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A Short-Run Forecasting Model of
ıal Expenditures

By Dan M. Bechter and Steven P. Zell

The volume and complexity of monthly data on economic activity make their interpretation difficult for both the layman and the professional economist. At the same time, the economist faces the difficulty of making forecasts of the nation's gross national product **(GNP)** in advance of the quarterly release of these data by the **U.S.** Department of Commerce. Finding a relationship between the GNP data and the earlier available monthly economic data would help to resolve both problems. This article seeks to establish such a relationship within the context of a formal econometric model.

The model focuses on the personal consumption expenditures **(PCE)** sector of the GNP accounts, a sector which constitutes almost two-thirds of GNP. In design, the model is a two-part, **12-equation** model relating developments in the PCE sector to several monthly series, notably retail sales. One part of the model examines PCE in nominal, or current dollar, terms because the monthly data are only available in that form. The second part of the model develops a price deflator for the personal consumption sector. From forecasts generated separately for nominal PCE and its deflator, forecasts for real PCE, or consumer spending corrected for inflation, were then made. The results of the forecasts indicate that the model successfully tracks real PCE, including most turning points.

STRUCTURE OF THE MODEL

Econometric models may be created for several different purposes. The most common purpose is to try to determine whether a causal relationship exists between some dependent variable, often called the endogenous variable, and one or more independent or exogenous variables. The hypothetical causal relationship is generally suggested by economic theory, but its actual format, including the specific numbers that define the relationship, is statistically estimated by various techniques. Such a causal model is generally referred to as behavioral, and like all models may consist of one or more equations which may or may not be dependent upon one another. An example of a behavioral model in its simplest form is a consumption function like equation 1:

$$1.\ C_t = a + b\ Y_t + e_t.$$

This equation, a one-equation model, hypothesizes that the amount of consumption in period t, C_t, is a function of disposable personal income, Y_t. Of the remaining terms, e_t is an unknown error term that arises in part because the equation is a simplification of reality, while a and b are coefficients whose numerical values are estimated by a statistical procedure.

For short-run forecasting of quarterly PCE, an alternative approach to model building is used in this article. Personal consumption expenditures are forecast by using a model with explanatory variables based on monthly data, such as retail sales, that are as closely related to the PCE series as possible. This type of model is not behavioral, in the sense that movements in the monthly series cause movements in the quarterly series under examination. Instead, the monthly data represent very early measures of the same economic phenomena that the PCE series are attempting to measure. In many cases they serve as one of many inputs into the actual calculation of the preliminary PCE data by the Department of Commerce.[1] One such input is retail sales, which consist largely of goods sold to individual consumers. Retail sales are more closely related to the goods portion of PCE than to total PCE, which includes a large services component. Thus, the model was formulated with one equation relating retail sales to the goods component of PCE, and other equations explaining the services component.

Briefly, a two-part, 12-equation model of the personal consumption sector was developed and statistically estimated.[2] The first eight equations constitute a self-contained model of the personal consumption sector measured in nominal or current dollar terms. These eight equations are linked by an identity to three equations which estimate the relationship between the monthly consumer and producer price indexes and the quarterly price deflator for personal consumption expenditures. The identity defines real PCE as nominal PCE divided by the deflator. When combined, these 12 equations yield a model which provides forecasts of real, or inflation-adjusted, personal consumption expenditures.

The equations were specified so that their estimation would reveal the nature of the relationship that existed between the related monthly and quarterly economic series. The model was structured so that, using monthly data, quarterly forecasts of personal consumption expenditures (both nominal and real) could be made shortly after the end of a quarter, but before the GNP data are released. Since total personal consumption expenditures had to be accounted for, the nominal PCE section of the model had to contain at least two equations; one with goods expenditures as the dependent variable and one with services expenditures as the dependent variable.

The total goods equation was specified as follows. Quarterly PCE expenditures on goods was estimated as a function of the previous quarter's goods expenditures and the quarterly change in an adjusted measure of retail sales.[3] Data availability was not a problem here. Retail sales data for a month are available approximately 10 days after the end of that month. Thus, a full quarter's retail sales data are available 10 days after the end of the

1 See Dan M. Bechter and Steven P. Zell, "Preliminary Estimates of GNP: 1972-78," Economic Review, Federal Reserve Bank of Kansas City, January 1979, pp. 19-28. See pp. 20-23 for a discussion of the composition of PCE and retail sales.

2 The equations of the model, the definitions of the variables, and estimated results are presented in the appendix to this article. In addition, a more detailed discussion of the model's structure and results is presented in a forthcoming Research Working Paper.

3 Retail sales were adjusted to reflect only consumer purchases of goods. From the total monthly level of retail sales are subtracted all expenditures on building supplies and hardware (treated in the GNP accounts as investment) and 15 per cent of expenditures on automobiles and supplies. The latter subtraction is made to eliminate automobiles sold for business use. See Bechter and Zell.

quarter, while GNP data are published about three weeks after the quarter's close. Thus, besides providing a means for interpreting movements in retail sales in terms of movements in quarterly consumer spending on goods, this equation also satisfies the goal of permitting future forecasts of the goods component of PCE in advance of future GNP publication. To continue to meet this goal of timely forecasts in subsequent equations, the date of retail sales availability was chosen as the closing date for the use of any other monthly series needed in the model. For other required series, if third-month data for a quarter were not available by this time, only two months of published data were used and the third month was estimated.

Specifying the equation for personal expenditures on **services** was considerably more complicated, because of the great difficulty in finding regularly published monthly data to serve as explanatory variables for quarterly PCE on services. Although the best explanatory variable for current quarter expenditures on services was found to be services expenditures in the previous quarter, such a simple trend specification alone means that forecasts from the services equation would be extremely insensitive to economic and other developments since the end of the previous quarter. To help capture the influence of such developments, the difference between current quarter disposable income (after-tax income) and consumer expenditures on goods was added as a second explanatory variable to the services equation. This gave rise to the need to forecast current quarter disposable income, defined as personal income (before tax) multiplied by 1 minus the tax rate. Because of the time constraint on the availability of monthly data noted earlier, however, the estimation of personal income for the current quarter requires prior estimation of its wage and nonwage components for the third month of the quarter. The estimated quarterly personal income, along with the previous quarter's tax rate, then produces an estimate of current quarter disposable income. Finally, this **became—in** recursive fashion—an input to the forecast of consumer expenditures on services.[4] The entire nominal PCE section of the model, which estimates both goods and services consumption, consists of five estimated equations and three identities.

To complete the model, a set of four equations was added to the nominal PCE section to forecast the PCE price index. Three of these equations were necessary so that monthly values of the consumer and producer price indexes could be used to forecast the PCE price deflator. Again, this represented a recursive model structure. Because the consumer price index (CPI) for the third month of a quarter is published after the GNP data, the first of these equations is used to estimate the third month of consumer prices. This was accomplished using as independent variables data on earlier months of both consumer prices and producers' prices for consumer finished goods. A second equation, an identity, averages the forecast value for the third month of consumer prices with the two prior months of actual CPI data to yield a quarterly consumer price index. The third equation then uses this quarterly consumer price index to forecast a price deflator for PCE. Finally, real PCE output is generated by another identity that links the two sectors of the model by dividing the simulation output for nominal PCE by that for the deflator.

