Rensselaer

Working Papers in Economics

Department of Economics, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180-3590, USA. Tel: +1-518-276-6387; Fax: +1-518-276-2235; URL: http://www.rpi.edu/dept/economics/; E-Mail: heimj@rpi.edu

DOES CONSUMER CONFIDENCE, AS MEASURED BY U. OF MICHIGAN INDICES, AFFECT DEMAND FOR CONSUMER AND INVESTMENT GOODS (OR JUST PROXY FOR THINGS THAT DO)?

John J. Heim
Rensselaer Polytechnic Institute

Number 0903

August 2009

DOES CONSUMER CONFIDENCE, AS MEASURED BY U. OF MICHIGAN INDICES, EFFECT DEMAND FOR CONSUMER AND INVESTMENT GOODS (OR JUST PROXY FOR THINGS THAT DO)?

John J. Heim, Ph.D.
Professor of Economics
Rensselaer Polytechnic Institute

Abstract: *Declining consumer confidence is cited as a cause of declining consumer demand, independent of changes income, wealth, etc. If so, it may also affect demand for investment goods, as businesses adjust production to reflect changes in consumer confidence and its anticipated effect on demand. This paper examines the University of Michigan's Index of Consumer Sentiment (ICS), and the Index of Consumer Expectations (ICE), a subcomponent of ICS also used in the Index of Leading Economic Indicators Index. Using simple two variable regressions ICS lagged one year explained considerable variance in current consumption (but not vice versa). Both the ICS and ICE lagged one year were found systematically related to consumer demand for nondurable goods, but not durable goods, services, or total consumer demand when an extensive list of other factors affecting demand such as income, wealth, interest rates, credit availability and the exchange rate were controlled for. Neither ICS nor ICE was found related to any component of investment.*

Keywords: Consumption, Investment, Consumer Confidence

1. INTRODUCTION AND OUTLINE

1.1. INTRODUCTION

If people's income or wealth declines, theory and empirical studies lead us to expect consumption to decline, and probably, consumer confidence as well. Not so clear is whether declining consumer confidence, absent changes in income or wealth, can directly affect consumer spending. If confidence levels can independently influence consumer (or investment) spending before changes in incomes or wealth occur, i.e., through "fear itself", politicians and public officials need to prudently choose their words when they report economic news, so as not to affect consumer confidence and create self fulfilling prophecy. The Federal Reserve and the FDIC, by adoption of certain policies, such as FDIC insurance, or "lender of last resort" guarantees may be acknowledging the possibility of this problem. Such policies are designed to prevent bank panics when consumer confidence in the safety of bank deposits falls rapidly at signs of trouble. They show some evidence the Federal Reserve and FDIC believe confidence may be affected by economic news: For example, former Federal Reserve Governor Mishkin argues:

> …Uncertainty about the health of the banking system in general can lead to runs on banks both good and bad, and the failure of one bank can hasten the failure of others…(Mishkin, 2007, p.280)

Declines in consumer confidence about where the economy is headed are often cited as one of the major causes of the great depression. For example Kelly (2009) cited the a decline in consumer confidence after the stock market crash in 1929 as one of the 5 major causes of the great depression:

> …With the stock market crash and the fears of further economic woes, individuals from all classes stopped purchasing items. This then led to a reduction in the number of items produced and thus a reduction in the workforce…More and more inventory began to accumulate…(Kelly, 2009)

The collapse of consumer confidence in 1990

> …frequently was cited as an important – if not the leading – cause of the economic slowdown that ensued…(Carroll, Fuhrer and Wilcox, 1994)

In addition, the chair of the President's Council of Economic Advisors recently cited the negative effects of uncertainty on spending as a cause of both the 1929 depression and the current recession:

> …Consumer spending depends on many things, including income, taxes, *confidence*, and wealth…Another factor to consider is the uncertainty created by the gyrations in asset prices. In a paper I wrote many years ago, I argued that the main effect of the crash of the stock market in 1929 on spending operated not through the direct loss of wealth, but through the enormous uncertainty it created. The initial crash in October was followed by wild fluctuations of stock prices. This volatility led consumers and firms to be highly uncertain about what lay ahead. I found narrative and statistical evidence that this uncertainty led to large drops in consumption and investment spending. This makes sense: when you don't know what is likely to happen, the best thing to do may be to simply do nothing as you wait for more information….The same factor may be at work today.…*uncertainty has almost surely contributed to a decline in spending, especially in the last few months… As businesses and consumers became more nervous and wanted to spend less, they sought fewer loans*… (Romer, 2009)

The depth of the current recession seemed to follow hard on the heels of treasury Secretary Paulson's headline - making public warnings that without a huge bailout, the banking industry might collapse, triggering an economic calamity. Did Paulson's own words contribute to the the problem by adversely affecting consumer confidence, which in turn caused a decline in consumer spending? Or was the collapse in consumer confidence simply concurrent with (or trailing) a fall in one of the economic factors known from prior studies to be related to consumer spending (e.g., stock market changes)?

Prior studies of consumer confidence have produced different results. Two of the most impressive efforts to date are discussed here. Bram and Ludvigson (1998) indicated the Michigan Indices of Consumer Sentiment (ICS) and Consumer Expectations (ICE) showed limited ability to forecast consumer spending. Using a regression with separate variables for four lags of a number of control variables (consumption, income, interest rates and a wealth) as well as the ICS, they found that ICS p-values for consumer goods (excluding motor vehicles) was <.000. However, when added to regressions for total consumption, durable goods alone, and services, the ICS was not significant at the 5% level. For the ICE, again using 4 lagged values the same control variables nothing of significance was found except for motor vehicles demand, significantly related to the ICE at the 4% level. However, they did find the Conference Board's Index of Consumer Confidence related to total consumer spending, and durables demand. They also found the Conference Board's Index of Consumer Expectations related to some kinds of consumer spending, namely total consumer spending, motor vehicle spending and spending on consumer services. These findings are discussed in another paper dealing with the relationship of Conference Board Indices of consumer confidence and their ability to explain consumer and investor behavior. (Heim 2009E)

Bram and Ludvigson's results were similar to earlier tests of the ICS by Carroll, Fuhrer and Wilcox (1994) , which found that controlling for income and past values of the dependent variable only the p-value for entry of 4 lags of the ICS was <.000 for total consumption, , all goods except motor vehicles, and motor vehicles goods. Consumption of services was not found to be well explained by the ICS variables. Without controls for income, this study found that a regression of (log) consumption on four lags of ICS alone explained 14% of the variance for 1955:1 – 1992:3 period. These results are summarized in the table below. For comparison, results of this study, which uses a different methodology, are also shown.

Both of the 1994 and 1998 studies used models of the following type for testing hypotheses:

$$\Delta Ln(C_t) = \alpha_0 + \Sigma_1^n(\beta_i S_{t-i}) + \gamma Z_{t-i} + \varepsilon_t$$

Where S are the ICS or ICE consumer sentiment and expectations variables, and Z are the control variables. The control variables were lagged values of a labor income variable and the dependent variable in both studies. The 1998 study also used additional control variables: the 3 month treasury rate and a stock market measure (both in first differences). Four lagged values of each variable were used in the model. Models of this sort are commonly used for short term forecasting, and this test is designed to see if adding the ICS or ICE to the predictor variables increased forecasting ability.

Do Michigan Consumer Sentiment or Expectations Indices Increase Explanatory Power When Added To Other Variables In The Consumption Function Tested?

Category	1994Study[1]	1998 Study[2]		Category	This Study	
	ICS	ICS	ICE		ICS	ICE
Total	Yes	No	No	Total	No	No
Motor Vehicles (MV)	Yes	No	Yes			
All Goods (Ex.MV)	Yes	Yes	No	Nondurables	Yes	No
Durables (Ex.MV)	(NA)	No	No	Durables	No	No
Services	No	No	No	Services	No	No

[1]Carrol, Fuhrer, Wilcox, (1994,Table 1) [2]Bram, Ludvigson, (1998, Table 2)

But the explanatory model implied by the variables and their multiple lagged values included in forecasting models is often less than clear, or simply indeterminant, in terms of specific economic variables and their specific lags that make a difference in consumer behavior. Therefore, it can be difficult to assess the economic, as opposed to statistical, meaning of results.

