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Consumer Behavior Under the Influence of Terrorism Within the United States

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Consumer Behavior Under the Influence of Terrorism within the United States

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Many indicators are helpful in improving statistical performance for forecasting and policy analysis. We do believe, however, no single indicator (or type of indicator) can do the necessary work by itself. Any new finding is likely to make a better contribution in combination with others that have been found to be useful. Timeliness, flexibility, and foresight are important properties of indicators, and we are especially interested in information that reflects subjective feelings of participants in the economy. Results of surveys covering consumers, producers or managers are useful in forecasting major macroeconomic variables, like personal consumption expenditures and personal income. Preliminary results indicate that models including survey results perform better than those that do not include survey results. Other surveys would be appropriate for such macroeconomic variables as industrial production, employment, and financial market averages.

Introduction

The macrodynamics of the US economy have been extraordinary in the terrorist environment. This is an extremely important issue because consumer behavior has provided a principal support – not the only support – for the US economy since 9/11, yet

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the consumer sector was supposedly vulnerable, as individuals suffered the most direct consequences of the surprise attack.

The economic outcome in the ensuing six-month period has been extremely strong and is motivated by a complicated mixture of psychological and economic reactions that deserve careful investigation. In this short piece, a combination of well-known economic factors will be examined, together with subjective responses to monthly questions from sample surveys to try to gain some understanding of recent macrodynamic adjustment.

I.   Time Patterns

First, let us look at the time patterns of monthly survey responses of samples of US investors and corresponding (real change in) purchases of consumer goods and services. This pair of magnitudes will first be monitored by corresponding movements in real disposable income and then by a complex multivariate reduction of some 24 traditional indicator variables of the US economy to a few (principal) components.

Monthly Income, Expenditure and Investor Optimism,   2001-2002

	J	A	S	O	N	D	J	F	M
Index of Optimism (UBS)	74	76	50	86	84	88	115	92	121
Consumer Expenditures, (% change)	0.3	0.1	-1.2	2.3	-0.2	0.3	0.4	0.5	0.2
Real Disposable Income (% change)	1.8	1.9	-0.7	-2.4	0.1	0.4	1.7	0.6	0.3
Estimated Consumer Expend-iture (% change)*	0.3	-0.2	2.1	0.3	0.6	0.7	0.6	0.3	

* Equation with Index of Investor Optimism and principal components of 24 indicators, extrapolated one month at a time, after August, 2001.

Usually, consumer spending moves, month-on-month, by a small fraction of one percent, and the index of consumer optimism (also the Michigan survey of a cross-section of households and the Conference Board survey of a similar population segment) moves by a few percentage points, at most. In September, however, when the shores of the US were first infiltrated and then severely attacked for the first time in recent memory, the survey index dropped by more than one-third in September. It is quite remarkable, however, that it revived very quickly and exceeded, in November, its pre-September published values. It has remained elevated at high values in comparison with most of the monthly values of the year.

The figures for disposable income change show terrorist effects in September, carry over to October and then begin to move in small increments as did the consumer expenditure figures. The psychological features of the Optimism Index have a somewhat different time shape.

Income alone is related to consumer spending, but it cannot tell the whole story, especially under strained circumstances of the sudden terrorist attack on our own soil and by people who are willing to be suicidal. The index of investor optimism cannot, by itself, account for all the movements in consumption even with a time lag. The optimism

index was high in August, but spending was low in September. Again the index reached a low value in September, but spending was high in October.

Right after the 9/11 attack, airports were closed; related travel-tourism businesses lacked customers; people embraced family members and stayed close to home. The low values of income in October do not seem to explain the high volume of spending in October, or even the modest declines in November and December, much less, the resurgence in January.

In very general terms, lacking numerical correspondence, we can say that consumers were eventually

(i)   re-assured by the US military response to spend for the longer run and by greater strictness of security standards.