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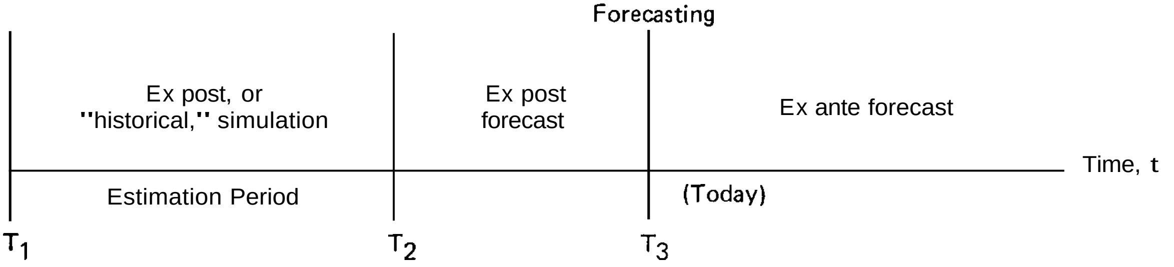
[4] A model with a simulation structure of this sort is known as *recursive*. That is, while each equation is estimated separately, the order in which the equations are simulated is important because the forecast results of one equation are used as inputs for the solution of subsequent equations in the model.

Chart 1



SOURCE: Robert S. Pindyck and Daniel L. Rubinfeld, Econometric Models and Economic Forecasts (New York: McGraw-Hill, 1976), p. 313.

In summary, a 12-equation model was specified with five identities and seven estimated equations. Three of the seven estimated equations constitute the central core of the model, with one having as its dependent variable consumer expenditures **(PCE)** on goods, another consumer expenditures on services, and a third the price deflator for total consumer expenditures. A fourth equation, with disposable personal income as the dependent variable, serves as an input into the services equation. The three remaining estimated equations were necessary because of the problems with monthly data availability. Once estimated and combined with the five required identities, these seven equations provide a recursive structure which, when solved, yields the simulation results that are described in the following sections.

SIMULATION WITH THE MODEL

Once a model is estimated, it may be used to conduct a variety of simulation experiments.[5] As Chart 1 shows, there are basically three periods over which simulation comparisons may be made. Simulation over the period in which the model was estimated may be referred to as **ex post simulation,** or "historical" simulation. Since over this period, the actual values of the endogenous (dependent) variables are available, a comparison may be made between these actual values and the simulation results to test whether the model is a valid representation of reality. The second type of simulation is **ex post forecasting,** in which the model is simulated beyond the estimation period, but no further than the last date for which data are available on all variables. The availability of actual values for the endogenous variables in this **ex post** forecasting period also permits a comparison with forecast values to test the forecasting accuracy of the model. Finally, **ex ante forecasting** consists of forecasting beyond "today" into the future. The closest fit of simulated to actual values can be expected to be for the estimation or historical period, followed by the **ex post** forecasting period, with the poorest fit likely to be for the **ex ante** forecast period.

5 The process of simulation is an econometric procedure. In it, a model consisting of one or more equations, each defining a relationship between a single dependent variable and one or more Independent variables, is used to generate estimates of the values of these dependent variables. The simulation of the values of the dependent variables may be done for the historical period over which the model relationship was estimated (the in-sample period), or it can be done for some out-of-sample period, in which case the simulation results are called forecasts.

Using these concepts, the simulation properties of the model were tested in a series of experiments. In the first experiment, the nominal PCE section of the model was estimated using data from the second quarter of 1%7 (1967:2) to the fourth quarter of 1972 (1972:4). The model was then simulated over two periods; first over the estimation period 1967:2 to 1972:4, and then over the period 1973:1 to 1978:2, the **ex post** forecast period.

In the second experiment, the nominal PCE section was also initially estimated from 1967:2 to 1972:4. However, it was then simulated one quarter forward, as it would have been if used, as designed, for making one quarter ahead forecasts of PCE. A repeated process of reestimation and resimulation was then followed. In all, this procedure was repeated 20 times, with the model being reestimated every quarter, using a sample period one quarter longer than in the prior estimation, and then again simulated for only a single quarter forward. The result of this procedure was a data set with 22 simulated values over the period 1973:1 to 1978:2 for each of the endogenous variables. In subsequent comparisons, these results will be referred to as results of the nominal **iteration** model, while the results of the first experiment will be referred to as those of the **single-estimation** model. A third experiment, described subsequently, combined the nominal iteration model with the deflator section of the model to provide a simulation of real personal consumption expenditures.

Analysis of Simulation Results

After the simulation results of the various experiments were obtained, they were evaluated as follows. First, the simulated values were compared to the actual values for each of the dependent variables. The errors (i.e., the differences between actual and simulated values) were inspected for both magnitude and sign patterns. Second, the root-mean-square (RMS) simulation error was calculated over the periods used in the simulation. The RMS error measures the deviation of the simulated variable from its actual time path, and is the most widely used comparison of simulation results.[6] The remainder of the article examines and analyzes the simulation results for total personal consumption expenditures in current dollars and in constant dollars.'

Simulation Results: Nominal PCE

The Single-Estimation Model. This model was simulated for two periods, the estimation period 1967:3 to 1972:4, and the **ex post** forecasting period 1973:1 to 1978:2. A comparison of the simulation output indicates the existence of a negative bias in the latter period. While the simulation errors of this single-estimation model are distributed fairly evenly about zero in the earlier period (mean error of 0.05), they begin to develop a distinctly negative bias in the **ex post** forecasting period (mean error of —3.38). This worsening of the

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6 **The RMS error for a variable Y_t is defined as:**

$$\text{RMS error} = \frac{1}{T}\sum_{t=1} (Y_t^s - Y_t^a)2$$

where Y^s = the simulated value of Y_t

Y_t^a = the actual value

T = the number of periods in the simulation

See Robert S. Pindyck and Daniel L. Rubinfeld, section 10.2, for this and other methods for evaluating simulation models.

7 **In all simulations presented in this article, lagged dependent variables were constrained to equal actual historical values rather than prior period simulated values. This procedure yielded a somewhat better simulation fit than that provided by the unconstrained simulated procedure.**

model's performance is further illustrated by the behavior of the root-mean-square error, which almost doubles from 3.32 in the historical period to 5.19 in the **ex post** forecasting period. Furthermore, in the historical period, only about half of the errors (10 out of 22) are negative. In the **ex post** forecasting period, however, fully 17 out of 22 errors are negative. A systematic, negative error thus appeared in the simulation output of the single-estimation experiment—that is, the model regularly underestimates the actual levels of nominal consumer spending after the end of 1972.

The negative bias of the model in the **ex post** forecasting period is readily explained. A model used for forecasting will retain its accuracy beyond the estimation period only to the extent that the behavior of the economy does not change significantly between the two periods. For the two periods employed, however, this assumption cannot be made. The oil embargo in late 1973, the quadrupling of oil prices, the subsequent large increases in other energy and petroleum related product prices, the worldwide food shortage in 1973, and the most severe postwar recession all took place after the estimation period. As a result of these factors, price increases-especially those for services—accelerated sharply and continued to rise more rapidly in the forecasting period than in the estimation period. The trend rate of current dollar expenditures on both goods and services could thus be expected to rise. In addition, the percentage of disposable income spent by Americans rose above its range observed in the estimation period. As a result, the relationships previously estimated in the single-estimation model over the period 1967:2 to 1972:4 were no longer accurate for the period following 1972. Therefore, using the model to forecast services expenditures in the later period resulted in the underestimation of actual services expenditures in 19 of 22 cases, and total personal consumption expenditures were systematically underestimated.