Is the projection's accuracy principally derived from inclusion of all the things, and their appropriate lags, (and only those lags) that theory tells us drives consumer spending (e.g., income, wealth). That is, is it an explanatory model? Or is the forecast principally derived from the assumption that, often, the best short term projections are obtained simply by assuming past trends in the dependent variable (and perhaps others) will continue, for at least a little while longer. These we will refer to as predictive models.

The models tested in this paper will be of the explanatory type. When controlling for the other variables that may affect consumption beside the ICS and ICE, extensive reliance will be placed on including as controls all variables (and their appropriate lags, if any) fairly exhaustive recent studies have found to be determinants of consumer behavior. No past values of the dependent variable will be used as predictors, since they are driven by other, more exogenous determinants. Inclusion of past values of the dependent variable can cloud somewhat the role played by these variables.

Explanatory and predictive models need not be unrelated. In our view, properly constructed, one can move back and forth from one to the other, depending on whether one is trying to explain what makes the economy work, or predict where it will go in the future. For example, suppose consumption was described by the following model, which (for simplicity of exposition), has only one "control" variable, income (Y), in addition to the test variable (ICS). It also includes a one period lagged value of the dependent variable:

1) $C_0 = \alpha + \gamma C_{-1} + \beta_1 Y_{-1} + \beta_2 ICS_{-1}$

Therefore, consumption lagged one period is simply

2) $C_{-1} = \alpha + \gamma C_{-2} + \beta_1 Y_{-2} + \beta_2 ICS_{-2} + \ +$

Then t is easy to show that with two backward substitutions into the dependent variable on the right hand side, in steady state equation (2) becomes

3) $C_0 = (1 + \gamma + \gamma^2)\, \alpha + + (1 + \gamma + \gamma^2)\, \beta_1 Y_{-1} + (1 + \gamma + \gamma^2)\, \beta_2 ICS_{-1} \quad \gamma^3 C_{-3}$

For which the algebra of infinite series expansion tells us that with infinite additional backward substitutions in steady state yields

4) $C_0 = (1/1\text{-}\gamma)\ \alpha + (1/1\text{-}\gamma)\ \beta_1\ Y_{-1} + (1\text{-}\gamma)\ \beta_2\ ICS_{-1} + \gamma^n\ C_{-n}$

Where $\gamma^n\ C_{-n}$ goes to zero as n goes to infinity, i.e.

5) $C_0 = (1/1\text{-}\gamma)\ \alpha + (1/1\text{-}\gamma)\ \beta_1\ Y_{-1} + (1/1\text{-}\gamma)\ \beta_2\ ICS_{-1}$

Hence, for example, Professor Fair's consumption equations (Fair 2004), which we would characterize as predictive models because of their inclusion of a single lagged value of the dependent variable, can be easily converted to explanatory models of the type we use in this study, as shown above. There is not necessary a contradiction in the two types of models. Properly constructed, a predictive model implies its own explanatory model.

The models we will use below are of the type shown in (5) above. Empirical tests are linear in their variables and in their effects on consumption. Variables used as determinants of consumption, and the specific lagged value used with each, will be taken from previous more comprehensive studies of just which variables/lags seem to explain the most variance in consumption. These will be used as controls and individual lagged values of ICS or ICE will be added to the same previously tested model to see if they are systematically related to any of the remaining unexplained variance. t-statistics on the added ICS or ICE variables will be used to evaluate how systematic the relationship is.

1.2. OUTLINE OF THE PAPER

The following outline provides an overview of the process we use to provide a separate evaluation of the University of Michigan's ICS and ICE indices:

1.0. Introduction and Outline

2.0. Methodology
- 2.1. Methods Use to Determine what Factors Drive Consumer Demand
- 2.2. Methods Use to Determine what Factors Drive Investment Demand

3.0. Testing Sensitivity Of Consumer Demand To The Index Of Consumer Sentiment (ICS)
- 3.1. Tests Assuming The Determinants Of Demand Are The Same For Each Part Of Total Consumption
- 3.2. Testing The ICS Using More Sophisticated Models Of Demand For Subcomponents Of Total Consumption
- 3.3. Conclusions Regarding The Relationship Of ICS To Consumption
- 3.3.1. Impact on GDP Of ICS Drop 2008 – June 2009
- 3.4 Tests of Whether Some Income Effects Merely Proxy For ICS

4.0. Testing Sensitivity Of Consumer Demand To The Index Of Consumer Expectations (ICE)
- 4.1. Tests Assuming The Determinants Of Demand Are The Same For Each Part Of Total Consumption
- 4.2. Testing The Ice Using More Sophisticated Models Of Demand For Subcomponents Of Total Consumption
- 4.3. Conclusions Regarding The Relationship Of ICE To Consumption
- 4.4. Comparison Of The ICS And ICE Findings For Consumption

5.0. Testing Sensitivity Of Investment Demand To The Index Of Consumer Sentiment (ICS)
- 5.1. Tests Assuming The Determinants Of Demand Are The Same For Each Part Of Total Consumption
- 5.2. Testing The ICS Using More Sophisticated Models Of Demand For Subcomponents Of Total Consumption

2.0. METHODOLOGY

2.1. ESTIMATING CONSUMER DEMAND:

This paper, econometrically, attempts to determine if declines in consumer confidence tend to precede, follow, or react concurrently to declines in demand for consumer or investment goods, i.e., is consumer confidence a leading, trailing or concurrent economic indicator? Recent work by Heim (2009A&B) has used U.S. 1960-2000 data to estimate the impact of a comprehensive group of factors commonly thought to be determinants of consumer demand. When testing measures of consumer sentiment, The factors found to be statistically significant determinants of consumer demand in those studies will be used as controls when testing the ICS and ICE measures of consumer confidence.

This paper assumes that the demand for consumer goods is principally driven by factors suggested by Keynes (1936). Keynes argued in chapter 8 of the General Theory of Employment, Interest and Money (1936, pp.95-96) that income, wealth, fiscal policy (taxes) and possibly the rate of interest might influence consumption. In chapter 9 he also notes the need for saving might affect the level of consumption spending.

Two other factors are added to this list of determinants of consumer demand. First, a "crowd out" variable is added, similar to the one used in investment studies to control for periods of limited credit availability which may occur in response to government deficits. Preliminary studies had indicated this variable was as strong a force affecting consumer spending, as it is in investment spending (Heim 2007, 2008A). The same studies also showed that Keynesian formulations of current period income explain far more variance in consumption than do Freidman/Modigliani average income formulations.

Second, we also add an exchange rate variable based on preliminary tests indicating this variable explains changes in consumer demand not otherwise explained by the other variables in the demand model and that a four year average value for this variable was most appropriate. (Heim 2009C).

A stepwise regression model was used to determine which of the above-hypothesized variables actually explained variance in consumer spending and for determining appropriate lags for the variables. At each stage of the stepwise process, the new determinant added was tested separately using its current year value and each of the preceding four years values in tests of which best explain current consumption, given the other variables in the model at that time Heim.

Heim (2008A) found that regression results on a modified Keynesian function of the following type explained 92% of the variance in consumer spending in the 1960 - 2000 period:

$$C = \beta_1 + \beta_2 (Y\text{-}T_{\mathbf{G}}) + \beta_3(T_G - G) - \beta_4 (PR). + \beta_5 (DJ)_{-2} + \beta_6 (XR)_{AV0123}$$

where

$(Y\text{-}T_G)$ = Disposable income defined as the GDP minus the government receipts net of those used to finance transfer payments

$(T_G - G)$ = The government deficit, interpreted as a restrictor of consumer as well as investment credit. It was found highly significant in a preliminary study (Heim 2008A), and is regressed as two separate variables because of earlier findings of differential effects.

PR = The Prime interest rate for the current period. It is deflated to get the "real" rate using the average of the past two year's CPI inflation rate.