(ii)   enticed into the market for durable goods and residences by very favorable interest rates,

(iii)   influenced by the economic effects of much higher military spending (the short-run multipliers associated with "military Keynesianism"), (Real National defense expenditures rose by 9% in 2001Q4 (seasonally adjusted annual rate)).

(iv)   influenced by reductions in taxation and by tax rebates.

These factors overwhelmed the negative wealth effects, increased unemployment, and announcements of "recession".

The issue before us now is to try to put all this together in a systematic way to interpret subjective expectations, market movements of strategic variables together with survey results for investor optimism and income fluctuations.

II.   A Suggested Approach

In general, and for the purposes of interpreting the dynamics of the terrorist shock to the US economy, it should be clear that sample surveys, alone, cannot provide a full analysis, nor can the movement of well understood and highly regarded macroeconomic indicators do the job; it requires some combination of these different sources of information and, even with that effort, it is not at all certain that one can fully understand what has taken place. Nevertheless, it appears to be promising to look jointly at the psychological issues, through the means of the survey method, and the more traditional economic methods with well known objectively measured magnitudes.

Accordingly, a joint estimation equation will be specified and also estimated to try to project the monthly path of consumer expenditures after 9/11. In earlier studies it has been found that the inclusion of sample survey expectations make a contribution to improvement of forecast accuracy of large-scale macroeconometric models, and that approach will be used in the present analysis. (Hymans, 1970 and Adams & Duggal, 1976.) Disposable income, alone, does not seem to be adequate for the situation that has prevailed in 2001 and 2002. In the first place, the large scale macroeconometric models are not generally available at the monthly frequency; they are, at best, estimated for a quarterly frequency. The month-to-month swings in the Index values listed above suggest that monthly (or finer) frequency is required. Attitudes, feelings, and expectations do not have a long period of validity, perhaps no more than a month or two before being radically changed. Also, disposable income on a monthly basis is not informative enough, as one can see from the table above; therefore it is necessary to seek

a <u>high-frequency</u> explanation of movements in objective measures of the macroeconomy, together with monthly readings of sample surveys, which are, indeed, highly volatile under present circumstances.

A suitable approach appears to be to combine monthly measures of the macroeconomy through the means of summary functions of a number of these monthly indicators that would, in fact, be used to build a monthly macroeconometric model that could be used in concert with an index of optimism obtained from sample surveys. Integrated models are frequently based on a complete set of national income and product accounts. These are not available at the present time for the USA at monthly frequency.

In a study, recently completed, by the two of us (Lawrence R Klein and Suleyman Ozmucur) for the predictive performance of the Index of Consumer Optimism, we have estimated some functions of 24 monthly variables, in the form of principal components. These variables are all-important and used in most cases, in the high-frequency forecasting model maintained at the University of Pennsylvania. They are not put together in a macroeconometric structural model but are designed to be used in tandem with such a model, at quarterly frequency.

These 24 variables are

new orders	hourly earnings
unfilled orders	hours worked/week
inventory/sales ratios	consumer price index
housing starts	producer price index
construction activity	inflation expectations[*]
building permits	export/import ratio
unemployment rate	effective exchange rate index
S&P 500 index	yield curve[**]
Dow Jones index	M2 money supply
Federal funds rate	consumer credit
prime rate	federal budget (receipts/outlays)
corporate bond rate	3-month treasury bill rate

From these individual monthly indicators, we have estimated 15 principal components, which account for 94% of the overall variance of the whole set of 24 variables and have regressed the percentage change in real consumption on 5 of these 15 components (a strategic set), a distributed lag of the index of investor optimism and autoregressive-moving average errors. This is the equation that we have used for projection of real consumption (Appendix A).

