ERR
1973:1	-0.8	-0.3
1973:2	-3.0	-1.2
1973:3	-4.9	-1.9
1973:4	-6.3	-2.4
1974:1	-5.2	-1.9
1974:2	-5.6	-2.1
1974:3	-4.5	-1.7
1974:4	-1.7	-0.6
1975:1	-1.5	-0.5
1975:2	-0.6	-0.2
1975:3	0.9	0.3
1975:4	-0.9	-0.3
1976:1	-2.5	-0.8
1976:2	-3.5	-1.2
1976:3	-6.5	-2.2
1976:4	-6.4	-2.1
1977:1	-4.5	-1.4
1977:2	-3.8	-1.2
1977:3	-3.4	-1.1
1977:4	-0.7	-0.2
1978:1	2.7	0.8
1978:2	5.8	1.7
1978:3	6.8	1.9
1978:4	8.1	2.3
1979:1	7.2	2.0
1979:2	11.6	3.1
1979:3	14.9	3.9
1979:4	15.3	4.0
1980:1	16.3	4.2
1980:2	9.9	2.6
1980:3	18.3	4.5
1980:4	22.3	5.4
1981:1	20.8	5.0

*Variables defined as in Table 1. In addition, MNY1B = M1-B

Table 3

Basic Hamburger Equation
(estimated 1955:2 to 197 :4)

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1955:2 TO 1972:4) 71 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MNY1B/GNP)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	-0.0480610	0.02743	-1.752	CONSTANT
1)	0.896957	0.02917	30.75	LOG(MNY1B\1/GNP)
2)	-0.0229494	0.008408	-2.729	LOG(DIV%PCMNNS)
3)	-0.0229293	0.009074	-2.527	LOG(RMSD)
4)	-0.0215408	0.01176	-1.832	LOG(RMGBLNS)
	0.504962	0.1176	4.295	RHO

R-BAR SQUARED: 0.9992
DURBIN-WATSON STATISTIC: 1.7863
STANDARD ERROR OF THE REGRESSION: 0.004369 NORMALIZED: 0.003166

Dynamic Simulation
(1973-1981:1)

	ERROR ($bill.)	%ERR
1973:1	-0.6	-0.2
1973:2	-2.6	-1.0
1973:3	-4.0	-1.6
1973:4	-5.4	-2.1
1974:1	-4.2	-1.6
1974:2	-4.7	-1.7
1974:3	-4.2	-1.6
1974:4	-2.4	-0.9
1975:1	-3.0	-1.1
1975:2	-2.3	-0.8
1975:3	-1.4	-0.5
1975:4	-3.7	-1.3
1976:1	-5.7	-2.0
1976:2	-7.1	-2.4
1976:3	-10.5	-3.5
1976:4	-11.2	-3.7
1977:1	-10.3	-3.3
1977:2	-10.7	-3.4
1977:3	-11.8	-3.6
1977:4	-10.5	-3.2
1978:1	-8.6	-2.6
1978:2	-7.0	-2.0
1978:3	-7.4	-2.1
1978:4	-7.6	-2.1
1979:1	-9.8	-2.7
1979:2	-6.6	-1.8
1979:3	-4.4	-1.2
1979:4	-4.0	-1.0
1980:1	-2.2	-0.6
1980:2	-8.4	-2.2
1980:3	0.7	0.2
1980:4	6.1	1.5
1981:1	5.6	1.3

- The simple correlation between the dividend-price ratio and velocity also reveals interesting patterns over alternative sample periods. Between 1955 and 1972 (the full sample period for the equation in Table 3) the simple correlation between these two variables was -.585. Between 1959 and 1972 the correlation dropped to -.014.

- For what it is worth, the 1955-58 period was the only time during the sample when the dividend-price ratio was greater than the long-term government bond yield (see Chart 1).

One final Hamburger equation: this time using the full sample 1959 to 1980. Table 4 shows the equation results. The two interest-rate variables are again insignificant and, as compared to the equation shown in Table 3, their absolute magnitude has shrunk by half.

There remain two other issues concerning specification: the constrained income elasticity, and the inclusion of the dividend-price ratio. It seems reasonable to constrain the long-run price elasticity of money demand to 1.0 (money being a veil and all). The reasonableness of constraining the nominal income elasticity to 1.0 is less clear. Moreover, why should the price and output effects have the same lag distribution? The traditional equation constrains only the long-run price elasticity since there are "economies introduced in the management of cash balances in a growing economy."

I have tested the validity of Hamburger's nominal-GNP constraint using the equation (and sample period) shown in Table 3. The traditional F-test rejects the hypothesis that the restriction is valid. (Note that a similar test on the constraint that the long-run price elasticity equal one could not be rejected.)

Table 5 shows the results from an equation similar to that in Table 3 with the long-run price elasticity constraint but without the long-run nominal GNP elasticity constraint. It wanders off by growing amounts.