DJ_{-2} = A stock market wealth measure, the Dow Jones Composite Average, lagged two years

XR_{AV0123} = The trade - weighted exchange rate (XR An average of the XR value for the current and past three years is used to capture what preliminary studies showed was slow, multiyear process of adjustment to exchange rate changes (Heim, 2007)

Regression results for this model were calculated using

- 2SLS Regression to deal with simultaneity between C and Y
- Newey –West heteroskedasticity corrections to standard errors
- 1st differences of the data to reduce multicollinearity, autocorrelation and nonstationarity
- 1960 – 2000 data from The Economic Report of the President, 2002

The actual regression results for consumer demand were as follows:

$$\Delta C_0 = .66\Delta(Y\text{-}T_G)_0 + .48\Delta T_{G(0)} + .06\Delta G_0 - 6.81\ \Delta PR_0 + .69\ \Delta DJ_{-2} + 1.39\ \Delta XR_{AV0123} \qquad R^2 = 92\%$$

$$(t =) \quad (27.9) \quad (5.2) \quad (0.5) \quad (-3.2) \quad (5.1) \quad (2.3) \qquad D.W.= 2.0$$

We shall take this as a well developed, comprehensive model of consumption to use when testing consumer sentiment variables below. One modification was made to this model for consistency with other work in this paper: the exchange rate used in the above model was changed from the G-10 rate to the Federal Reserve's real Broad exchange rate, which better reflects U.S. trading patterns. The change has virtually no effect on the estimated effects of other variables. The "baseline" model of consumption modified to include the real Broad rate instead of the G-10 rate was found to be :

$$\Delta C_0 = .66\Delta(Y\text{-}T_G)_0 + .49\Delta T_{G(0)} + .04\Delta G_0 - 6.92\ \Delta PR_0 + .62\ \Delta DJ_{-2} + 2.83\ \Delta XR_{AV0123} \qquad R^2 = 92\%$$

$$(t =) \quad (29.2) \quad (5.7) \quad (0.3) \quad (-3.2) \quad (4.9) \quad (3.2) \qquad D.W.= 2.0$$

t-statistics of 2.0 and 2.7 are significant at the 5 and 1% level respectively.

To test whether the Index of Consumer Sentiment (ICS), or later, the Index of Consumer Expectations (ICE) explains any variation in consumption when the effects of the "baseline" variables above have been controlled for, we will add the ICS or ICE variable being tested to the above model, and retest it using the same methodology. If the t-statistic on the regression coefficient for the ICS or ICE variable is significant at the 5% level or above (t>= 2.0), we will conclude that it does explain variance otherwise unexplainable in a well specified consumption function.

2.2. ESTIMATING INVESTMENT DEMAND: METHODOLOGY

The investment model used to test the ICS and ICE consumer confidence variables includes as controls a comprehensive list of other variables traditionally thought to be determinants of investment. See, for example, Keynes (1936), Jorgenson (1971), Terragossa (1997), and Spenser & Yohe (1970).

$$\Delta I = \beta_{D1}\ \Delta ACC + \beta_{D2}\ \Delta DEP + \beta_{D3}\ \Delta CAP_{-1} + \beta_{D4}\ \Delta T_G - \beta_{D5}\ \Delta G - \beta_{D6}\ \Delta r_{-2} + \beta_{D7}\ \Delta DJ_{-2} + \beta D_{I8}\ \Delta PROF_{-2} + \beta_{D9}\ \Delta XR_{AV0123}$$

The variables included in these equations are

ΔACC	=	An accelerator variable $\Delta(Y_t - Y_{t-1})$
ΔDEP	=	Depreciation
ΔCAP_{-1}	=	A measure of last year's capacity utilization
$\Delta PROF_{-1}$	=	A measure of business profitability two years ago
ΔDJ_{-1}	=	Last Year's Dow Jones Composite Index – A Proxy For "Tobin's q "
$PR_{-2}*Y_{-4}$	=	The Real Prime Interest Rate Lagged two years Multiplied By The Size of The GDP Two Years Before That (A Way Of Adjusting Interest Rate Effects For Economy Size)

The other variables in the model (exchange rate, government deficit) have the same meanings as in the consumption model previously discussed, with lags as noted. These actual regression results for this model were calculated using

- 2SLS Regression to deal with simultaneity between C and Y
- Newey –West heteroskedasticity corrections to standard errors
- 1^{st} differences of the data to reduce multicollinearity, autocorrelation and nonstationarity
- 1960 – 2000 data from The Economic Report of the President, 2002

Previous studies (Heim 2009B) had shown these variables would explain 90% of the variance in total investment demand 1960-2000. Econometric results are shown below. Variables are shown in order of their contribution to explained variance using a stepwise regression procedure:

$$\Delta I = .43\,\Delta T_G - .39\Delta G + .29\Delta ACC + .86\Delta DEP - 1.17\Delta PR_{-2}*Y_{-4} + .50\,\Delta DJ_{-1} + .38\,\Delta PROF_{-1} + 3.77\,\Delta XR_{AV0123} + .17\Delta CAP_{-1} \quad R^2=.90$$
$$(t =) \quad (4.4) \quad (-2.2) \quad (8.5) \quad (3.0) \quad (-2.5) \quad (3.2) \quad (2.6) \quad (2.2) \quad (0.2) \quad DW = 2.3$$

t-statistics of 2.0 and 2.7 are significant at the 5 and 1% level respectively.

To test whether the Index of Consumer Sentiment (ICS), or later, the Index of Consumer Expectations (ICE) explains any variation in investment when the effects of the "baseline" variables above have been controlled for, we will add the ICS or ICE variable being tested to the above model, and retest it. If the t-statistic on the regression coefficient for the ICS or ICE variable is significant at the 5% level or above (t>= 2.0), we will conclude that it does explain variance otherwise unexplainable in a well specified investment function.

3.0. CONSUMER DEMAND: TESTS OF THE INDEX OF CONSUMER SENTIMENT (ICS)

3.1. TESTS ASSUMING DETERMINANTS ARE THE SAME FOR ALL TYPES OF CONSUMER DEMAND

The Index of Consumer Sentiment (University of Michigan/Reuters, 2009) was added to the previously tested consumption model to see if it increased explanatory power. The model was tested adding the current year value (ICS_0), the one year lag (ICS_{-1}) and the two year lag (ICS_{-2}). In addition, the two and three year average lagged values of the index (ICS_{AV0-1} or ICS_{AV-1-2}) were tested. When added to the otherwise fully specified model of total consumption demand described above, all the consumer sentiment variables were all found to be statistically insignificant. i.e., contributing nothing (or virtually nothing) to explained variance, and yielding t-statistics that were not significant at the 5% level or better. Results are shown in Table 1 below.

Table 1

Testing the Consumer Sentiment Index As A Determinant of Consumer Demand
(Controlling For Other Major Influences On Consumer Demand)