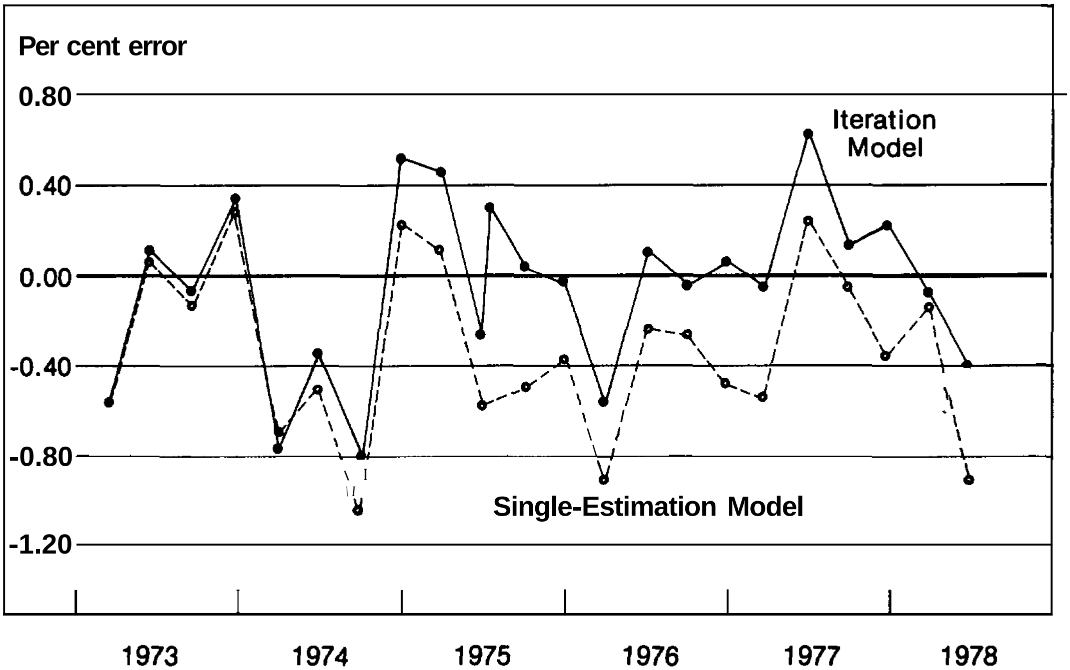
The Iteration Model. Though the **ex post** forecasting ability of the single-estimation version of the PCE model has been found lacking, the real test of the model is how well and how consistently it is able to forecast one quarter ahead—the task for which it was designed. To answer these questions, the iteration model was used. The iteration model was reestimated each quarter and simulated only one quarter ahead to forecast nominal consumer spending for the period 1972:4 to 1978:2.

How well does the simulation output from the iteration model compare with that from the single-estimation model? Over the **ex post** forecasting period, the iteration model is easily the superior of the two models. This is illustrated in Chart 2, which compares the per cent errors of the two simulation outputs. Unlike the single-estimation model, the iteration model shows no particular patterns to its errors, which 'are both much smaller (RMS of 3.79 versus 5.19) and much more evenly distributed about zero (mean error of –0.41 versus –3.38). Thus, to avoid the simulation inaccuracy introduced by a change in the behavior of the economy between the historical and forecasting periods, the iteration approach is preferable to a single fitting of the model. Reestimating and resimulating the model every quarter appears to be the best method for obtaining good short-run forecasts of nominal personal consumption expenditures.

Simulation Results: Real PCE

Final evaluation of the simulation performance of the personal consumption model requires the generation and analysis of simulation output for real personal consumption expenditures. For this third simulation experiment, both the deflator section and the

Chart 2
FORECAST OUTPUT OF NOMINAL PERSONAL CONSUMPTION EXPENDITURES
1973:1 TO 1978:2
(Per Cent Error From Actual Values)

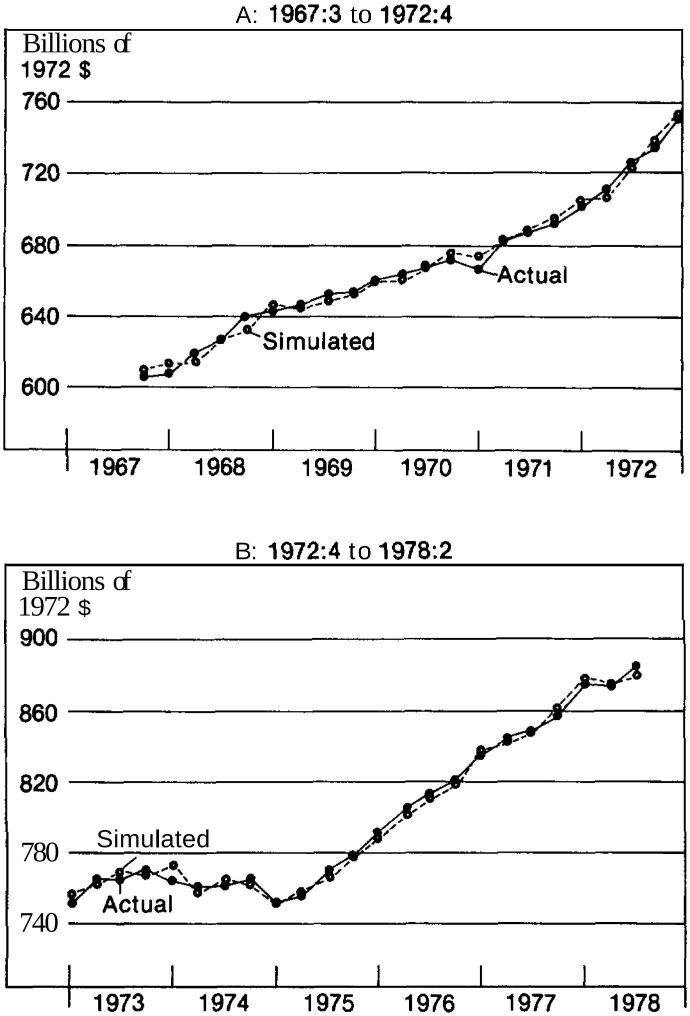


nominal PCE section were estimated over the period **1967:2** to **1978:1,** corresponding to the last iteration of the iteration model. This approach to the one-quarter-ahead forecasting of real PCE follows directly from the results of the first two experiments, namely; that a better ex ante forecast of nominal **PCE** results from the use of the iteration model reestimated each quarter, than from the use of the **single-estimation** model. Having established that result and therefore accepting the last iteration of the iteration model as the appropriate simulation of nominal PCE, the next step was to estimate and simulate the price deflator section of the model.

The simulation results from the price equations were extremely good. Over the entire time period, **1967:3** to **1978:2,** the **RMS** simulation error for the third month of the CPI was only 0.16. The per cent errors for each observation were also quite small, ranging from 0.25 per cent to −0.42 per cent, with most errors far smaller. It should be noted that simulation of the **first** equation of the deflator section alone generates an estimate of the CPI for the last month of each quarter a **full** month before the results are published. Finally, excellent simulation results were also obtained for the price deflator: the **RMS** simulation error equaled 0.25, and the range of per cent errors **was** from 0.48 per cent to −0.39 per cent.