The inclusion of the dividend-price ratio is somewhat unconventional. Hamburger seems to suggest in his article that it captures a wealth effect as well as being "an indicator of the yield on all physical capital." I doubt it does the former and am certain that does not do the latter. First, the DPR is a rate not a stock. In addition, it applies only to equities. It misses all non-equity financial wealth as

Chart 1

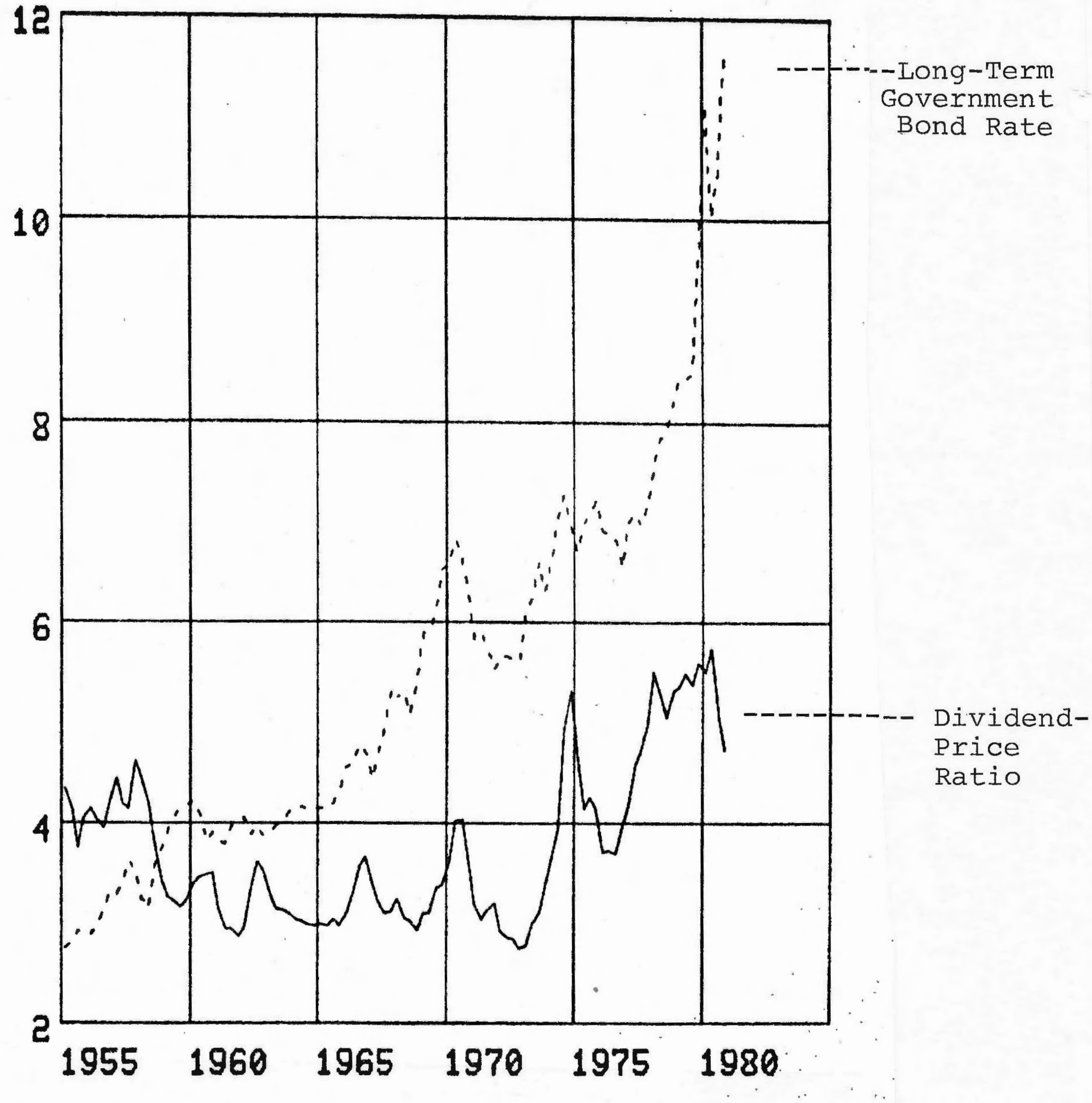

12
10
8
6
4
2
1955
1960
1965
1970
1975
1980
Long-Term Government Bond Rate
Dividend-Price Ratio

Table 4

Hamburger Equation
(estimated 1959:2 to 1980:4)

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1959:2 TO 1980:4) 87 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MNY1B/GNP)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	-0.0378823	0.009598	-3.947	CONSTANT
1)	0.930046	0.01728	53.81	LOG(MNY1B\1/GNP)
2)	-0.0218346	0.005489	-3.978	LOG(DIV%PCMNNS)
3)	-0.0124512	0.008997	-1.384	LOG(RMSD)
4)	-0.00761576	0.008108	-0.9393	LOG(RMGBLNS)
	0.157083	0.1135	1.384	RHO

R-BAR SQUARED: 0.9991
DURBIN-WATSON STATISTIC: 1.9348
STANDARD ERROR OF THE REGRESSION: 0.005581 NORMALIZED: 0.003579

Table 5

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1955:2 TO 1972:4) 71 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MNY1B/PGNP)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	0.607194	0.2804	2.166	CONSTANT
1)	0.193992	0.04881	3.975	LOG(GNP72)
2)	0.665463	0.1036	6.422	LOG(MNY1B\1/PGNP)
3)	-0.0205213	0.008537	-2.404	LOG(DIV%PCMNNS)
4)	-0.0451749	0.01283	-3.521	LOG(RMSD)
5)	-0.0234602	0.01197	-1.960	LOG(RMGBLNS)
	0.568380	0.1281	4.437	RHO