ΔC_0	$=.67\Delta(Y-T_G)_0$	$+.51\Delta T_{G(0)}$	$-.002\Delta G_0$	$-7.60\,\Delta PR_0.$	$+.59\,\Delta DJ_{-2}$	$+3.11\,\Delta XR_{AV0123}$	$-.29\,\Delta ICS_0$	$R^2=92\%$
(t =)	(30.1)	(5.9)	(-0.0)	(-2.7)	(4.6)	(2.8)	(-0.6)	D.W.= 2.0
ΔC_0	$=.66\Delta(Y-T_G)_0$	$+.46\Delta T_{G(0)}$	$+.07\,\Delta G_0$	$-7.16\,\Delta PR_0.$	$+.65\,\Delta DJ_{-2}$	$+2.39\,\Delta XR_{AV0123}$	$+.47\,\Delta ICS_{-1}$	$R^2=92\%$
(t =)	(28.4)	(4.1)	(0.5)	(-3.5)	(4.2)	(2.1)	(0.8)	D.W.= 2.0
ΔC_0	$=.67\Delta(Y-T_G)_0$	$+.50\Delta T_{G(0)}$	$-.03\,\Delta G_0$	$-7.79\,\Delta PR_0.$	$+.61\,\Delta DJ_{-2}$	$+2.60\,\Delta XR_{AV0123}$	$+.60\,\Delta ICS_{-2}$	$R^2=92\%$
(t =)	(33.0)	(5.2)	(-0.3)	(-3.2)	(4.9)	(2.9)	(1.2)	D.W.= 2.0
ΔC_0	$=.66\Delta(Y-T_G)_0$	$+.48\Delta T_{G(0)}$	$+.06\,\Delta G_0$	$-6.75\,\Delta PR_0.$	$+.64\,\Delta DJ_{-2}$	$+2.64\,\Delta XR_{AV0123}$	$+.20\,\Delta ICS_{AV0-1}$	$R^2=92\%$
(t =)	(27.0)	(4.0)	(0.4)	(-2.6)	(4.0)	(2.4)	(0.2)	D.W.= 2.0
ΔC_0	$=.66\,\Delta(Y-T_G)_0$	$+.46\Delta T_{G(0)}$	$+.01\,\Delta G_0$	$-8.06\,\Delta PR_0.$	$+.63\,\Delta DJ_{-2}$	$+2.06\,\Delta XR_{AV0123}$	$+1.16\,\Delta ICS_{AV-1-2}$	$R^2=93\%$
(t =)	(31.8)	(4.3)	(0.1)	(-3.7)	(4.5)	(1.9)	(1.4)	D.W.= 2.0
ΔC_0	$=.65\,\Delta(Y-T_G)_0$	$+.44\Delta T_{G(0)}$	$+.07\,\Delta G_0$	$-6.79\,\Delta PR_0.$	$+.68\,\Delta DJ_{-2}$	$+1.90\,\Delta XR_{AV0123}$	$+1.21\,\Delta ICS_{AV0-1-2}$	$R^2=92\%$
(t =)	(22.7)	(3.6)	(0.6)	(-3.9)	(3.9)	(1.4)	(0.9)	D.W.= 2.0
ΔC_0	$=.66\,\Delta(Y-T_G)_0$	$+.46\Delta T_{G(0)}$	$+.03\,\Delta G_0$	$-7.28\,\Delta PR_0.$	$+.66\,\Delta DJ_{-2}$	$+1.98\,\Delta XR_{AV0123}$	$+1.27\,\Delta ICS_{AV0-1-2-3}$	$R^2=93\%$
(t =)	(27.1)	(4.1)	(0.3)	(-3.4)	(4.3)	(1.7)	(1.1)	D.W.= 2.0
ΔC_0	$=.66\,\Delta(Y-T_G)_0$	$+.48\Delta T_{G(0)}$	$+.03\,\Delta G_0$	$-6.89\,\Delta PR_0.$	$+.63\,\Delta DJ_{-2}$	$+2.60\,\Delta XR_{AV0123}$	$+.45\,\Delta ICS_{AV0-1-2-3-4}$	$R^2=92\%$
(t =)	(28.0)	(4.6)	(0.3)	(-3.1)	(4.2)	(2.1)	(0.3)	D.W.= 2.0
ΔC_0	$=.66\,\Delta(Y-T_G)_0$	$+.54\Delta T_{G(0)}$	$+.05\,\Delta G_0$	$-7.38\,\Delta PR_0.$	$+.59\,\Delta DJ_{-2}$	$+3.24\,\Delta XR_{AV0123}$	$-1.19\,\Delta ICS_{AV0-1-2-3-4-5}$	$R^2=92\%$
(t =)	(29.1)	(5.0)	(0.4)	(-3.2)	(4.7)	(2.6)	(-0.6)	D.W.= 2.1

Overall consumption spending is made up of three quite different subcomponents: demand for durable goods, demand for non durable goods and demand for services. Though overall consumer demand may not be systematically related to consumer sentiment, it may be that at least one of its subcomponents is (as is suggested by the persistence of positive sign on the ICS variable in Table 1).

Table 2 below shows how demand for consumer goods and services was divided between durables, nondurables and services during the 1960 – 2000 period. that typically over the 40 year period studied, durables demand was only 10% of total consumer demand, explaining the lack of significance when testing the ICS variable against total consumer demand for all three subcategories of consumer goods and services. Note that even as far back as 1960 services was the largest component of consumer demand, followed by demand for non durable goods. Demand for durables averaged only ten percent of the total over the period.

TABLE 2
COMPONENTS OF REAL U.S. CONSUMPTION 1960 – 2000
(Billions of Chained 1996 Dollars)

Year	Total	Durables	Nondurables	Services
1960	$1510.8	$101.7	$ 612.8	$ 791.7
1970	2317.5	184.4	854.8	1275.7
1980	3193.0	279.6	1065.8	1858.5
1990	4474.5	487.1	1369.6	2616.2
2000	6257.8	895.4	1849.9	3527.6
Av.%	*100%*	*10%*	*33%*	*57%*

Source: Economic Report of the President 2002, Appendix Tables B2, B7.B16

In Table 3A and 3B below we will expand the Table 1 tests to include up to 8 lagged individual periods and expand the tests of average lags to include lag averages up to eight lagged periods. The Table 1 tests show that prior to testing for ICS or ICE variables the model was sufficiently well constructed that even adding the ICS or ICE variables does not alter our findings for the other individual variables much, i.e., the model is fundamentally robust, and its variables were not simply proxies for omitted ICS variables. Conversely, adding the ICS variable to a model already controlling for these other influences on consumption, strengthens the likelihood that we will not get apparently significant results simply because ICS is correlated with some other determinant of consumer spending not previously entered in the model (but which should have been).

The regression models in Table 1, using exactly the same control variables, were retested with one of total consumption's three subcomponents as the dependent variable. Results are shown in Table 3A below. Table 3A shows the regression coefficient and t statistic obtained for each variant of the ICS variable tested separately. For comparison, results for total consumption are also included, some of which are repeated from Table 1. Normally, when using exactly the same variables determinants of each of the parts as well as the whole, the regression coefficients on the parts should precisely total to the value of the coefficient on the whole (Heim, 2009B). However, use of a chain deflator (but only that) causes the coefficient on the ICS variable for total consumption not to be the strict sum of the coefficients obtained for the parts in Table 3A.

Table 3A
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICS Variables
Using Different Components of Total Consumption As The Dependent Variable

Lag Used	Durables β_D (t)	Nondurables β_{ND} (t)	Services β_S (t)	Total Consumption (Some Results From Table1) β_T (t)
0	**.31 (2.2)**	-.16 (-0.7)	- .54 (-1.4)	- .29 (-0.6)
-1	.08 (0.3)	.17 (0.6)	- .17 (-0.4)	.47 (0.8)
-2	**.48 (2.0)**	- .07 (-0.4)	.21 (0.6)	.60 (1.2)
-3	-.04 (-0.2)	.04 (0.2)	- .29 (-0.8)	- .43 (-0.9)
-4	**-.35 (-2.0)**	-.16 (-0.9)	.00 (0.0)	- .67 (-1.2)
-5	.22 (0.8)	.02 (0.1)	- .08 (-0.2)	.28 (0.5)
-6	.22 (1.3)	.08 (0.4)	- .44 (-1.4)	.02 (0.0)
AV_{0-1}	.42 (1.4)	.00 (0.1)	- .77 (-1.3)	.20 (0.2)
AV_{-1-2}	**.64 (2.6)**	.07 (0.2)	.09 (0.1)	1.16 (1.4)
AV_{0-1-2}	**1.28 (5.1)**	-.12 (-0.2)	- .57 (-0.6)	1.21 (0.9)
$AV_{0-1-2-3}$	**1.41 (2.8)**	-.06 (-0.1)	-1.32 (-1.2)	1.27 (1.1)
$AV_{0-1-2-3-4}$	.84 (1.7)	-.54 (-0.8)	-1.59 (-0.8)	.45 (0.3)
$AV_{0-1-2-3-4-5}$	**1.35 (2.4)**	-.47 (-0.6)	-1.65 (-1.1)	-1.19 (-0.6)
$AV_{0-1-2-3-4-5-6}$	**2.16 (2.4)**	-.01 (-0.0)	-3.88 (-2.8)	- .70 (-0.4)
$AV_{0-1-2-3-4-5-6-7}$	**2.18 (2.5)**	.36 (0.5)	-3.16 (-2.0)	.72 (0.4)
$AV_{0-1-2-3-4-5-6-7-8}$	1.30 (1.5)	-.09 (-0.1)	-4.26 (-3.3)	-1.53 (-0.7)

Table 3A suggests the 0, -2, -4 and a number of the average lags are significantly related to demand for consumer durables at the 5% level or better. A variety of average lags are also significant, but tests showed this was only because they contain some of these individual lags.

However, the variables controlled for in Table 3A only include those found statistically significant when testing for the determinants of total consumer demand. When testing for determinants related to only consumer durables (Heim 2009A), two additional variables were found to be systematic and important determinants of this part of total consumption: 1) demand for new housing (many come with durables such as stove, refrigerator, and dishwasher), and 2) population size. Add these variables to the controls, as we did in Table 3B below, and all of the above lags become insignificant. Hence, we conclude that failure to include important model controls, not a fundamental relationship between the ICS and demand for durables, is what caused our findings of a significant relationship between ICS and consumer durables demand in Table 3A.