Since the survey, whether from the universe of investors or of all households, obtain information from individual citizens, not their corporations or business entities, it is reasonable to expect that the responses are indicative of human behavior as consumers. After the terrorist attack, the large drop in the indexes, typified by the UBS Index of Optimism of the investing population might be thought to be forecasting, by itself, a big drop in consumer spending, as soon as October, but this did not happen. Not only did

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[*] Yield spread between inflation indexed and not-indexed ten-year treasuries.
[**] Yield spread between ten-year treasuries and federal funds rate.

consumer attitudes regain much strength but economic fundamentals in the consumer sector turned unusually favorable. This did not stimulate large expenditures for travel tourism, and many services, but it did stimulate purchases of durable goods, especially cars, where the annualized value of demand exceeded the best values for a sales-year, at about 17 million units. The annual rate went to nearly 20 million units, all in a short period of just a few weeks. Our equation with a combination of principal components of 24 market-based variables and survey results, projected an October increase of 2.1%. The high recovery value for October was used, together with principal components of the 24 indicators to estimate November expenditures, but consumer incomes and market conditions were not very favorable in November, although some of the consumer incentives stayed in place. The result was that there was little change in November over October values for real consumer expenditures. In December, the equation projected a gain of 0.6%, and the observed amount was 0.3%. These results prevailed over a very apprehensive view of the traditional Christmas sales season by most forecasters. The November Index of Optimism was not very strong with respect to October, as Table 1 shows, but the market values of the principal components were strong enough to generate a better holiday shopping season than had been expected.

The gain for consumer expenditures was very slightly stronger (+0.31) in January, 2002, than in December, 2001 (+0.021). In January, there was help from income flows as well as from a very strong finish for the Index of Optimism. The December value was not extraordinarily high, but the combination of improved consumer attitudes and good market conditions brought consumer spending to even higher January gains than in December, and this surprised many who expected a continuation of recessionary or "near" recessionary conditions.

The UBS Survey Index in February declined markedly from January. This could have been due to more enemy resistance in the War in Afghanistan and also to more investor apprehension about the bankruptcy hearings for the Enron case.

It should be noted that the preferred specification of the Index of Optimism in the empirical applications of the Survey findings supports a definite time delay in the passing of subjective appraisals of the economy to consumer performance. Is this uniquely an American pattern? In the United Kingdom, the researches of (Pain and Weale 2001) find a definite time delay for the effect of US Consumer Survey Data to show up in corresponding economic behavior. They used quarterly data and found a lag effect of one quarter. We find a similar result with our data, although our equation specification is different and also the survey index is different. The UK research is based on the University of Michigan index of consumer sentiment.

An interesting feature of the investigation by Pain and Weale is that corresponding data and specifications among UK households do not show evidence of a time delay from consumer attitudes. That remains as an interesting difference between the two countries.

If one were to limit the specification to the <u>bivariate</u> relationship between a sample survey index and consumer expenditure, we would not necessarily get either plausible results or the same dynamic specification results, but researchers are finding that consumer attitudes are important; however they do have some particular characteristics that must be built into the system.

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UBS, Index of Investor Optimism.
< <u>http://www.ubs.com/e/index/about/research/indexofinvestoroptimism.html</u>>

APPENDIX A

Dependent Variable: DLOG(CONSUMPTION)*100
Method: Least Squares
Sample(adjusted): 1997:03 2001:08
Included observations: 54 after adjusting endpoints
Convergence achieved after 11 iterations
Newey-West HAC Standard Errors & Covariance (lag truncation=3)
Backcast: 1997:02

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.386372	0.002818	137.1080	0.0000
PC1	0.007950	0.006138	1.295182	0.2019
PC2	0.004740	0.012977	0.365275	0.7166
PC4	0.035744	0.010819	3.303978	0.0019
PC7	-0.069559	0.026547	-2.620226	0.0119
PC12	0.051438	0.022234	2.313519	0.0253
PDL01	0.006711	0.000684	9.808163	0.0000
PDL02	-0.001217	0.001716	-0.709249	0.4818
MA(1)	-0.974174	0.010983	-88.70172	0.0000

R-squared	0.551602	Mean dependent var	0.352151
Adjusted R-squared	0.471887	S.D. dependent var	0.299751
S.E. of regression	0.217833	Akaike info criterion	-0.059163
Sum squared resid	2.135307	Schwarz criterion	0.272334
Log likelihood	10.59741	F-statistic	6.919664
Durbin-Watson stat	2.130667	Prob(F-statistic)	0.000007