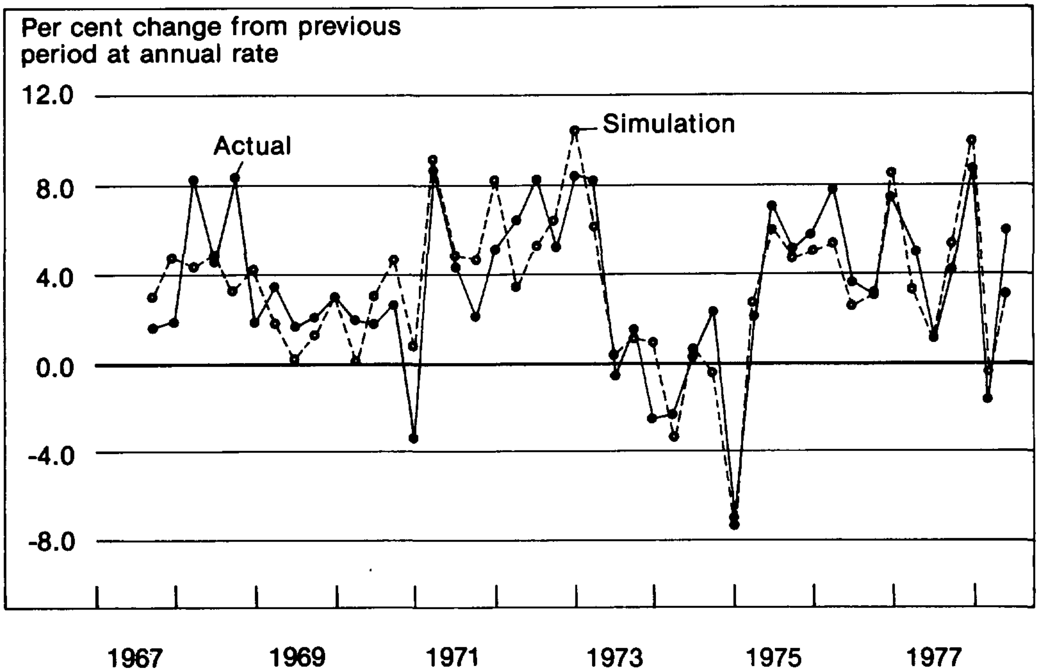
How well does the total model predict real consumer spending? To answer this question,

Chart 3
REAL PERSONAL CONSUMPTION EXPENDITURES: SIMULATED AND ACTUAL VALUES



two types of comparisons were made of the tracking behavior of simulated real PCE. The first type, illustrated in Chart 3, compares the levels of actual and simulated real PCE over the two periods **1967:3** to **1972:4,** and **1972:4** to **1978:2.** The second type of comparison, presented in Chart 4, contrasts the per cent **changes** from one quarter to the next of the simulated and actual real series. In that chart, each point on the actual per cent change line is calculated as the annual growth rate of one quarter's actual value from the previous

Chart 4
REAL PERSONAL CONSUMPTION EXPENDITURES: PER CENT CHANGE FROM PREVIOUS QUARTER
1967:3 TO 1978:2
(Annual Rate)



quarter's actual value. The per cent changes on the simulated line, however, are calculated somewhat differently. Since the model was designed to forecast only one quarter forward, actual values of the GNP series for the previous quarter are already known. Thus, rather than calculating the per cent change between two approximate simulated values, the previous quarter's known actual value was used as the initial point for each simulated per cent change calculation in Chart **4.**[8]

Both of the charts allow study of economic **turning points.**[9] While both upturns and downturns are turning points, the latter have the greater economic significance since economic series such as real **PCE** normally grow over time. A downturn means that real expenditures by consumers actually fell following the previous quarter's increase. As the actual series in Chart 3 shows, five such occurrences have taken place in the period under study; in **1970:4, 1973:4, 1974:4,** and **1978:1.** These downturns can also be seen with the actual series in Chart 4 as points which fall

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8 This approach would be used by the researcher to forecast quarterly per cent changes each quarter. It yields a closer fit to the **actual** per cent changes than could be obtained by calculating per cent changes using two quarters of simulated values alone.

9 Users of this model would assess whether a turning point had been reached by **comparing** the most recent quarter's simulated value with the previous quarter's actual value rather than comparing the two quarters' simulated values. Thus, Chart 4 will be used to assess the **success** of the model in tracking turning points.

below the zero per cent change line, directly after a previous point above the line.

As to overall performance of the model, Chart 3 clearly shows that the simulated levels of real PCE generally track the actual levels very closely. As Chart 4 shows, however, the model's performance in catching downturns is somewhat mixed. While the downturn in 1978:1 was correctly forecast, that in 1974:4 was predicted one quarter early, that in 1973:4 was predicted one quarter late, and those in 1973:2 and 1970:4 were missed altogether. The picture, however, is better than it looks. Though the downturn in 1970:4 was sizable, the downturn in 1973:2 was almost insignificantly different from zero. Furthermore, the level of real PCE predicted for that date was almost exactly equal to its true value. In addition, the simulation model correctly predicted sharp declines in the rate of growth of real PCE from the previous quarter (Chart 4). Finally, the recoveries in the rate of growth of real PCE that followed each of these downturns were also correctly predicted by the model. The model also did quite well in predicting other sharp changes in the rate of growth of PCE, especially in the period following 1973 (Chart 4). For the period before 1974, the model tended to first undershoot and then to overshoot the true per cent changes. However, it appears that the model has stabilized in recent years, and is thus providing very good forecasts of real PCE behavior.

SUMMARY AND CONCLUSIONS

The research described here grew out of two related concerns among economic analysts: how to systematically interpret the vast amount of economic data generated monthly, and how to accurately forecast GNP one quarter ahead using the most up-to-date data available. The solutions to both problems appeared related. If a model could be developed to estimate the relationship between various monthly series and GNP components, the model could also be used to forecast GNP.

These issues were analyzed through use of a small model of the personal consumption expenditures (PCE) sector, which constitutes nearly two-thirds of GNP. Equations were developed and estimated relating the GNP series of nominal PCE on goods and services, disposable income, and the PCE price deflator to related monthly series such as retail sales, personal income, and other price indexes. Where possible, the equations attempted to measure the GNP variables by as close a monthly approximation as could be specified. Thus, the model differs from the more usual behavioral economic model, in which causal relationships are assumed to exist between the dependent and independent variables.

Using this article's approach, extremely good estimation fits were obtained between the monthly data and their related GNP series. The conclusion of the estimation section of this article is that, despite some data shortcomings in both timeliness and availability, very good models can be constructed using monthly data to estimate personal consumption expenditures and its deflator.

When the model was used to forecast PCE developments it was found that, when reestimated each quarter as new data become available, the current dollar section of the model provided excellent simulation results of nominal personal consumption expenditures. Furthermore, good results were also obtained by the equations used to forecast the PCE price deflator. Combined together, the total set of equations was then used to obtain forecasts for real personal consumption expenditures. The resulting output successfully tracked the actual value of real PCE, catching most turning points, and equally important, reflected most of the sharp changes in the series, especially in recent years.