R-BAR SQUARED: 0.9935
DURBIN-WATSON STATISTIC: 1.6917
STANDARD ERROR OF THE REGRESSION: 0.004171 NORMALIZED: 0.0007743

	ERROR	%ERR
1973:1	-0.1	0.0
1973:2	-1.4	-0.5
1973:3	-1.9	-0.7
1973:4	-3.0	-1.1
1974:1	-1.4	-0.5
1974:2	-2.3	-0.9
1974:3	-3.1	-1.1
1974:4	-3.3	-1.2
1975:1	-5.9	-2.1
1975:2	-7.0	-2.5
1975:3	-8.2	-2.9
1975:4	-12.5	-4.3
1976:1	-16.1	-5.5
1976:2	-18.0	-6.1
1976:3	-21.3	-7.1
1976:4	-22.0	-7.2
1977:1	-21.5	-6.9
1977:2	-22.5	-7.1
1977:3	-24.0	-7.4
1977:4	-23.0	-7.0
1978:1	-21.4	-6.3
1978:2	-21.6	-6.3
1978:3	-23.7	-6.8
1978:4	-26.0	-7.3
1979:1	-29.9	-8.3
1979:2	-27.5	-7.4
1979:3	-26.4	-7.0
1979:4	-25.7	-6.7
1980:1	-24.7	-6.3
1980:2	-31.7	-8.2
1980:3	-24.5	-6.1
1980:4	-21.8	-5.3
1981:1	-25.5	-6.1

well as housing and consumer-durable wealth. Even if the DPR were a good indicator of equity wealth it would be an awful proxy for total wealth. Moreover, it is not even a very good measure of the total returns on equity let alone "all physical capital". As can be seen in Chart 1 the recent DP ratio is near 5% and that is a nominal yield!

I mentioned above that the Hamburger equation shown in Table 3 tracks money demand in 1980 far better than a Goldfeld-type equation. About one-half of this improvement is due to constraining the long-run nominal GNP elasticity to one. The remainder is due to the combination of including the DPR and estimating the equation using 1955-58 data.

All of this raises very interesting questions about model validation. Here we have an equation that, admittedly, tracks recent money demand relatively well. It, however, was estimated over a very restricted sample period, it includes partially made-up data, it applies a coefficient constraint which is unjustifiable, theoretically and statistically, and it includes a variable which (arguably) has only limited relevance. The equations recent accuracy obviously counts for something but does it mean we should totally ignore the warning signals that other validation techniques are raising?

A Simple Alternative

Recall, from my April 24 memo, that the original purpose of this tour through money-demand land was to derive an acceptable, simple equation that could be used as a check on assumptions about shifts in the demand for money. We saw from our first T-3 exercise on the Carter baseline that the financial sectors of the large-scale models were fairly heavily "managed." My hope was that we could find an easy tool to quantify the relative degree of management, nothing more or less.

In that spirit, Table 6 presents such an equation. It's chief features are these:

- The long-run price elasticity is constrained to equal 1.0. The long-run real income elasticity is .75.
- The long-run interest elasticity (using the T-bill rate) is .14.

Table 6

An Alternative Money Demand Equation
(estimated from 1959:2 to 1979:4)

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1959:2 TO 1979:4) 83 OBSERVATIONS
DEPENDENT VARIABLE: LOG(MNY1B/PGNP)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	0.0537547	0.2159	0.2489	CONSTANT
1)	0.904673	0.05898	15.34	LOG(MNY1B\1/PGNP) GNP Deflator
2)	0.0714435	0.01767	4.044	LOG(GNP72) Real GNP
3)	-0.0134954	0.003689	-3.658	LOG(RMGBS3NS) 91-day T-bill Rate
4)	-0.0111578	0.004723	-2.363	D75
	0.363646	0.1254	2.900	RHO

R-BAR SQUARED: 0.9916
DURBIN-WATSON STATISTIC: 1.8320
STANDARD ERROR OF THE REGRESSION: 0.004545 NORMALIZED: 0.0008394

	ERROR ($bill.)	%ERR
1974:1	0.6	0.2
1974:2	-1.0	-0.4
1974:3	-3.1	-1.1
1974:4	-4.5	-1.6
1975:1	-4.9	-1.8
1975:2	-3.7	-1.3
1975:3	-1.7	-0.6
1975:4	-3.4	-1.2
1976:1	-4.2	-1.4
1976:2	-4.2	-1.4
1976:3	-6.0	-2.0
1976:4	-5.8	-1.9
1977:1	-4.8	-1.5
1977:2	-5.4	-1.7
1977:3	-6.2	-1.9
1977:4	-4.7	-1.4
1978:1	-3.6	-1.1
1978:2	-2.4	-0.7
1978:3	-2.2	-0.6
1978:4	-1.7	-0.5
1979:1	-3.3	-0.9
1979:2	-0.1	0.0
1979:3	2.4	0.6
1979:4	1.5	0.4
1980:1	2.0	0.5
1980:2	-7.7	-2.0
1980:3	-1.9	-0.5
1980:4	2.8	0.7

- o The equation is estimated from the second quarter of 1959 through the fourth quarter of 1979.

- o A within-sample dynamic solve from 1974 on produces a reasonable good fit. In the post-sample period 1980, the error averages less than one percent.

- o It includes a shift dummy that equals 1.0 from 1975 on. The long-run effect of this dummy is to lower money demand by about eleven percent (in 1979-80).

While this is unlikely to be the last word on money demand, it appears to be an adequate alternative for our purposes.

I have used that equation to estimate money demand based on the real GNP, deflator, and T-bill paths in three of the Carter baseline simulations (MPS, DRI, and CEI) the results are shown in the Table below. On the table each column shows the difference between the M1-B actually generated by the model and M1-B calculated by my equation (using the right-hand side elements taken from the model simulation). The only other adjustment captures the shifts into M1-B (from sources other than demand deposits) induced by nationwide introduction of NOWs. This adjustment must, of course, be added to the results from my equation to make them consistent with the estimates derived from the models.