Inverted MA Roots	.97

Lag Distribution of D(UBS)	i	Coefficient	Std. Error	T-Statistic
. *|	0	0.00759	0.00213	3.56840
. *		1	0.00671	0.00068	9.80816
. *		2	0.00515	0.00149	3.45842
. *		3	0.00292	0.00134	2.17885
Sum of Lags		0.02237	0.00228	9.80816

This sample and specification is for the estimate reported in (Klein and Ozmucur, 2001) except for deletion of 3 superfluous financial variables.

APPENDIX B
MODEL UPDATE

POSTSCRIPT

Principal components and the consumption equation were re-estimated every month since April 2002 and forecasts were made for the following month. These results are provided in this appendix.

The equation estimated most recently is given in Table I. The equation is estimated with 65 monthly observations from June 1997 to October 2002. The equation includes seven principal components, which account for over 70% of the variation in 24 indicators, a polynomial distributed lag of the UBS Index of Investor Optimism, and autoregressive and moving average processes of residuals. The determination coefficient (R^2)for the equation is 0.81, and all parameters associated with principal components and the Index are significant at the five percent level, most of them at the one percent level. The actual, fitted and residual diagram indicates the degree of closeness of fit. On this diagram (Figure I) actual and fitted values estimated by the equation are given at the top (the right scale), while residuals are given at the bottom part (the left scale). In addition to Durbin-Watson statistics (2.15) given in Table 1, Ljung-Box-Pierce Q statistics (9.97 for 12 lags) and Breusch-Godfrey Lagrange multiplier tests for 2 lags (F=1.07, χ^2=2.23) indicate that there is no serial correlation in residuals (Table II). Engle's ARCH test indicates that there is no autoregressive conditional heteroscedasticity (Table II). Residuals are not only random, but they also are normally distributed, as indicated by the low Jarque-Bera statistic (Figure II).

These tests are based on the final equation estimated (the longest sample). In order to test the forecasting power of the model, the equation is first estimated using data from June 1997 to July 2001, and the real consumption expenditure is extrapolated for August 2001.The equation is then estimated using data from June 1997 to August 2001, and the real consumption expenditure is extrapolated for September 2001. The process has been continued up to the latest data point available (October 2002). This is as close as one can get to the test of the, one-period ahead, ex-ante forecasting power of the model. These results are provided in Figures III and IV, and Table III. There is a close relationship between actual and extrapolated real consumption expenditures. Correlation between the actual and extrapolated values exceeds 0.9 (Figure III). One-period ahead forecast errors are well below one percent, with the exception of October 2001 (Table III). Unusual incentives given for auto sales, boosted real consumer expenditures by 1.98% in October 2001; the model extrapolation was short of that with a predicted increase of 0.9%.

TABLE I.
ESTIMATED EQUATION

Dependent Variable: DLOG(CONSUMPTION)*100
Method: Least Squares
Sample(adjusted): 1997:06 2002:10
Included observations: 65 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=3)
Backcast: 1997:04 1997:05

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.323226	0.002760	117.1311	0.0000
PC1	0.029419	0.003866	7.609933	0.0000
PC2	0.120399	0.010334	11.65029	0.0000
PC3	-0.028716	0.005348	-5.369555	0.0000
PC5	-0.043842	0.011346	-3.864111	0.0003
PC6	-0.027169	0.005715	-4.754136	0.0000
PC7	0.039496	0.013465	2.933274	0.0050
PC8	-0.066781	0.009712	-6.876301	0.0000
PDL01	0.001346	0.000629	2.139254	0.0371
AR(3)	-0.338568	0.122950	-2.753697	0.0081
AR(2)	-0.371905	0.138100	-2.693009	0.0095
MA(1)	-1.288349	0.169390	-7.605835	0.0000
MA(2)	0.290434	0.185640	1.564501	0.1238