The tests reported in Table 3A failed to find the ICS variable significantly related to nondurables, services or total consumption. Again, the controls used above when testing nondurables and services demand were also not precisely those found in Heim (2009A) to be the determinants of those specific subcategories of consumption. Hence, these non-significance results might also be considered suspect for lacking a full set of appropriate controls. Table 3B below, will repeat the Table 3A tests using the more complete set of controls for each subcomponent of total consumption. Results there indicate no statistically significant relationship between ICS and demand for consumer durables or services, but will find a relationship with nondurables.

Again, the controls used in Table 3A, based on the criteria used in this study, were most appropriate for use in controlling for other factors that affect total consumption. Other variables found related to subcomponents of total consumption (e.g., durables) but not total consumption, were not used as controls in our tests of ICS and total consumption. It could plausibly be argued that they should be, since we know them to be related to (part of) total consumption. They are found statistically insignificant when testing total consumption only because different – and larger - patterns of variation in total consumption overwhelm their effect. They will be used as controls when retesting subcomponents of total consumption in Table 3B below.

3.2. TESTING THE ICS USING MORE SOPHISTICATED MODELS OF DEMAND FOR SUBCOMPONENTS OF TOTAL CONSUMPTION

Heim (2009A) has found differences in the factors driving demand for each of the three subcomponents of consumer spending. After extensive examination of a wide range of factors (and a wide range of lags for each), The study found that of the variables hypothesized to be determinants of consumer spending by a wide range of economists, only the following seemed systematically related to consumer spending on the subcomponents of total consumption:

Consumer Durables[1]:

$\Delta C_D = f$ [$\beta_1 \Delta(Y-T_G)_t$, + $\beta_2 \Delta T_G$ + $\beta_3 \Delta G$ + $\beta_4 \Delta XR_{AV0123}$ + $\beta_5 \Delta DJ_{-2}$, + $\beta_5 \Delta PR$ + $\beta_6 \Delta POP$ + $\beta_7 \Delta House$]

R^2/Adj.(DW)	$\Delta(Y-T_G)$ β_{1t}(t)	ΔT_G β_{2T} (t)	ΔG β_{2G}(t)	ΔXR_{AV0i23} β_3(t)	ΔDJ_{t-2} β_4(t)	$\Delta MORT$ $\beta 6_7$(t)	ΔPR β_5(t)	$\Delta HOUSE$ β_8(t)	ΔPOP β_6(t)
94/92% (2.2)	.14 (5.7)	..12 (3.4)	-.05 (-0.7)	1.89 (4.1)	.35 (5.3)		-1.59(-2.0)	.20 (2.7)	-.004(-2.5)

Consumer Non-Durables[1]:

$\Delta C_{ND} = f$ [$\beta_1 \Delta(Y-T_G)_t$, + $\beta_{2T\&2G} \Delta(\text{Crowd Out})_t$, + $\beta_3 \Delta DJ_{-3}$, + $\beta_4 \Delta PR$, + $\beta_5 \Delta POP$]

R^2/Adj.(DW)	$\Delta(Y-T_G)$ β_1(t)	ΔT_G β_{2T} (t)	ΔG β_{2G}(t)	ΔDJ_{-3} β_3(t)	ΔPR β_4(t)	ΔPOP β_5(t)
86/84% (2.1)	.13(5.5)	.18 (5.9)	-.07(-1.1)	.28 (3.7)	-1.96(-2.4)	.003 (1.7)

Consumer Services[1]:

$\Delta C_s = f$ [$\beta_1 \Delta(Y\text{-}T_G)_t$, + $\beta_{2T\&2G} \Delta$(Crowd Out $)_t$, + $\beta_3 \Delta POP$ + $\beta_4 \Delta DJ_{-2}$, + $\beta_5 \Delta(16\text{-}24)/65$, + $\beta_6 \Delta$ MORT]

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_t(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔPOP $\beta_3(t)$	DJ_{-2} $\beta_4(t)$	Δ16-24/65 $\beta_5(t)$	ΔMORT $\beta_6(t)$
81/78% (1.6)	*.18 (5.1)*	*.10 (2.4)*	*.13 (1.4)*	*.013 (5.1)*	*.39 (4.0)*	*-212.9(-1.8)*	*-4.66(-1.7)*

[1] (Heim, 2009A, pp.8, 10 and 12)

In addition, from before we have:

Total Consumer Goods & Services

$\Delta C_D = f$ [$\beta_1 \Delta(Y\text{-}T_G)_t$, + $\beta_2 \Delta T_{G}$ + $\beta_3 \Delta G$ + $\beta_4 \Delta XR_{AV0123}$ + $\beta_5 \Delta DJ_{-2}$, + $\beta_5 \Delta PR$]

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_{1t}(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔXR_{AV0i23} $\beta_3(t)$	ΔDJ_{t-2} $\beta_4(t)$	ΔMORT $\beta 6_7(t)$	ΔPR $\beta_5(t)$
92/91% (2.0)	.66(29.2)	.49 (5.7)	+.04 (0.3)	2.83 (3.2)	.62 (4.9)		-6.92(-3.2)

These models will be considered the baseline models, to which the ICS variable will be added, and the models above retested. Regression coefficients and t-statistics for the ICS variable are shown bellow in Table 3B. (t-statistics were calculated using Newey-West adjusted standard errors.) Recall that results presented in Table 1 above suggested that coefficients and t statistics on the other variables in the model remained relatively constant, so they are not included here.

Table 3B
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICS Variables Using Different Components of Total Consumption As The Dependent Variable

Lag Used	Durables β_D (t)	Nondurables β_{ND} (t)	Services β_S (t)	Total Consumption[1] β_T (t)
0	.07 (0.4)	-.02 (-0.1)	-.15 (-0.5)	- .45 (-0.8)
-1	- .02 (-0.1)	**.58 (2.7)**	-.09 (-0.3)	.90 (1.2)
-2	.23 (1.3)	.00 (0.0)	.28 (1.0)	.55 (0.9)
-3	-.10 (-0.7)	- .05 (-0.2)	-.13(-0.6)	-.43 (-1.1)
-4	-.26 (-1.6)	-.19(-1.2)	.30 (1.0)	-.17 (-0.3)
-5	.22 (1.6)	.05 (0.3)	-.06 (-0.3)	.42 (0.7)
-6	.01 (0.0)	- .03 (-0.2)	-.13 (-0.9)	- .07 (-0.1)
AV_{0-1}	.05 (0.2)	.55 (1.8)	-.26 (-0.8)	.38 (0.5)
AV_{-1-2}	.26 (1.4)	**.54 (2.1)**	.24 (0.6)	**1.51 (2.2)**
AV_{0-1-2}	.52 (1.7)	.67 (1.5)	.19 (0.4)	1.75 (1.6)
$AV_{0-1-2-3}$	.34 (0.6)	.89 (1.4)	.02 (0.0)	.90 (0.5)
$AV_{0-1-2-3-4}$	- .33 (-0.6)	.60 (0.9)	1.39 (1.8)	.59 (0.3)
$AV_{0-1-2-3-4-5}$	.40 (0.8)	.67 (0.8)	1.36 (1.2)	1.79 (0.7)
$AV_{0-1-2-3-4-5-6}$	.57 (0.6)	1.13 (1.2)	.41 0.3)	2.07 (0.6)
$AV_{0-1-2-3-4-5-6-7}$	- .03 (-0.0)	1.25 (1.1)	1.17 (0.7)	2.82 (0.8)
$AV_{0-1-2-3-4-5-6-7-8}$	-1.87 (-1.8)	.80 (0.6)	- .34 (-0.2)	-1.37 (-0.5)

[1] Total consumption is regressed on a baseline model containing all variables found to be determinants of any of the subcomponents of total consumption. The baseline model was then retested with the ICS variable added. Results above show the regression coefficient and t-statistic for the ICS variable.

Table 3B, using better - tailored set of controls for other influences on various parts of consumption, finds no relationship between the demand for durables or services and the ICS variables tested. A relationship between ICS lagged one year and this year's demand for nondurables was found. However, A relationship with total consumption was also found. However, the total consumption model in Table 3B includes far more variables as controls than were earlier found to be significantly related to total consumption, and the better specified model of total consumption seems to be given in Table 3A. It finds no significant relationship between ICS and total consumption. Hence, we consider the Table 3B results of significance to be spurious.