Estimated M1-B Shifts
(full model minus single-equation*, billions of dollars)

	MPS	DRI	CEI	NOW Adjustment
1981:1	-2.2	-6.3	-6.4	5.8
2	-8.5	-12.2	-8.3	10.0
3	-13.1	-14.8	-12.1	12.0
4	-16.7	-15.8	-15.1	14.0
1982:1	-18.6	-18.8	-21.4	14.2
2	-20.9	-22.5	-27.3	14.4
3	-23.5	-26.7	-32.3	14.6
4	-26.6	-27.3	-36.9	14.8
1983:1	-30.4	-32.6	-44.2	15.0
2	-34.5	-38.4	-49.5	15.2
3	-38.9	-45.8	-56.3	15.4
4	-43.6	-54.3	-64.0	15.6

Note: Data taken from "Carter baseline" simulations with target M1-B growth.

* Adjusted for nationwide introduction of NOWs (see column four)

The results suggest that, by this definition of "shifts", all three models are assuming fairly sizeable shifts in M1-B demand. By the end of 1983 the ranges are from about nine percent for MPS to about thirteen percent for CEI. More important than the absolute shifts are the relative shifts embodied in each result. All three models seem to assume similar shifts during 1981. In 1982 DRI and MPS assume an additional $10-11 billion shift, CEI's is closer to $20 billion. Over the four quarters of 1983 MPS assumes a $17 billion additional shift, DRI and CEI both assume a $27 billion shift.

Chart 2 can be used to inspect the believability of these results. In the first three panels velocity is plotted. They show history and forecast. The solid line is the velocity result from each of the model simulations. The dotted line shows the velocity consistent with the M1-B results from my single-equation forecast. The CEI result (which shows declining velocity after 1981 for the M1-B forecasted by my equation) looks somewhat suspicious. However, in the CEI forecast real interest rates are negative in 1982 and 1983. Indeed, they are projected to be more negative than at any time during the last five years. The real T-bill rate is plotted in the bottom three panels. It is calculated as the current quarter's nominal T-bill rate minus the four-quarter change in the GNP deflator.

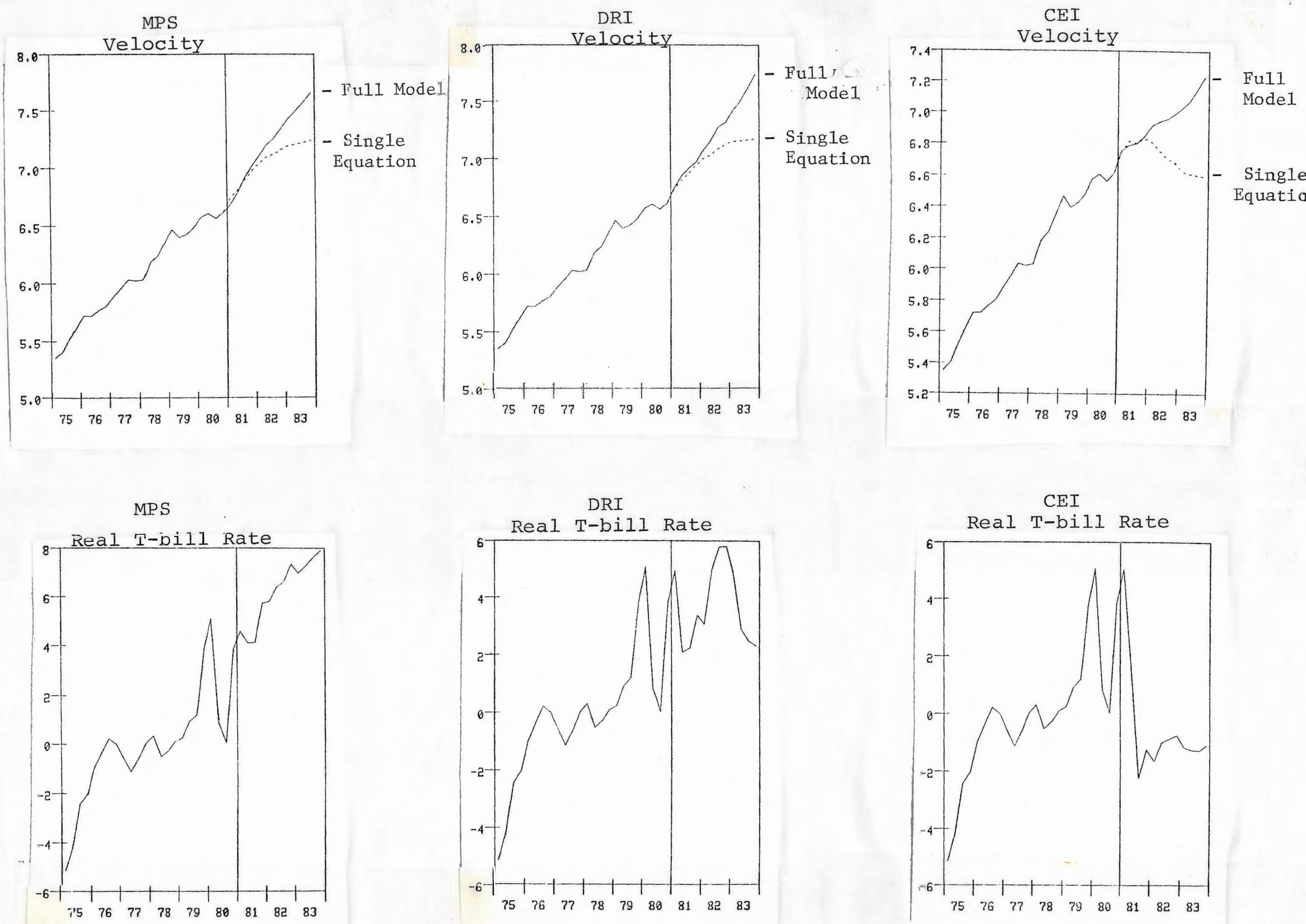
The February Forecast. I have performed a similar exercise on the February forecast. I used the real GNP, deflator, and T-bill rate as projected to estimate M1-B using my equation. I then compared the results to the upper ends of the Fed target ranges. The results show very sizeable shifts.