R-squared	0.809509	Mean dependent var	0.318332
Adjusted R-squared	0.765549	S.D. dependent var	0.416338
S.E. of regression	0.201591	Akaike info criterion	-0.188293
Sum squared resid	2.113230	Schwarz criterion	0.246585
Log likelihood	19.11951	F-statistic	18.41489
Durbin-Watson stat	2.155220	Prob(F-statistic)	0.000000

Inverted AR Roots	.26 -.76i	.26+.76i	-.52
Inverted MA Roots	1.00	.29	

Lag Distribution of D(UBS)	i	Coefficient	Std. Error	T-Statistic
. * |	0	0.00108	0.00050	2.13925
. *|	1	0.00161	0.00075	2.13925
. *|	2	0.00161	0.00075	2.13925
. * |	3	0.00108	0.00050	2.13925
Sum of Lags		0.00538	0.00252	2.13925

FIGURE I.
ACTUAL FITTED AND RESIDUALS
(SAMPLE PERIOD)
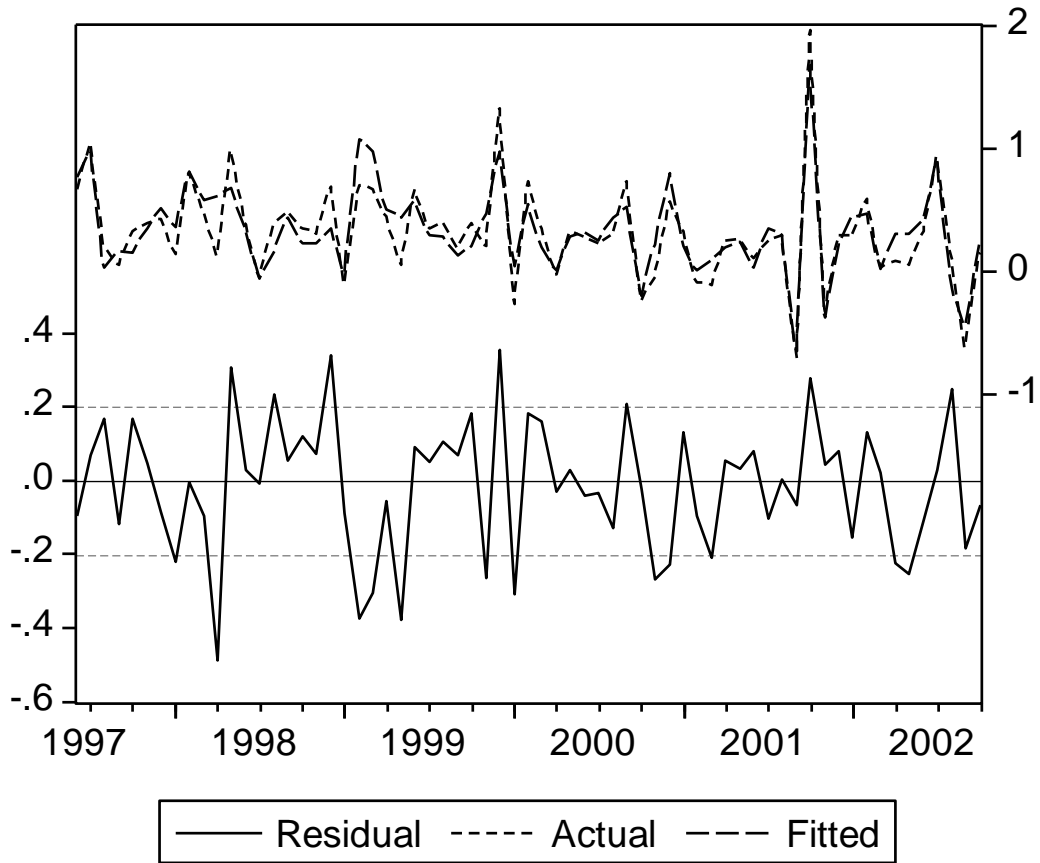
TABLE II.
AUTOCORRELATION AND ARCH TESTS