3.3 CONCLUSIONS REGARDING THE RELATIONSHIP OF ICS TO CONSUMPTION

Based on the Table 3A results (for total consumption) and the 3B results (for individual components of total consumption), we conclude the ICS is not either concurrently or after a lag significantly related to total consumer demand , demand for consumer durables, or demand for consumer services. when other determinants of consumption are properly controlled for. However, absent these controls the ICS can function as an proxy for them, explaining some variance. However, the relationship between current demand for nondurables and last year's ICS does appear significant, even with other known factors that can influence demand controlled for. Some variance remains which can only be explained by changes in the Index of Consumer Sentiment (ICS).

Because of its systematic relationship with current year demand for nondurable consumer goods, the following full demand equation, modified to include the ICS_{-1} variable, is presented:

Consumer Non-Durables (Revised Standard Model):

$$\Delta C_{ND} = f\ [\ \beta_1\, \Delta(Y\text{-}T_G)_t,\ +\ \beta_{2T\&2G}\, \Delta(\text{Crowd Out})_t,\ +\ \beta_3\, \Delta DJ_{-3},\ +\ \beta_4\, \Delta PR,\ +\ \beta_5\, \Delta POP\ +\ \beta_6\, ICS_{-1}\ ]$$

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_1(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔDJ_{-3} $\beta_3(t)$	ΔPR $\beta_4(t)$	ΔPOP $\beta_5(t)$	ΔICS_{-1}
89/87% (1.9)	.10(4.5)	.15 (4.6)	-.06(-1.4)	.36 (6.2)	-2.19(-2.7)	.004 (2.6)	.58 (2.7)

3.3.1. IMPACT ON GDP OF ICS DROP 2008 – JUNE 2009

The Index of Consumer Sentiment averaged 85.58 during 2007, and fell to and average of 63.75 for 2008, declining 21.83 points. The first six months of 2009, the index averaged 62.95, rising in the last four of these six month and suggesting the index had "bottomed out" and was turning around.

The initial impact of the change in the Index during 2008 (- 21.83 points) is treated as an exogenous change in consumer demand (specifically, demand for nondurables one year later). The change is ($.58 billion)*(-21.83) = $-12.66 billion in 2009. However, this initial decline is further augmented by both multiplier and accelerator effects, recently estimated at 2.22 for the multiplier alone, but increasing to 5.88 when accelerator effects are added (Heim 2008B). Hence our estimated total decline (during 2009) of the 2008 decline in the ICS is

(5.88)*($ -12.66 billion) = $ -74.44 billion total decline in 2009 GDP (in real 1996 dollars) resulting from the 2008 decline in ICS, (*ceteris paribus*).

The GDP price deflator has increased approximately 30% since 1996, so our $-74.44 estimate in 1996 dollars is approximately $96.8 billion in 2009 dollars, or about 7/10 of one percent of the GDP. And this is for the largest annual decline ever in the ICS. By comparison, the BEA reported declines in the GDP for the fourth quarter of 2008 of 6.3% (4^{th} quarter results annualized)) and 5.5% (annualized) for the first quarter of 2009 (BEA News Release, 6/25/2009). Hence, we conclude that while the decline in consumer confidence may have caused the GDP to decline, even the largest ever annual drop which occurred in 2008 will probably only be responsible for a relatively small part of the overall decline in the GDP in 2009. (By comparison with the 2008 drop of 21.83 points, the drop in 1979 was 13.4 points and the drop in 1974 was 12.4 points . These were followed by slumps the following year; but the slumps were small: in both cases the decline in the real GDP the following year was only about 1/5 of 1%.)

The average annual change in the ICS 1961 - 2000 was 5.7 index points (in absolute terms) or about 26% of the 2008 change. 80% of the changes 1961 – 2000 were less than 10 index points. Hence, while a factor, changes in consumer confidence, as measured by the ICS, seem to typically have a noticeable, though relatively small impact on the GDP.

3.4 DOES ICS MERELY PROXY FOR INCOME WHEN INCOME IS POORLY CONTROLLED FOR?

Inadequately controlling for the other variables economic theory tells us affect consumption allows ICS to proxy for them. This can occur when ICS is significantly correlated with one or more of the other variables. For example, the simple correlation between disposable income ($Y-T_G$) and ICS_0 is .37. There is some, evidence that this type of inadequate control may be why there is some perception of a systematic relationship between total consumption and ICS, despite our findings of non-significance. For example, if ($Y-T_G$) is left out of the regressions above and a constant term added[1], ICS_0 and ICS_{AV0-1} become statistically significant.

Dropping the disposable income variable from the regression did show there is some intercorrelation between ICS and disposable income. Leaving ($Y-T_G$), out, t- statistics on the ICS variables often improve and may leave ICS statistically significant. An example of results for tests without the ($Y-T_G$) control are shown in Table 4 below for several ICS lag levels. Results for exactly the same model with the $Y-T_G$ variable included are shown immediately below for comparison. A constant term is included in all the tested models[1], so results for the models with ($Y-T_G$) included are not exactly the same as Table 1 results. Nonetheless, they do show the same general results.

Table 4
Testing the Consumer Sentiment Index (ICE) As A Determinant of Consumer Demand
(Constant Term Added To Table 1 Models; ($Y-T_G$) Not Included In Some Models)

ΔC_0	= 94.97[1]	(na)	$+.59\Delta T_{G(0)}$	$-.17\Delta G_0$	$-2.66\Delta PR_0$.	$+1.07\ \Delta DJ_{-2}$	$+3.22\ \Delta XR_{AV0123}$	**+ 2.39** ΔICS_0	R^2=74%
(t =)	(11.4)		(4.1)	(-0.5)	(-0.8)	(5.0)	(1.6)	**(2.9)**	D.W.= 2.3
ΔC_0	= 19.44[1]	$+.56\Delta(Y-T_G)_0$	$+.54\Delta T_{G(0)}$	$-.13\ \Delta G_0$	$-7.26\ \Delta PR_0$.	$+.61\ \Delta DJ_{-2}$	$+3.51\ \Delta XR_{AV0123}$	$.00\ \Delta ICS_0$	R^2=92%
(t =)	(2.2)	(11.3)	(11.6)	(-1.1)	(-2.6)	(4.7)	(3.6)	(0.0)	D.W.= 2.0
ΔC_0	= 99.03[1]	(na)	$+.68\Delta T_{G(0)}$	$-.33\Delta G_0$	$-8.97\Delta PR_0$.	$+.91\ \Delta DJ_{-2}$	$+3.98\ \Delta XR_{AV0123}$	$+1.67\ \Delta ICS_{-1}$	R^2=71%
(t =)	(12.8)		(5.9)	(-1.6)	(-2.4)	(2.9)	(1.6)	(1.4)	D.W.= 2.3
ΔC_0	= 20.48[1]	$+.55\Delta(Y-T_G)_0$	$+.51\Delta T_{G(0)}$	$-.10\ \Delta G_0$	$-7.58\ \Delta PR_0$.	$+.64\ \Delta DJ_{-2}$	$+2.97\ \Delta XR_{AV0123}$	$+.61\ \Delta ICS_{-1}$	R^2=93%
(t =)	(2.5)	(11.2)	(5.2)	(-0.7)	(-3.8)	(4.0)	(2.9)	(0.9)	D.W.= 2.0
ΔC_0	= 104.39[1]	(na)	$+.80\Delta T_{G(0)}$	$-.64\Delta G_0$	$-10.06\Delta PR_0$.	$+.80\ \Delta DJ_{-2}$	$+5.21\ \Delta XR_{AV0123}$	$+1.27\ \Delta ICS_{-2}$	R^2=71%
(t =)	(12.8)		(6.0)	(-2.4)	(-2.1)	(2.8)	(1.7)	(0.9)	D.W.= 2.2
ΔC_0	= 23.23[1]	$+.56\Delta(Y-T_G)_0$	$+.56\Delta T_{G(0)}$	$-.27\ \Delta G_0$	$-8.63\ \Delta PR_0$.	$+.58\ \Delta DJ_{-2}$	$+3.28\ \Delta XR_{AV0123}$	$+.90\ \Delta ICS_{-2}$	R^2=93%
(t =)	(3.1)	(12.7)	(6.1)	(-2.0)	(-3.5)	(4.6)	(3.7)	(1.5)	D.W.= 2.0
ΔC_0	= 94.04[1]	(na)	$+.48\Delta T_{G(0)}$	$-.05\Delta G_0$	$-4.40\Delta PR_0$.	$+1.12\ \Delta DJ_{-2}$	$+1.53\ \Delta XR_{AV0123}$	**+ 4.18** ΔICS_{AV0-1}	R^2=76%
(t =)	(11.1)		(3.9)	(-0.2)	(-2.6)	(3.9)	(0.8)	**(3.7)**	D.W.= 2.4
ΔC_0	= 21.37[1]	$+.54\Delta(Y-T_G)_0$	$+.50\Delta T_{G(0)}$	$-.08\ \Delta G_0$	$-6.66\ \Delta PR_0$.	$+.66\ \Delta DJ_{-2}$	$+2.90\ \Delta XR_{AV0123}$	$+.71\ \Delta ICS_{AV0-1}$	R^2=93%
(t =)	(2.3)	(9.4)	(4.9)	(-0.6)	(-2.7)	(3.9)	(2.9)	(0.9)	D.W.= 2.0