Estimated M1-B Shifts
(Fed target range minus single-equation, billions of dollars)

	Administration Forecast
1981:1	-3.9
2	-7.8
3	-9.9
4	-12.4
1982:1	-16.3
2	-21.2
3	-26.7
4	-32.6
1983:1	-39.8
2	-47.1
3	-54.7
4	-62.5

Chart 2

Velocity and Real Interest Rates: Alternative Simulations*



*"Carter Baseline" simulations

This is no surprise since we always knew that the velocity assumptions were somewhat extreme.

Thoughout this exercise my hope has been that we could devise a process that would yield a simple, albeit crude, measure of the implied shifts in money demand in the commercial forecasts as well as our own. This first pass suggests that the exercise performed here may be a useful test from time to time. The results are, of course, based on the believability of the equation that I have used. I have no great confidence in it, but I think it is an adequate benchmark money demand equation. One thing is clear from this effort there ain't no such thing as a good money demand equation.

Briefing Paper on the Economic Program

The Program consists of four fundamental and interdependent parts: significant Federal budget outlay cuts, a three-year phased reduction in Federal individual income tax rates combined with an acceleration and standardization of business depreciation schedules, a gradual and steady reduction in the rate of growth of monetary aggregates, and finally, substantial review, analysis, and reform of Federal government regulations and rules.

Budget Outlay Reductions

A central feature of the President's economic proposals is the dramatic slowing in the growth of Federal budget outlays. From fiscal 1977 to fiscal 1981 total budget outlays grew at an average annual rate of over 13 percent. In contrast, the proposed growth of outlays for fiscal 1982 is less than half that rate at about 6 percent. Federal budget outlays, which are expected to be approximately 23 percent of GNP in 1981, would decline to less than 20 percent of GNP by 1984. The spending reduction plan will shift Federal budget priorities. Increased importance is attached to National Defense while maintaining the Federal government's support for "safety net" programs. There will also be reductions in the growth of off-budget outlays and in Federal credit programs compared to what was previously projected. As a result, the total claim on the credit markets by the Federal government is expected to be significantly reduced.

Tax Reductions

The Administration's proposals for tax reduction include an across-the-board cut in marginal tax rates for individuals of 10 percent for each of the next 3 years starting July 1, 1981. For businesses, the Administration proposes to accelerate the write-off for depreciation of machinery, equipment and structures. The basic objectives of the proposals are to reduce the burden of taxation by: (1) limiting tax revenue as a percent of GNP to under 20 percent by the end of the planning period; (2) providing incentives for increased production in the private sector by lowering marginal tax rates and by adopting the "accelerated cost recovery system"; (3) stimulating greater spending for new and long-lived productive capacity; and (4) promoting innovation and providing a healthy environment for new capital accumulation. It is expected that private sector investment spending will rise as a share of Gross National Product as government spending's share declines and as the Federal budget is brought into balance.

Monetary Policy

The Administration is not proposing specific year-by-year changes in monetary targets to be set by the Federal Reserve System.

Neither is the Administration suggesting to the Fed which measures of money and credit should be used as the objects for targeting monetary policy. The Administration's economic premises do assume a steady reduction in the growth of the various monetary aggregates such that monetary expansion would be reduced by half between 1980 and 1986. This assumption is certainly consistent with recent statements by the Federal Reserve. It should be made very clear, however, that the Administration does not seek to dictate Federal Reserve monetary policy.

Reduced Regulation

The Administration's regulatory reform measures call for review of all major regulatory proposals by executive branch agencies, especially those that would impose large costs on the economy or involve overlapping jurisdiction among agencies. In addition, there will be review of executive branch regulations already on the books, concentrating on those that are particularly burdensome to the national economy or to key industrial sectors. Moreover, the Administration will be developing legislative proposals designed to deal with statutory obstacles to more cost-effective regulation.

Talking Points on Current Economic Activity

Notes on the first Quarter

Real GNP grew at a very strong 8.4 percent annual rate in the first quarter. Big increases were registered in non-residential fixed investment (up 13.3 percent) federal purchases (up 14.3 percent), and exports (up 26.0 percent). Consumption grew at a 5.0 percent annual rate, and the saving rate fell from its fourth-quarter-1980 level of 5.1 percent to 4.7 percent. The implicit price deflator rose at an annual rate of 10.0 percent.

The second revisions to the first quarter as well as the "flash" for the second will be available next Thursday.

January was by far the strongest month of the quarter. In January, aggregate hours grew at a 13.2 percent annual rate, and industrial production was up at a 5.7 percent annual rate. Consumption, boosted by a surge in car sales, rose at a 10.2 percent annual rate. Business fixed investment and housing were also quite strong.

Activity slowed dramatically in February and March. Real consumption declined by small amounts in both months. Construction activity also weakened sharply and by March total real construction spending was 5.5 percent below January's levels. Aggregate production hours in March were 0.3 percent below January's total.

Early Second Quarter Data

The recent data suggest that while most demands appear to be faltering, the aggregate production and hours data seem to be holding up.

- The unemployment rate jumped back to its 1980 peak of 7.6 percent in May. This was mostly due to a very rapid gain in the labor force. Total household employment actually grew during the month.