APPENDIX
PERSONAL CONSUMPTION SECTOR MODEL WITH ESTIMATION RESULTS FOR THE FINAL ITERATION
(Estimation Range 1967:2 to 1978:1, 44 Observations)
EQUATIONS

A. **Definitions** (by equation number)

1. CONSUMQ ≡ TOTGOODQ + TOTSERVQ
2. PIQ ≡ (PI1 + PI2 + PI3)/3
3. PI3 ≡ WAGEPI3 + NWAGEPU
9. CPIQ □ (CPI1 + CPI2 + CPI3)/3
12. REALPCE ≡ CONSUMQ/GDC

B. **Estimated Equations** (t – statistics in parenthesis)

4. WAGEPI3 = 1.00885 * WAGEPI3(–1) + 0.59169 * WAGEPI3(–1) * %ΔPRIVWAGE3
(1010.14) (15.3191)

Estimation method: GLS AUTOl RHOl = –0.2050, RSQ = 0.99987, DW(∅) = 1.96

5. NWAGEPI3 = –2.06375 + 0.5098 * (PI2 – NWAGEPI2) + 0.5098 * (PI1 – NWAGEPI1)
(–0.81445) (146.394) (146.394)

Estimation method: OLS, RSQ = 0.99804, DW(∅) = 1.94

6. DISPIQ = –0.2598 + 0.33333 * (1–TXRATE) * PIQ
(–0.07554) (265.313)

Estimation method: GLS AUTOl RHOl = –0.31, RSQ = 0.994, DW(∅) = 2.07

7. TOTGOODQ = –1.5801 + 0.8280 * A SALESQ + 1.00715 * TOTGOODQ(–1)
(–1.04963)(12.0743) (279.495)

Estimation method: OLS, RSQ = 0.99957, DW(∅) = 2.24

8. TOTSERVQ = –3.67877 + 0.00530 * (DISPQ – TOTGOODQ) + 1.02968 * TOTSERVQ(–1)
(–5.41279) (0.31986) (51.5456)

Estimation method: GLS AUTOl RHOl = –0.3445, RSQ = 0.99989, DW(∅) = 1.85

10. CPI3 = 0.45338 * CPI2 + 0.19239 * (CPI2 ** 2)/CPI1
(4.39427) (2.93712)

+ 0.29804 * CPI2 (CPI1/CPI3(–1)
(2.40944)

– 0.09647 * CPI2 * WPI3(–1)/WPI2(–1)
(–2.50993)

Estimation method: OLS, RSQ = 0.99997, DW(∅) = 2.06

11. GDC = 0.12803 * GDC(–1) + 0.87284 * GDC(–1) * CPIQ/CPIQ(–1)
(2.0091 1) (13.91 12)

Estimation method: GLS AUTOl RHOl = 0.2627, RSQ = 0.99978, DW(∅) = 1.86

VARIABLES

Endogenous:

WAGEPI3: Wage personal income for the third month of a quarter.

NWAGEPI3: Nonwage personal income for the third month of a quarter.

DISPIQ: Quarterly disposable personal income (income after taxes).

TOTGOODQ: Quarterly total personal expenditures on goods.

TOTSERVQ: Quarterly total personal expenditures on services.

CPI3: Consumer price index for the third month of a quarter.

GDC: Personal consumption price deflator.

Definition:

PIQ: Quarterly personal income.

PI3: Personal income for the third month of a quarter.

CONSUMQ: Quarterly total personal consumption expenditures on goods and services.

CPIQ: Quarterly average consumer price index.

REALPCE: Real quarterly total personal consumption expenditures.

Exogenous:

WAGEPI2, WAGEPI1: Wage personal income for the second and first months of a quarter, respectively.

NWAGEPI2, NWAGEPI1: Nonwage personal income for the second and first months of a quarter, respectively.

SALESQ: The sum of three months of retail sales, calculated at an annual rate, and adjusted to reflect only sales of goods to individuals. (See text.)

P12, **PI1**: Personal income for the second and first months of a quarter.

PRIVWAGE3: Total nonsupervisory wages earned in the private nonagricultural workforce in the third month of every quarter. Calculated as the product of seasonally adjusted hours and earnings from the Labor Department's monthly establishment survey.

TXRATE: The "effective" tax rate, defined as 1 minus the ratio of disposable income (DISPIQ) to total personal income (PIQ), with both numerator and denominator lagged one quarter. (See text.)

CPI1, CPI2: Consumer price indexes for the first and second months of a quarter, respectively.

WPI1, WPI2, WPI3: Consumer finished goods price index from wholesale price index for the first, second, and third months of a quarter.

Federal Reserve Intervention Policy

By Richard K Abrams

On November 1, 1978, the Federal Reserve and the U.S. Treasury announced a new and expanded program to defend the foreign exchange value of the dollar. The program included an increase in the Federal Reserve's discount rate, the imposition of reserve requirements on large time deposits, and an expansion of U.S. intervention capabilities in the foreign exchange markets. A major aspect of the expanded intervention capability was an increase in the size of Federal Reserve's swap lines with several key central banks, thereby allowing greater foreign exchange borrowings for purposes of intervention. As a result of the November action, increased attention has been focused on the importance of the swap network and intervention policies in foreign exchange markets.

This article will examine Federal Reserve intervention policy, giving special emphasis to the swap network.[1] The first section discusses the mechanics of swap intervention. The second reviews U.S. intervention activities and the evolution of intervention policy through the fixed and floating rate periods.

THE NATURE AND WORKINGS OF THE SWAP NETWORK

Federal Reserve intervention is normally undertaken to ease selling pressure against the dollar in the foreign exchange markets. Such intervention requires that the Federal Reserve act as a seller of foreign exchange and a buyer of dollars. If the Federal Reserve already holds the required foreign exchange as a result of past borrowings or dollar sales, these funds are sold directly to the market; otherwise, the funds must be borrowed. Historically, almost all such borrowing has been through the swap network.[2] This network is a set of short-term reciprocal currency agreements the Federal Reserve maintains with 14 foreign central banks and the Bank of International Settlements (BIS). Each agreement allows the Federal Reserve and the partner bank short-term access to the other's currency up to a specified limit. At present, the total size of the swap network is $29.8 billion.

[1] The Exchange Stabilization Fund (ESF) of the U.S. Treasury may participate with the Federal Reserve in its intervention activities, with the Federal Reserve Bank of New York acting as the Treasury's agent.

[2] The Treasury can obtain foreign exchange by borrowing from the International Monetary Fund (IMF), by selling foreign-denominated securities, and by selling Special Drawing Rights (SDR's), which are effectively central bank money issued by the IMF. However, it did not exercise this option during the floating rate period prior to November 1, 1978. The value of the SDR is based on a geometrically weighted average of 16 currencies, with the weights based on the country's quota at the IMF.

A swap contract is written at the end of each day that Federal Reserve swap intervention takes place. To write a contract, the Federal Reserve calculates the dollar amount of the intervention, and the average exchange rate at which trades took place. The Federal Reserve gives the foreign central bank a dollar account equal to the size of the intervention and receives sufficient foreign exchange to cover its dollar purchases. The foreign bank's dollars are then invested in a nonnegotiable U.S. Treasury certificate of indebtedness until the swap is retired.

Swaps mature in 90 days. They are retired by repurchasing the foreign bank's dollars at the original exchange rate. If the dollar has appreciated in the interim, the Federal Reserve will realize a profit on the swap because the foreign exchange will cost fewer dollars. However, if the dollar has declined, a loss will occur. Furthermore, if the dollar has remained weak throughout the period, the swap may be renewed in order to prevent additional dollar sales from causing the dollar to decline further.

U.S. intervention is carried out on a day-to-day basis by officers at the foreign exchange desk at the Federal Reserve Bank of New York.[3] If intervention is planned for any day, the officers discuss the intervention limits for the day with the central banks whose swap lines they plan to use. Sometimes the foreign bank will suggest intervention limits that differ from those suggested by Federal Reserve officials.[4] Because swap lines can only be drawn upon by mutual consent, negotiations must then take place, with the smaller of the two proposed limits being accepted.