[1] Constant term had to be added in tests without ($Y-T_G$) to avoid negative R^2 (a not uncommon result when a regression fails to contain major explanatory variables; $Y-T_G$ explains 68% of total variance

when entered first in a stepwise regression procedure). For comparison, below each model tested without the Y-TG explanatory variable, the same model with it is tested. Since our objective was to test a model linear in its variables, the Table 1 model (without the constant term) are preferred. Using the constant term here implies mathematically that one or more of the variables tested is non linear or that the constant term represents the coefficient on a linear variable who derivative (1) was included for some reason.

4.0. TESTS OF THE SENSITIVITY OF CONSUMER DEMAND TO THE INDEX OF CONSUMER EXPECTATIONS (ICE)

4.1. TESTS ASSUMING THE DETERMINANTS OF DEMAND ARE THE SAME FOR EACH PART OF TOTAL CONSUMPTION

From previous studies, extensive testing of variables that could be possible determinants of <u>total</u> consumption yielded the following consumer demand model, repeated from Table 1 above:

ΔC_0	$=.66\Delta(Y\text{-}T_G)_0$	$+.49\Delta T_{G(0)}$	$+ .04\Delta G_0$	$- 6.92\ \Delta PR_0.$	$+.62\ \Delta DJ_{-2}$	$+ 2.83\ \Delta XR_{AV0123}$	$R^2 = 92\%$
(t =)	(29.2)	(5.7)	(0.3)	(-3.2)	(4.9)	(3.2)	D.W.= 2.0

Using the determinants as controls for the other major variables which affect consumption, Table 5 below shows the results of adding the index of consumer expectations (ICE) to this model, and retesting to determine iCE's significance.. The tests are identical to Table 1 except ICE, not ICS is tested.

Table 5
Testing the Consumer Expectations Index (ICE) As A Determinant of Consumer Demand (Controlling For Other Major Influences On Consumer Demand)

ΔC_0	$=.67\Delta(Y\text{-}T_G)_0$	$+.55\Delta T_{G(0)}$	$- .06\Delta G_0$	$- 8.77\ \Delta PR_0.$	$+.57\ \Delta DJ_{-2}$	$+ 3.36\ \Delta XR_{AV0123}$	$- .66\ \Delta ICE_0$	$R^2=93\%$
(t =)	(35.5)	(5.8)	(-0.5)	(-3.7)	(5.0)	(3.2)	(-2.3)	D.W.= 2.0
ΔC_0	$=.66\Delta(Y\text{-}T_G)_0$	$+.47\Delta T_{G(0)}$	$+ .07\ \Delta G_0$	$- 7.03\ \Delta PR_0.$	$+.66\ \Delta DJ_{-2}$	$+ 2.47\ \Delta XR_{AV0123}$	$+ .34\ \Delta ICE_{-1}$	$R^2=92\%$
(t =)	(28.0)	(4.6)	(0.6)	(-3.3)	(4.5)	(2.6)	(0.9)	D.W.= 2.0
ΔC_0	$=.68\Delta(Y\text{-}T_G)_0$	$+.49\Delta T_{G(0)}$	$- .05\ \Delta G_0$	$- 7.89\ \Delta PR_0.$	$+.58\ \Delta DJ_{-2}$	$+ 2.46\ \Delta XR_{AV0123}$	$+ .68\ \Delta ICE_{-2}$	$R^2=93\%$
(t =)	(34.7)	(5.1)	(-0.4)	(-3.2)	(4.7)	(2.7)	(1.3)	D.W.= 2.0
ΔC_0	$=.65\Delta(Y\text{-}T_G)_0$	$+.49\Delta T_{G(0)}$	$+.12\ \Delta G_0$	$- 6.83\ \Delta PR_0.$	$+.63\ \Delta DJ_{-2}$	$+ 2.83\ \Delta XR_{AV0123}$	$- .57\ \Delta ICE_{-3}$	$R^2=92\%$
(t =)	(29.4)	(6.2)	(1.0)	(-3.2)	(5.3)	(3.1)	(-1.4)	D.W.= 2.0
ΔC_0	$=.67\Delta(Y\text{-}T_G)_0$	$+.52\Delta T_{G(0)}$	$-.01\ \Delta G_0$	$- 7.36\ \Delta PR_0.$	$+.59\ \Delta DJ_{-2}$	$+ 3.16\ \Delta XR_{AV0123}$	$- .34\ \Delta ICE_{AV0-1}$	$R^2=92\%$
(t =)	(32.5)	(4.6)	(0.0)	(-2.8)	(4.2)	(3.2)	(-0.6)	D.W.= 2.0
ΔC_0	$=.67\ \Delta(Y\text{-}T_G)_0$	$+.46\Delta T_{G(0)}$	$+ .02\ \Delta G_0$	$- 7.85\ \Delta PR_0.$	$+.64\Delta DJ_{-2}$	$+ 1.96\ \Delta XR_{AV0123}$	$+ 1.07\ \Delta ICE_{AV\text{-}1\text{-}2}$	$R^2=93\%$
(t =)	(33.3)	(4.4)	(0.2)	(-3.7)	(4.7)	(1.8)	(1.6)	D.W.= 1.9
ΔC_0	$=.66\ \Delta(Y\text{-}T_G)_0$	$+.46\Delta T_{G(0)}$	$+ .06\ \Delta G_0$	$- 6.71\ \Delta PR_0.$	$+.64\ \Delta DJ_{-2}$	$+ 2.36\ \Delta XR_{AV0123}$	$+ .59\ \Delta ICE_{AV0\text{-}1\text{-}2}$	$R^2=92\%$
(t =)	(26.0)	(3.9)	(0.5)	(-3.0)	(4.1)	(2.04)	(0.6)	D.W.= 2.0
ΔC_0	$=.66\ \Delta(Y\text{-}T_G)_0$	$+.52\Delta T_{G(0)}$	$+ .04\ \Delta G_0$	$- 7.07\ \Delta PR_0.$	$+.61\ \Delta DJ_{-2}$	$+ 3.22\ \Delta XR_{AV0123}$	$- 0.63\ \Delta ICE_{AV0\text{-}1\text{-}2\text{-}3}$	$R^2=92\%$
(t =)	(30.3)	(5.1)	(0.3)	(-3.3)	(4.6)	(2.9)	(-0.7)	D.W.= 2.0
ΔC_0	$=.66\ \Delta(Y\text{-}T_G)_0$	$+.57\Delta T_{G(0)}$	$+ .05\ \Delta G_0$	$- 7.76\ \Delta PR_0.$	$+.58\ \Delta DJ_{-2}$	$+ 3.66\ \Delta XR_{AV0123}$	$- 1.89\Delta ICE_{AV0\text{-}1\text{-}2\text{-}3\text{-}4}$	$R^2=92\%$
(t =)	(30.8)	(5.6)	(0.4)	(-3.53)	(4.9)	(2.9)	(-1.4)	D.W.= 2.1
ΔC_0	$=.65\ \Delta(Y\text{-}T_G)_0$	$+.56\Delta T_{G(0)}$	$+ .04\ \Delta G_0$	$- 7.78\ \Delta PR_0.$	$+.62\ \Delta DJ_{-2}$	$+ 3.26\ \Delta XR_{AV0123}$	$- 1.75\Delta ICE_{AV0\text{-}1\text{-}2\text{-}3\text{-}4\text{-}5}$	$R^2=92\%$
(t =)	(25.0)	(6.4)	(0.3)	(-3.43)	(5.0)	(2.8)	(-1.0)	D.W.= 2.1

Here again we see that the original extensive testing process used to determine what belonged in the baseline model results in little change in the original variables regression coefficients and t-statistics when an ICE variable is added to the equation. This suggests the original findings of importance for the original variables were substantive, and that they were not proxying for the (absent) ICE variable. As was the case with the ICS tests shown in Table 1, we find no significant relationship between consumer expectations, as measured by the University of Michigan's ICE, and total consumption. The exception to this is for ICE_0. However, this "significant" finding has the wrong sign, and we conclude it is spurious.