- After adjusting for the miner's strike, the May data show that industry employment has been essentially flat since March. Initial claims for unemployment insurance have been very stable since January.

- Aggregate hours in May fell at a 3.7 percent rate principally due to a sharp decline in construction hours.

- o Industrial production for April was up at a 4.8 percent annual rate, to a level 0.7 percent above the first quarter.
- o Real consumption in April (the data for which will be available next week) is almost certain to have fallen making it the third straight month of consumption declines since January. Significant further weakness is unlikely. Personal income growth (after accounting for the coal stike) has remained relatively strong. The Michigan index of consumer sentiment has grown steadily since February.
- o Both housing starts and permits picked up modestly in April. However, starts still remain over 300,000 units less than January's level, stuck at about the 1.3 million unit level.
- o The business investment picture appears mixed. The nondefense capital goods shipments for April fell 0.6 percent, and construction hours and employment fell sharply in May. Nevertheless, investment surveys still show plans for relatively large advance in capital investment, especially by the petroleum industry.
- o Defense spending continues to make large gains. Industrial production of defense and space equipment in April was 1.3 percent above the first quarter's average and shipments remain at high levels.

The inflation picture shows some very modest improvement if one looks closely enough. However, the current "underlying" rate, as measured by inflation in the CPI excluding food, energy, and housing, still is in the neighborhood of 9.0 percent down perhaps as much as 0.5 percentage points since January. The twelve-month change in the PCE deflator is closer to 9.5 percent having shown little if any improvement since January. The monthly data continue to flop around.

- o April's CPI annual inflation rate was 5.1 percent due to weakness in food and energy prices. Home purchase and finance has again begun to exert some upward push to the index.
- o The May PPI for finished goods rose at only a 4.6 percent annual rate. Food and energy prices were contributing factors.

o The crude PPI excluding food and energy rose sharply in May for the second month in a row. This index had been falling fairly sharply in the early months of the year.

<u>A Flash Guess</u>

The second quarter growth is very likely to be modestly negative, somewhere in the neighborhood of -1 to -2 percent. The big uncertainties are the degree of retrenchment in net exports, and the degree of inventory stock building.

That is a statement about the reported data which are likely to show some correction from the extraordinary first quarter results. It is an underestimate of current economic conditions which, although far from robust, continue to show some modest strength.

The uncertainties, as ever, revolve around the outlook for interest rates and the rate-sensitive sectors notably housing.

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20506

June 2, 1981

MEMORANDUM FOR: Jerry Jordan

FROM: Steve Brooks

SUBJECT: A Monetarist Model

I have estimated a simple monetarist model which is now available for forecasting and analysis. This memo provides the detail on structure, estimation, and use. It has been designed so that it will be easy to change the model by adding or altering equations. Your comments and suggestions will be greatly appreciated.

The Basic Structure

The model determines nominal GNP from a traditional "St. Louis" equation, with money and high-employment Federal expenditures as the two independent variables (Table 1). The GNP deflator is determined by money and the relative price of energy (here defined as the WPI for fuel and related products) (Table 2). This latter variable has a couple of problems. It double-counts some energy prices and reflects the price of energy use not domestic production. It is not the best index, but it is easily available. (MJM may have stronger views on this point). Real GNP is taken as the residual. The unemployment rate is derived from an Okun's law equation based on real GNP and potential (Table 3). I tried several equations for the three-month Treasury bill rate, but none proved successful. The model currently does not have a T-bill equation. . . any suggestions?

A complete variable listing is shown below:

Summary Model Structure

VARIABLE NAME	DEFINITION
Endogenous variables	
GNP	Nominal GNP ($ billions)
GNP72*	Real GNP (billions of 1972 $)
PGNP	GNP deflator (1972 = 1.000)
RU	Unemployment Rate (percent)
* Identity	
Exogenous variables	
MNY1B	M1-B ($ billions)
GNPK72	Real Potential GNP, CEA basis (billions of 1972 $)
WPI05	Wholesale price index for fuel and related products and power (commodity basis) (1967 = 1.0)
RUFE	Full-employment unemployment rate (percent) (1981 = 5.1%)

Chart 1 shows the results from a dynamic simulation from 1970 to 1980. Each panel compares the actual (solid line) to the predicted (dotted line) values for the four endogenous variables. For nominal GNP and the deflator the 4-quarter change is plotted rather than the level. Real GNP tracks fairly well. However, the severity of the 1975 and the 1980 recessions is less than actually occurred.

The unemployment rate is off because real GNP is off. A dynamic simulation of the unemployment rate equation using actual real GNP shows much better results.

I have used the model to forecast through 1983. The key assumptions are these:

- Four-quarter growth in money is assumed to be 8 1/2 percent in 1981, 6 percent in 1982, and 5 1/2 percent in 1983.

- Oil prices (nominal) will be constant the remainder of this year. Thereafter I have assumed they grow at an annual rate of 6.5 percent.

- The high-employment expenditures are taken from the March budget. (See my earlier memos with Bob Turner.)

The results are shown in Table 4.