Given the intervention limits, intervention can be either indirect or direct. In the indirect approach, the Federal Reserve uses a commercial bank as an agent to buy funds according to conditions set by the Federal Reserve.[5] In the direct approach, which relies heavily on the "announcement" effect, the Federal Reserve contacts banks directly with offers to buy dollars. At times almost every major trading bank may receive offers to buy dollars.

The purpose of both approaches is to ease selling pressure against the dollar and to alter the short-run expectations of the traders in the foreign exchange markets. Because the time horizon of traders is sometimes very short, a moderate change in market behavior can sometimes encourage traders to replenish their dollar portfolios, causing the dollar to appreciate. However, if the traders believe strongly that the decline will continue, the market is large enough to render almost any central bank intervention ineffective.[6]

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3 If the planned intervention is greater than the limits specified in the Federal Open Market Committee's (FOMC's) procedural instructions, the Foreign Currency Subcommittee of the FOMC and the officials of the Treasury must first be consulted. *Oversight of the Effect of Floating Exchange Rates on U.S. Exports*, Hearing Before the Subcommittee on International Finance of the Committee on Banking, Housing and Urban Affairs, U.S. Senate, 95th Cong., 2d sess., February 6, 1978, p. 56.

4 Anatol B. Balbach showed in his paper, "The Mechanics of Intervention in Exchange Markets," Federal Reserve Bank of St. Louis *Review*, Vol. 60, No. 2, February 1978, that drawing of the swap line, other things equal, expands the money supply of the accommodating country during the life of the swap, while leaving the money supply of the initiating country unchanged. Therefore, the foreign central bank may oppose a swap drawing because of domestic monetary considerations.

5 Conversations with traders at commercial banks have shown that they sometimes guess incorrectly as to whether or not the Federal Reserve has been intervening. Further, when they correctly guessed the intervention, their estimates of the size of the action were often very inaccurate.

6 The estimated volume of foreign exchange transactions was over $100 billion a month in New York City alone in April 1977. Roger M. Kubarych, *Foreign Exchange Markets in the United States* (New York: Federal Reserve Bank of New York, 1978), p. 5.

U.S. INTERVENTION DURING THE FIXED RATE PERIOD

From 1944 until early 1973, most of the world's currencies functioned under a regime of fixed exchange rates known as the Bretton Woods system. During most of this period, the United States needed no intervention policy, for the dollar acted as the cornerstone of the system. The other currencies floated within narrow bands against the dollar, while the dollar maintained convertibility into gold at a fixed rate. If a country's currency approached the lower end of its band, it had to either devalue or sell dollars to defend its parity range. If the currency rose to the upper end, it either had to revalue or buy dollars.

This system worked well until the early 1960's. Throughout this period, the United States often had balance of payments deficits. These deficits provided central banks with the reserves required to defend their parity range against the dollar. However, because of the deficits, concern arose that the United States would be unable to maintain its exchange rate. As a result, in March 1961 the German mark was revalued by 5 per cent, with the Netherlands guilder soon following. This action made all currencies candidates for upward revaluation or devaluation, for it was now felt the other countries would be unwilling to maintain their under- or overvalued exchange rates. As a result, while central banks were able to defend their parities in the spot market, many were unable to prevent the exchange rates on contracts for future delivery, or forward rates, from diverging from acceptable ranges.

In March 1961, to maintain appropriate forward rates, the U.S. Treasury began .to intervene in the forward markets in German marks, Swiss francs, and Netherlands guilders. The purpose of this action was to bring forward exchange rates back into alignment and restore confidence in the dollar. The operation proved successful, and its success led U.S. authorities to believe that future intervention might provide added stability to the foreign exchange markets. Accordingly, in February 1962, the FOMC authorized foreign currency operations. By August of that year, the Federal Reserve had negotiated $700 million in swap lines with seven central banks and the BIS. (See Table 1.)

The purpose of the swap network was to allow central banks to defend the exchange rate of their country's currency while economizing on foreign exchange holdings. Swaps also allowed foreign countries to protect the gold value of their dollar reserves against a dollar devaluation. By activating their swap line, they could avoid converting their dollars into gold as in the past.

While it is difficult to judge the performance of the swap network during the fixed rate period, central banks found it a useful mechanism. First, central bankers thought the network sufficiently worthwhile that they expanded it from $700 million in June 1962 to $11.7 billion in March 1973. (See Table 1.) Second, the network was used actively, with the United States initiating $11.9 billion in swaps during the period, while foreign central bank drawings totaled $15.4 billion. Finally, the Federal Reserve made profits each year on its swap transactions. (See Table 2.) Total realized profits came to $27.3 ,million between 1962 and March 1973.

It has been argued that the losses from the swap debt outstanding on August 15, 1971, should be included in the profitability calculations for swaps during the fixed rate period.[7] These losses, which were brought about by subsequent declines in the exchange value of the dollar, totaled $847.8 million through the end

[7] Milton Friedman, "Back to the Gaming Table," *Newsweek*, January 30, 1978, p. 65.

Table 1
FEDERAL RESERVE RECIPROCAL CURRENCY AGREEMENTS
(In Millions of Dollars).

	Aug. 2, 1962	March 9, 1973	July 10, 1973	March 13, 1978	Nov. 1, 1978
National Bank of Belgium	50	600	1,000	1,000	1.000
Bank of Canada	250	1,000	2,000	2,000	2,000
Bank of England	50	2,000	2,000	3,000	3,000
Bank of France	50	1.000	2,000	2,000	2,000
German Federal Bank	50	1,000	2,000	4,000	6,000
Netherlands Bank	50	300	500	500	500
Swiss National Bank	100	1,000	1,400	1,400	4,000
B.I.S. (Swiss francs)	100	600	600	600	600
(Other authorized European currencies)	—	1,000	1,250	1,250	1,250
Austrian National Bank	—	200	250	250	250
Bank of Denmark	—	200	250	250	250
Bank of Italy	—	1,250	2,000	3,000	3,000
Bank of Japan	—	1,000	2,000	2,000	5,000
Bank of Mexico	—	130	180	360	360
Bank of Norway	—	200	250	250	250
Bank of Sweden	—	250	300	300	300
Total	700	11,730	17.980	22.160	29,760

*SOURCE: Federal Reserve Bank of New York, Monthly **Review,** and Federal Reserve Board Press Release, November 1, 1978, p. 2.

of **1978,** with another **$150** million in losses yet to be realized. It may also be argued that the swap debt was incurred to prevent gold outflows to foreign central banks prior to the dollar's first devaluation. Therefore, the swap liquidation losses could be at least partly offset by unrealized profits from the gold saving that resulted from the original swap drawing. In fact, if all such drawings prevented gold outflows, the **$1** billion loss actually can be viewed as a net unrealized gain of over $5 billion.' However, since it is likely that the United States would have devalued sooner had these lines been unavailable, the actual gold saving was probably considerably smaller.

U.S. INTERVENTION DURING THE FLOATING RATE PERIOD

By August 1971, with the U.S. balance of payments deficits creating an excess supply of dollars, some central banks began demanding

[8] The limit value of the gold saving **was** estimated by calculating the price that would have been received for the gold if the swap debt was retired by selling the gold that was saved when the original debt was incurred. The gold price used was the official price until March **1973** and the average quarterly market price of gold for all other periods. Thus, for each quarter: Potential Profits = **(Retirement/ $35)** x (Avg. Gold Price– **$35)** – (losses on **Currency** Liquidation).