Sample: 1997:06 2002:10
Included observations: 65
Q-statistic
probabilities
adjusted for 4
ARMA term(s)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*|. |	.*|. |	1	-0.087	-0.087	0.5192	
. |. |	. |. |	2	0.030	0.023	0.5817	
. |. |	. |. |	3	0.012	0.017	0.5917	
. |. |	. |. |	4	-0.007	-0.006	0.5954	
**|. |	**|. |	5	-0.216	-0.220	3.9800	0.046
.*|. |	.*|. |	6	-0.103	-0.149	4.7696	0.092
.*|. |	.*|. |	7	-0.129	-0.154	6.0232	0.110
.*|. |	**|. |	8	-0.165	-0.206	8.0912	0.088
.*|. |	.*|. |	9	-0.058	-0.129	8.3487	0.138
. |*. |	. |. |	10	0.086	-0.001	8.9321	0.177
.*|. |	.*|. |	11	-0.058	-0.135	9.2023	0.238
.*|. |	**|. |	12	-0.097	-0.269	9.9695	0.267

Breusch-Godfrey Serial Correlation LM Test: (2 lags)

F-statistic	1.070811	Probability	0.350459
Obs*R-squared	2.237663	Probability	0.326661

ARCH Test:

F-statistic	0.924306	0.340082
	Probability	
Obs*R-squared	0.940107	0.332250
	Probability	

FIGURE II.
NORMALITY TESTS OF RESIDUALS

Series: Residuals	
Sample 1997:06 2002:10	
Observations 65	
Mean	-0.014961
Median	0.003217
Maximum	0.354279
Minimum	-0.489852
Std. Dev.	0.181085
Skewness	-0.265023
Kurtosis	2.826900
Jarque-Bera	0.842053
Probability	0.656373
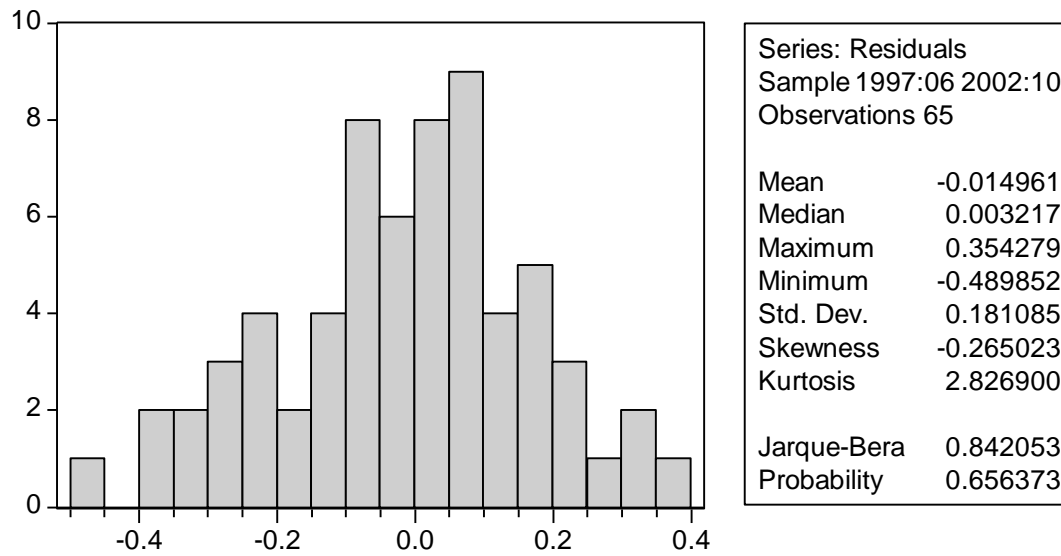
FIGURE III.
ACTUAL AND EXTRAPOLATION
(OUTSIDE SAMPLE)