TABLE 1

ORDINARY LEAST SQUARES

QUARTERLY(1961:1 TO 1979:4) 76 OBSERVATIONS
DEPENDENT VARIABLE: LOG(GNP/GNP\1)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	0.00724875	0.003076	2.357	CONSTANT
1)				PDL(DLMNY1B,3,6,FAR)
\0	0.407358	0.1374	. + * +	
\1	0.364943	0.08059	. + * +	
\2	0.236328	0.08611	. + * +	
\3	0.0785203	0.05974	.+*+	
\4	-0.0514745	0.06913	+ *.+	
\5	-0.0966500	0.07660	+ * +	
SUM	0.939025	0.1905	4.929	
AVG	NM			
2)				PDL(DLGEXPFK,3,6,FAR)
\0	0.0821168	0.04617	. + * +	
\1	0.0382383	0.03338	+ * +	
\2	0.00478999	0.03344	+ * +	
\3	-0.0169931	0.02584	+ * .+	
\4	-0.0258759	0.03175	+ * +	
\5	-0.0206232	0.03246	+ * .+	
SUM	0.0616529	0.1038	0.5942	
AVG	NM			

R-BAR SQUARED: 0.3063
DURBIN-WATSON STATISTIC: 2.1292
STANDARD ERROR OF THE REGRESSION: 0.007365 NORMALIZED: 0.3502

Where DLMNY1B = $\log\left(\frac{M1\text{-}B}{M1\text{-}B_{-1}}\right)$ and

$$DLGEXPFK = \log\left(\frac{GEXPFK}{GEXPFK_{-1}}\right)$$

and PDL (X, 3, 6, FAR) indicates a polynominal distributed lag on X with a third-degree polynominal, six lags, and with an end-point constraint of zero at the sixth lag.

TABLE 2

```
              ORDINARY LEAST SQUARES
              ----------------------

QUARTERLY(1961:1 TO 1979:4)   76 OBSERVATIONS
DEPENDENT VARIABLE:   LOG(PGNP/PGNP\1)

         COEFFICIENT   STD. ERROR    T-STAT    INDEPENDENT VARIABLE

       -0.000146998    0.001152     -0.1276    CONSTANT

 1)                                            PDL(DLMNY1B,4,8,FAR)
  \0      0.0302209     0.06805    +  .   *        +
  \1       0.101130     0.04096       .      +     *    +
  \2       0.130074     0.03769       .           +   *   +
  \3       0.138199     0.03107       .            +   *   +
  \4       0.137981     0.03388       .            +   *   +
  \5       0.133235     0.02872       .             +  *  +
  \6       0.119111     0.03457       .          +   *   +
  \7      0.0820925     0.04458       .    +    *    +
  SUM      0.872042     0.08887       9.813
  AVG       3.76505      0.4729       7.962

 2)                                            PDL(DLRWPI05\1,3,6,NONE)
  \1      0.0336055     0.01642    .     +     *     +
  \2      0.0402609     0.01156    .         +   *   +
  \3      0.0331964    0.009124    .        +  *  +
  \4      0.0218673    0.009315    .    +  *  +
  \5      0.0157292     0.01160    .+   *   +
  \6      0.0242377     0.01662    . +     *     +
  SUM      0.168897     0.02090       8.081
  AVG       2.10993      0.3941       5.353

R-BAR SQUARED:  0.7463
DURBIN-WATSON STATISTIC:  1.5721
STANDARD ERROR OF THE REGRESSION:  0.003325   NORMALIZED:  0.2848
```

Where DLRWPI05 = $\log\left(\frac{WPI05}{WPI05_{-1}}\right)$

PDL's are defined as above except "NONE" indicates no end-point constraint.

TABLE 3

LEAST SQUARES WITH FIRST-ORDER AUTOCORRELATION CORRECTION

QUARTERLY(1961:1 TO 1979:4) 76 OBSERVATIONS
DEPENDENT VARIABLE: (RU-RUFE)

	COEFFICIENT	STD. ERROR	T-STAT	INDEPENDENT VARIABLE
	0.0759558	0.1099	0.6914	CONSTANT
1)	20.3950	2.310	8.830	LOG(GNPK72/GNP72)
2)	13.4290	2.447	5.489	LOG(GNPK72\1/GNP72\1)
3)	6.54754	2.452	2.670	LOG(GNPK72\2/GNP72\2)
4)	3.75505	2.484	1.512	LOG(GNPK72\3/GNP72\3)
5)	1.77441	2.307	0.7690	LOG(GNPK72\4/GNP72\4)
	0.819793	0.06668	12.29	RHO

R-BAR SQUARED: 0.9822
DURBIN-WATSON STATISTIC: 1.4163
STANDARD ERROR OF THE REGRESSION: 0.1613 NORMALIZED: 0.1885

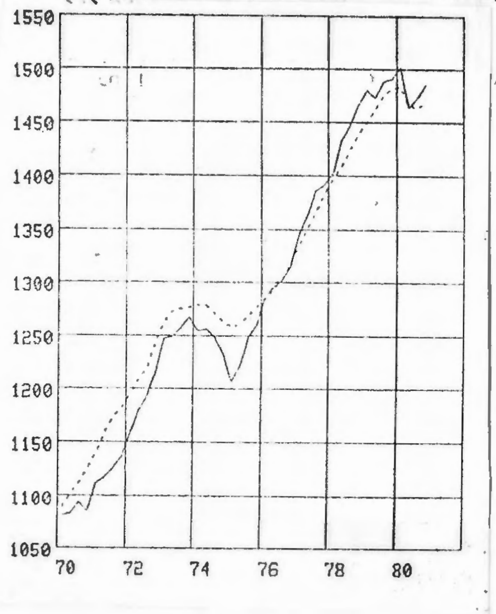
TABLE 4

MODEL FORECAST
(1981:2 to 1983:4)