Table 2
NET REALIZED PROFITS (+) AND LOSSES (–) ON FEDERAL RESERVE CURRENT FOREIGN EXCHANGE OPERATIONS 1962 THROUGH MARCH 1973
(Millions of Dollars)

Year	Federal Reserve Net Profits
1962	+0.3
1963	+0.3
1964	+0.1
1965	+1.0
1966	+1.4
1967	+1.3
1968	+8.1
1969	+6.4
1970	+3.0
1971	+3.7
1972	+1.4
1973*	+0.3
Total Net Profits	+27.3

*One-fourth of 1973 profits.

SOURCE: Federal Reserve Bank of New York Quarterly Review, Summer 1978, p. 54.

gold for their excess dollar holdings. As a consequence, the United States found it necessary to suspend the dollar's convertibility into gold, and several major currencies were allowed to float against the dollar. The general float continued until December 18, 1971, when the Smithsonian Agreement was signed. The new agreement accepted a new set of exchange rates, while allowing the value of currencies to float in a band of 2% per cent on either side of the official parity, rather than plus or minus 1 per cent as in the past. The dollar was also formally devalued by raising the official price of gold from $35 to $38 an ounce. Still, the system remained unstable, and despite an additional dollar devaluation on February 12, 1973, the system collapsed. On March 13, 1973, the United States formally announced the dollar was a floating currency, starting a new era in Federal Reserve intervention policy.

In the new floating rate era, some central banks felt that larger swap lines were needed because the foreign exchange markets were growing rapidly and official limits on exchange fluctuations had been removed. Therefore, on July 10, 1973, the United States expanded its swap lines 53 per cent to $18 billion. (See Table 1.) However, the expansion of the swap lines gave no guarantee that intervention would be successful, or even appropriate, because of uncertainty that existed about the appropriate value of currencies in the new system.

The new problem of intervention policy was that it was now more difficult to identify the market conditions in which intervention might be appropriate. Previously, a market had been considered disorderly when exchange rates were at their intervention limits. But with no official limits, an exchange rate movement based on a change in economic conditions or in the relative desirability of a given currency could be an orderly movement. The new question became whether or not the rate had been changing faster or by more than it should. The appropriate value of an exchange rate at any point, present or future, is not always clear[9]. Thus, intervention has become risky and difficult. The Federal Reserve's

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[9] No model of exchange rate determination has forecasted exchange rate movements very successfully. The modeling problems probably stem from three sources. Fist, the generalized, managed float is a rather new phenomenon, and the adaptation of market transactors has been gradual. Second, expectations and portfolio considerations are often more important than underlying economic considerations. At various times, differing groups of transactors will dominate the market. Finally, central banks try to make their intervention seem as random as possible to avoid traders forecasting it and capitalizing on it.

response to the problem has been to attempt to calm disorders in foreign exchange markets, rather than defend any exchange rate or range of rates.

Determining what constitutes a disorderly market has been both difficult and highly subjective. Further, using a rigid decision rule or set of rules seems inappropriate because disorders appear to vary across time. There are, however, certain circumstances in which intervention is likely to occur. One case is in response to major exchange market fluctuations that do not appear to be based on new information about the underlying economic relationships. These fluctuations can either be large exchange rate movements, or a marked widening of the bid and asked quotations for a given currency, for either would indicate that traders are unwilling to acquire a given currency.[10] If the Federal Reserve believes these fluctuations are not based on underlying conditions, or that they are an overreaction to some change in conditions, intervention often occurs. In this way, the Federal Reserve tries to persuade traders that there is a two-way risk in the market.[11]

The other major cause for intervention occurs when the Federal Reserve tries to smooth exchange rate adjustments. The Federal Reserve attempts these smoothing actions when it believes that exchange rate movements, while based on underlying economic conditions, are either too large or too rapid. The purpose of this intervention is to keep the foreign exchange markets functioning smoothly, and to help prevent "runs" on the dollar. Intervention of this type is sometimes costly. If the market does not readjust quickly and allow the Federal Reserve to retire the swaps, losses can occur as the exchange rates move along their longer run trend.

Analyzing the success of Federal Reserve swap policy during the period from March 1973 to October 1978 is difficult. However, some indirect observations can be made about swap policy. During most of this period, the swap network was used sparingly. From March 1973 through October 1978 only about $5.9 billion in swaps were initiated by the United States and $2.8 billion by foreign banks. Thus, on an annual basis, the network has been less active during the floating rate period than during the **fixed** rate period. Despite a large growth of the foreign exchange market, the size of the swap network was increased only about 25 per cent. (See Table 1.) The swap network was inactive because the dollar was a generally weak currency during most of this period and the United States preferred to keep intervention to a minimum. Until late 1977, the Federal Reserve's policy stance was one of leaning "gently" against the wind. Therefore, since U.S. intervention was modest and foreign banks generally did not need dollars, the swap lines were not heavily used.

Another measure can be used to judge success of Federal Reserve intervention policy—the profitability of its current foreign exchange operations. However, this measure has two weaknesses. First, the Federal Reserve does not view intervention as a speculative activity; therefore, its policy is to retire swaps as soon as practicable. As a result, the Federal Reserve may accept an exchange loss and retire a swap at a time when the dollar is expected to appreciate. Second, the Federal Reserve sometimes intervenes in a falling market to smooth the dollar's decline; as a result, losses sometimes occur. While intervention directed at short-run market

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10 Intervention is especially likely to occur when the market appears to have become severely one-sided—such as when large exchange rate movements are taking place on little or no trading volume and/or traders are becoming unwilling to give bid or asked quotations for certain currencies.

11 Slowing or countering exchange rate movements acts to reduce the expected variance and volatility of exchange rates which may lessen the uncertainty of exporters, potential exporters, and people in import-competing industries. This, in turn, may help to stimulate production and trade.

Table 3
NET REALIZED PROFITS (+) AND LOSSES (−) ON FEDERAL RESERVE CURRENT FOREIGN EXCHANGE OPERATIONS MARCH 1973 THROUGH DECEMBER 1978
(Millions of Dollars)

Year	Profitability
1973*	+1.0
1974	+4.1
1975	+8.0
1976	+6.2
1977	+4.6
1978†	−33.4
Total	−9.5

*Three-fourths of 1973 profits.
†The Federal Reserve also had $58.4 million in unrealized losses from the revaluation of its swap debt at the end of 1978. However, a January 20 estimate of the effects of the dollar's appreciation since January 1, 1979, showed these losses to be eliminated at current exchange rates.

SOURCE: Federal Reserve Bank of New York, Quarterly Bulletin, Summer 1978, p. 54; Federal Reserve Bank of New York, Quarterly Bulletin, Autumn 1978, p. 10; Federal Reserve Press Release, January 8, 1979.

disorders should be generally profitable, the "rear guard" defenses of a falling dollar sometimes results in losses. Table 3 shows the results for the floating rate period. During the first four years of the float, the dollar was not subjected to major speculative attacks; as a result, intervention was slightly profitable. Then, in 1978, with the massive attack on the dollar, the Federal Reserve's job became one of keeping the market from becoming highly disorderly. In the short run, some losses had to be taken.[12]

Prior to October 1977, floating rate intervention policy appeared to be generally successful in preventing disorderly markets. However, U.S. authorities were unable to counter the movement against the dollar during the next 13 months. From October 1977 through October 1978, the dollar fell sharply in the foreign exchange markets. In fact, the dollar fell rapidly against every major currency except the Canadian dollar, with the fall in the effective exchange rate totaling over 11 per cent.[13] By late October, U.S. authorities felt that the decline in the dollar was greater than was justified by fundamental factors.