ACTUAL vs. EXTRAPOLATION

14
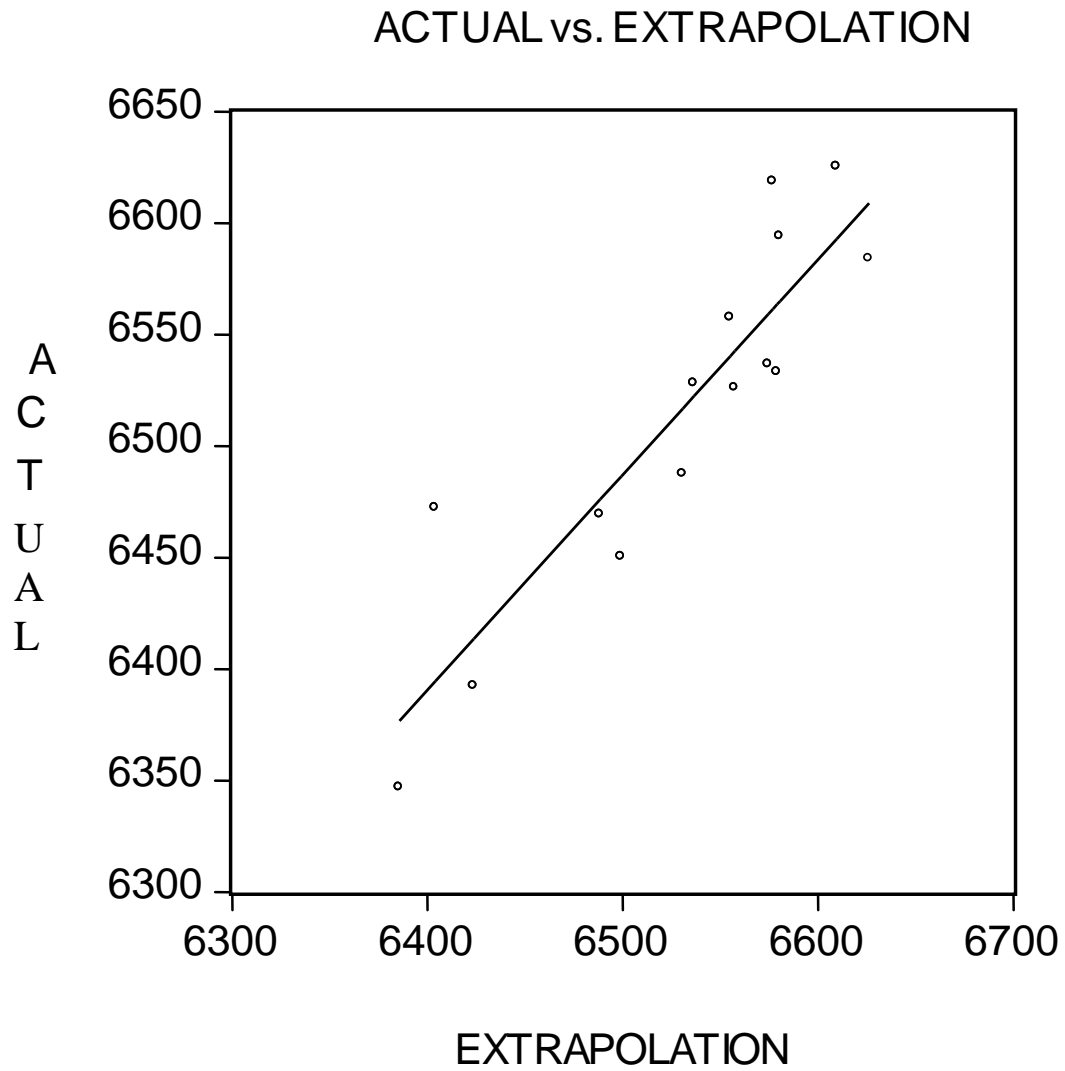
FIGURE IV.
ACTUAL AND EXTRAPOLATION
(OUTSIDE SAMPLE)
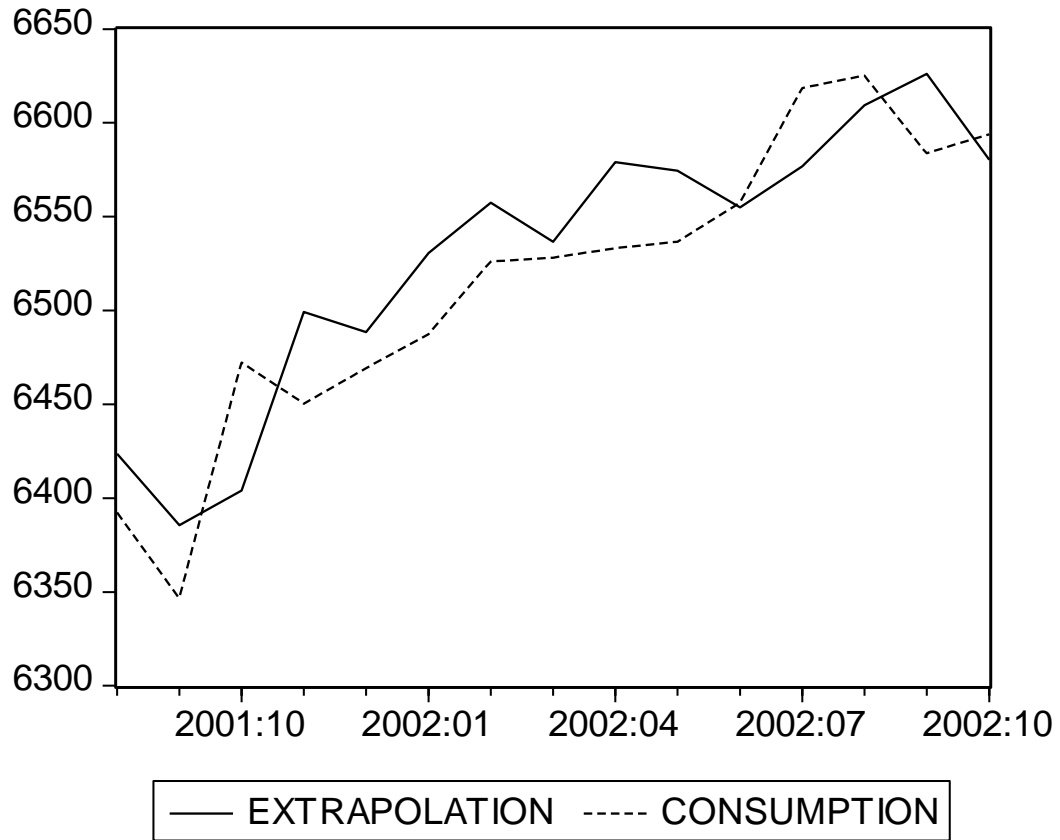
TABLE III.
ONE-PERIOD AHEAD EXTRAPOLATIONS

obs	Consumption	extrapolation	Percent error	Consumption (%chg)	Extrapolation (%chg)
	6373.7				
2001.08	6392.3	6423.7	-0.49	0.29	0.79
2001.09	6346.9	6385.6	-0.61	-0.71	-0.11
2001.10	6472.3	6404.1	1.05	1.98	0.90
2001.11	6450.3	6499.2	-0.76	-0.34	0.42
2001.12	6469.3	6488.4	-0.30	0.29	0.59
2002.01	6487.4	6530.7	-0.67	0.28	0.95
2002.02	6526.0	6557.5	-0.48	0.59	1.08
2002.03	6528.1	6536.6	-0.13	0.03	0.16
2002.04	6533.2	6579.1	-0.70	0.08	0.78
2002.05	6536.6	6574.5	-0.58	0.05	0.63
2002.06	6557.5	6555.0	0.04	0.32	0.28
2002.07	6618.6	6576.8	0.63	0.93	0.29
2002.08	6625.1	6609.4	0.24	0.10	-0.14
2002.09	6583.9	6626.0	-0.64	-0.62	0.01
2002.10	6594.0	6580.4	0.21	0.15	-0.05