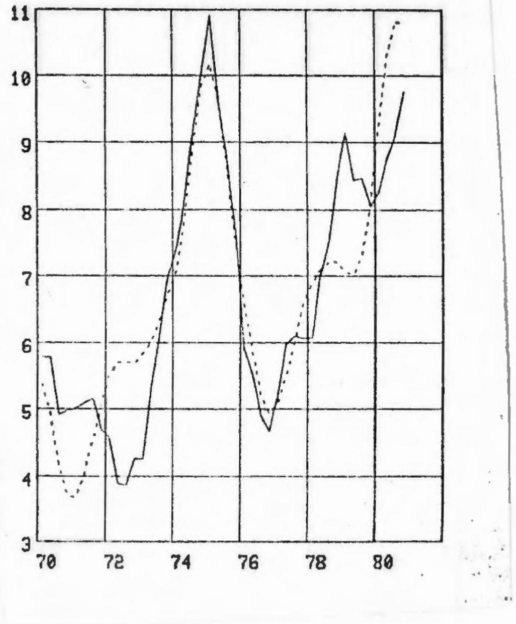
	Actual 1981:1	1981:2	1981:3	1981:4	1982:1	1982:2	1982:3	1982:4	1983:1	1983:2	1983:3	1983:4
GNP	2,853.8	2,940.5	3,023.5	3,092.0	3,161.0	3,230.3	3,302.2	3,371.5	3,440.1	3,510.2	3,582.4	3,656.2
%CH	19.3	12.7	11.8	9.4	9.2	9.1	9.2	8.7	8.4	8.4	8.5	8.5
GNP72	1,516.0	1,527.8	1,538.8	1,545.3	1,554.2	1,561.4	1,570.7	1,582.8	1,594.0	1,606.1	1,618.5	1,631.4
%CH	8.4	3.2	2.9	1.7	2.3	1.8	2.4	3.1	2.8	3.1	3.1	3.2
PGNP	1.883	1.925	1.965	2.001	2.034	2.069	2.102	2.130	2.158	2.185	2.213	2.241
%CH	10.0	9.3	8.6	7.5	6.8	7.1	6.6	5.4	5.4	5.2	5.2	5.1
VELOCITY	6.806	6.848	6.923	6.961	7.014	7.064	7.116	7.161	7.209	7.258	7.309	7.360
%CH	11.8	2.5	4.5	2.2	3.1	2.9	3.0	2.5	2.7	2.8	2.8	2.8
Unemployment Rate	7.3	7.1	7.0	7.0	7.1	7.2	7.3	7.3	7.3	7.3	7.3	7.3
						ASSUMPTIONS						
MNY1B	419.3	429.4	436.7	444.2	450.7	457.3	464.0	470.8	477.2	483.6	490.1	496.7
%CH	6.7	10.0	7.0	7.0	6.0	6.0	6.0	6.0	5.5	5.5	5.5	5.5
WPI05	6.661	6.661	6.661	6.661	6.766	6.874	6.983	7.094	7.206	7.321	7.437	7.555
%CH	49.5	0.0	0.0	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
GEXPFK	646.000	649.200	667.100	677.100	687.400	697.200	717.300	719.600	724.700	733.900	744.600	753.000
%CH	11.4	2.0	11.5	6.1	6.2	5.8	12.0	1.3	2.9	5.2	6.0	4.6
GNPK72	1,576.3	1,587.6	1,599.0	1,610.5	1,622.4	1,634.5	1,646.6	1,658.8	1,671.1	1,683.5	1,696.0	1,708.6
%CH	2.9	2.9	2.9	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

CHART 1 Dynamic Simulation Results, 1970-1980 (Actual, solid line - simulation, dotted line)

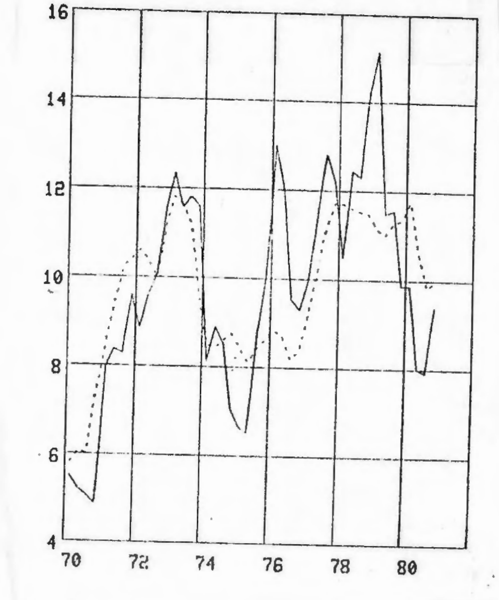
Real GNP
(billions of 1972 dollars)



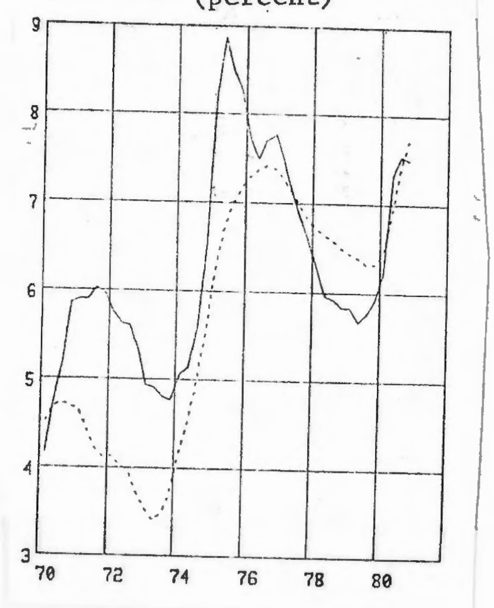
GNP Deflator
(4-Quarter Change)



Nominal GNP
(4-Quarter Change)



Unemployment Rate
(percent)



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