In late 1977 and early 1978, the decline of the dollar appeared to be based on economic fundamentals. During 1976 and 1977, the U.S. economy not only grew and inflated faster than most other industrial nations, but the U.S. trade balance also turned negative in 1976, and seriously so in 1977, with a deficit of $31 billion. However, by mid-1978 the trade balance, while still in deficit, was gradually improving and U.S. interest rates were rising relative to foreign rates.

Still, despite the improvement of these fundamental economic factors, the dollar's decline was accelerating. The continued decline stemmed from a general belief that the dollar would continue to fall faster than international interest rate differentials would indicate, causing people to diversify away from the

12 One can argue that interest costs should be included when measuring the profitability of swaps. However, placing swap funds in nonnegotiable Treasury certificates of indebtedness merely results in the Treasury borrowing funds from foreign central banks rather than in the open market. The only diierence is that, in this case, the recipient of the interest is predetermined rather than being determined by the highest bidder in the market.

13 The "effective exchange rate" used by Morgan Guaranty Trust Company of New York measures the change in our exchange rate relative to the currencies of our 15 primary trading partners using a geometric average. Weighting is based on each country's share of U.S. exports and imports. Thus, since Canada accounts for almost 40 per cent of U.S. trade, the weakness of the Canadian dollar prevented the effective exchange rate from declining further.

dollar.[14] By mid-October, it became evident that the dollar's decline was likely to continue unless some action was taken by U.S. authorities.

Since the dollar's decline was inflationary, as well as being damaging to a climate of growth and investment, U.S. authorities decided that confidence in the dollar should be **restored.**[15] On November **1,** the Federal Reserve and the Treasury announced a joint program directed at combating inflation and strengthening the dollar.

The new program acted to strengthen the dollar in three **ways.** The Federal Reserve's discount rate was raised from **8 %** per cent to 9% per cent, and domestic banks were encouraged to borrow from the Eurodollar market through the imposition of a **2** per cent supplementary reserve requirement on all domestic time deposits of **$100,000** or **more.**[16] Also, plans were announced for a major expansion of the intervention capabilities of both the Federal Reserve and the Treasury.

A four-part program was instituted to expand U.**S.** intervention capabilities. First, the U.S. Treasury made use of some of the reserves which were unconditionally available from the International Monetary Fund **(IMF).** This included an immediate **$2** billion drawing in marks and yen from its reserve tranche, and the sale of **SDR's** valued at $1.4 billion. The Treasury also made a **$1** billion reserve tranche drawing in marks and yen, through the **IMF's** General Agreement to Borrow (GAB) facility.[17] While these facilities had long been available, the United States had chosen not to use them. However, including these actions in this program helped to reaffirm the seriousness of the current policy stance.

Second, the U.S. intervention potential was expanded by increasing the Federal Reserve's swap lines with the Japanese, German, and Swiss central banks. These three lines were expanded by **$7.6** billion to **$15** billion. (See Table **1.)** In conjunction with this act was an implicit statement that rather freer access would be given to these lines, and the explicit statement that the yen line would be activated by the U.S. for the first time.

Third, the Treasury announced plans to issue up to **$10** billion in foreign-denominated securities in the German, Swiss, and Japanese capital markets to obtain additional foreign exchange for intervention purposes. The first sale was of **$1.6** billion in mark-denominated two- and four-year notes which were sold in the German capital markets on December **12, 1978.** A **$1.2** billion Swiss franc issue of two and one-half- and four-year notes was sold in Switzerland on January **18.**

Finally, in December, the monthly Treasury gold sale was increased from 300,000 ounces to a minimum of **1.5** million ounces to expand the supply of publicly available gold and help relieve pressure on the **dollar.**[18] The action also was expected to improve the U.S. trade balance, since much of the gold would be sold to foreigners.[19]

The new program also indicated that U.S.

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14 Theoretically, a person would not object to **holding** a depreciating **currency** if the interest premium on that currency, relative to the alternative currencies, was equal to the rate of depreciation.

15 Estimates of the inflationary effect of the dollar's decline range from a one-quarter of 1 per cent to a 2 per cent Consumer Price Index increase per 10 per cent decline of the dollar on a trade-weighted basis. The latter estimate is probably closer to the truth.

16 The encouragement was doubly effective because of the August removal of reserve requirements on funds raised in the Eurodollar market. It is also noteworthy, however, that the Federal Reserve sterilized the $3 billion reserve contraction that this new rule would have caused.

17 The GAB is a **lending** arrangement between the **IMF** and seven industrial IMF members and Switzerland. The purpose of the GAB is to lend specific currencies to the Fund should the need arise.

18 The United States also had previously announced plans to increase its gold sale to 750,000 ounces in November.

intervention was to become more aggressive. Prior to the November announcement, intervention generally had been directed solely at exchange market conditions. Now, as indicated by the Federal Reserve and the Treasury, the United States would counter a decline in the dollar that had "exceeded any decline related to fundamental factors."[20] Further, the release indicated that the United States would intervene "in a forceful and coordinated manner" directed at the "correction of recent excessive exchange rate movements."[21] Thus, rather than leaning against the wind, the new program tried to bring about some realignment of exchange rates.

While it is too early to judge the success of this program, the early results are promising. The initial actions to reverse market sentiment about the dollar were highly successful. In the first two days of the program, the dollar rose appreciably against most major currencies. Moreover, a major test of the dollar came after the December 17 announcement of the OPEC oil price increase. The market discounted this information quickly, and conditions were again quiet by the middle of the next business day, although the dollar did remain somewhat weak for the rest of December. Since then, the market has been stable and the dollar has generally firmed. From October 30 through the end of February, the dollar has risen almost 5 per cent on a trade-weighted basis, while rising 7.5 per cent against the German mark, 14.5 per cent against the Japanese yen, and 13.8 per cent against the Swiss franc.

CONCLUSION

Since the early 1960's, U.S. authorities have intervened from time to time in the foreign exchange markets in support of the U.S. dollar. This intervention, conducted mainly through the swap network, has proven to be a useful tool for helping achieve the nation's international monetary goals. These goals have included defending the Bretton Woods system, preserving orderly foreign exchange markets, and maintaining confidence in the dollar's role as a key international currency. Experience has shown that intervention in foreign exchange markets has been a useful and low-cost instrument of short-run international policy. However, in the longer run, the achievement of international policy goals depends primarily on basic underlying economic conditions. Thus, it is important that the United States tie its intervention activity to policies designed to reduce the internal rate of price inflation and improve the nation's international balance of payments position.

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19 It is also noteworthy that between October 27 and October 31, the limit on the Federal Reserve's net open position in foreign exchange was raised from $1.5 to $5 billion. This increased the ability of the Federal Reserve to incur swap debt to obtain foreign exchange with which to intervene to support the dollar.

20 Joint Statement of Secretary of the Treasury, W. Michael Blumenthal, and Federal Reserve Board Chairman, G. William Miller, Federal Reserve Press Release, November 1, 1978, p. 1.

21 Joint Statement, pp. 1-2.