Overall consumption spending is made up of three quite different subcomponents: durables, nondurables and services. Not all components of consumer demand may be systematically related to consumer expectations, but it may be that at least one is. To test this hypothesis, the regression model used in Table 5 was rerun using one of the three subcomponents of total consumption as the dependent variable. Results are give in Table 6A. Total consumption results are included for reference.

Table 6A
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICE Variables
Using Different Components of Total Consumption As The Dependent Variable

Expectations Lag Used	Durables β_D (t)	Nondurables β_{ND} (t)	Services β_S (t)	Total Consumption β_T (t)
0	.04 (0.3)	- .21 (-1.3)	**- .55 (-2.4)**	- .66 (-2.3)
-1	.28 (1.8)	.17 (0.8)	- .37 (-1.1)	.34 (0.9)
-2	.26 (1.7)	- .05 (-0.3)	.44 (1.5)	.68 (1.3)
-3	-.03 (-0.2)	- .07 (-0.4)	- .39 (-1.5)	- .57 (-1.4)
-4	-.20 (-1.4)	- .07 (-0.5)	- .02 (-0.0)	- .36 (-1.0)
-5	.15 (0.6)	- .05 (-0.4)	- .12 (-0.5)	.01 (0.0)
-6	.24 (1.5)	.11 (0.6)	- .40 (-1.5)	.14 (0.5)
AV_{0-1}	**.35 (2.1)**	- 04 (-0.1)	**- .98 (-2.4)**	- .34 (-0.6)
AV_{-1-2}	**.56 (3.3)**	.12 (0.5)	.10 (0.2)	1.07 (1.6)
AV_{0-1-2}	**.84 (5.8)**	- .13 (-0.3)	- .63 (-0.8)	.59 (0.6)
$AV_{0-1-2-3}$	.99 (2.1)	- .34 (-0.8)	-1.72 (-1.8)	- .63 (-0.7)
$AV_{0-1-2-3-4}$	.63 (1.6)	- .67 (-0.9)	-2.10 (-1.5)	-1.89 (-1.4)
$AV_{0-1-2-3-4-5}$	.99 (1.9)	- .77 (-1.0)	-2.10 (-1.5)	1.75 (-1.0)
$AV_{0-1-2-3-4-5-6}$	**1.56 (2.1)**	- .27 (-0.3)	-2.29 (-1.9)	-1.56 (-1.2)
$AV_{0-1-2-3-4-5-6-7}$	**1.85 (2.4)**	.36 (0.6)	**-2.96 (-2.4)**	.39 (0.3)
$AV_{0-1-2-3-4-5-6-7-8}$	1.11 (1.8)	-.09 (-0.1)	**-3.79 (3.7)**	-1.52 (-1.0)

The Table 6A results show significant relationships between some ICE lag levels and demand for either durables or services. However, when we retest these ICE variables in Table 6B below using determinants for each of the three parts more specifically found to drive that particular type of consumption, no lagged value of ICE is found significant. Hence, we conclude that the findings of significance in Table 6A are result only from using a poor set of controls on other influences on consumption, allowing ICE to proxy for missing controls.

On the other hand, the controls used were found, after fairly exhaustive testing using a stepwise regression procedure, to be the ones that most systematically explained the variance in total consumption. Hence, they seemed the ones most appropriate to serve as controls for other influences when testing for the effects of ICE on total consumption. Hence, the results in Table 6A seem the most credible. They fail to find any variant of ICE significantly related total consumption.

4.2. TESTING THE ICE USING MORE SOPHISTICATED MODELS OF DEMAND FOR SUBCOMPONENTS OF TOTAL CONSUMPTION

As noted earlier, another study (Heim 2009A) has found major differences in the factors driving demand each of the three subcomponents of consumer spending. The study extensively examined a wide range of factors (and lags), and found the following variables (from among many hypothesized by economists) most systematically related to consumer spending on the subcomponents of total consumption:

Consumer Durables[1]:

$\Delta C_D = f\ [\ \beta_1\ \Delta(Y\text{-}T_G)_t,\ +\ \beta_2\ \Delta\ T_{G\ +}\ \beta_3\ \Delta G\ +\ \beta_4\ \Delta\ XR_{AV0123}\ +\ \beta_5\ \Delta DJ_{-2},\ +\ \beta_5\ \Delta PR\ +\ \beta_6\ \Delta POP\ +\ \beta_7\ \Delta House]$

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ β_{1t}(t)	$\Delta\ T_G$ β_{2T} (t)	ΔG β_{2G}(t)	ΔXR_{AV0i23} β_3(t)	$\Delta\ DJ_{t-2}$ β_4(t)	ΔMORT $\beta 6_7$(t)	ΔPR β_5(t)	ΔHOUSE β_8(t)	ΔPOP β_6(t)
94/92% (2.2)	.14 (5.7)	..12 (3.4)	-.05 (-0.7)	1.89 (4.1)	.35 (5.3)		-1.59(-2.0)	.20 (2.7)	-.004(-2.5)

Consumer Non-Durables[1]:

$\Delta C_{ND} = f\ [\ \beta_1\ \Delta(Y\text{-}T_G)_t,\ +\ \beta_{2T\&2G}\ \Delta(\text{Crowd Out})_t,\ +\ \beta_3\ \Delta DJ_{-3},\ +\ \beta_4\ \Delta PR,\ +\ \beta_5\ \Delta POP]$

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ β_1(t)	$\Delta\ T_G$ β_{2T} (t)	ΔG β_{2G}(t)	$\Delta\ DJ_{-3}$ β_3(t)	ΔPR β_4(t)	ΔPOP β_5(t)
86/84% (2.1)	.13(5.5)	.18 (5.9)	-.07(-1.1)	.28 (3.7)	-1.96(-2.4)	.003 (1.7)

Consumer Services[1]:

$\Delta C_s = f\ [\ \beta_1\ \Delta(Y\text{-}T_G)_t,\ +\ \beta_{2T\&2G}\ \Delta(\text{Crowd Out})_t,\ +\ \beta_3\ \Delta POP\ +\ \beta_4 \Delta DJ_{-2},\ +\ \beta_5\ \Delta(16\text{-}24)/65,\ +\ \beta_6\ \Delta\ MORT\ ]$

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ β_1(t)	$\Delta\ T_G$ β_{2T} (t)	ΔG β_{2G}(t)	ΔPOP β_3(t)	DJ_{-2} β_4(t)	Δ16-24/65 β_5(t)	ΔMORT β_6(t)
81/78% (1.6)	*.18 (5.1)*	*.10 (2.4)*	*.13 (1.4)*	*.013 (5.1)*	*.39 (4.0)*	*-212.9(-1.8)*	*-4.66(-1.7)*

[1] (Heim, 2009A, pp.8, 10 and 12) These equations are repeated from before Table 2B for easy reference.

These models will be considered the baseline models for each type of consumer demand. The ICE variable is then added and the model retested, using the specific controls shown above for each subcomponent of total demand. Results presented in Table 6B below indicate the regression coefficient and t-statistic obtained when doing so.

Table 6B
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICE Variables Using Different Components of Total Consumption As The Dependent Variable

Expectations Lag Used	Durables β_D (t)	Nondurables β_{ND} (t)	Services β_S (t)	Total Consumption[1] β_T (t)
0	- .09 (-0.6)	- .09 (-0.6)	- .23 (-1.0)	**- .72 (-2.8)**
-1	.17 (1.2)	.40 (2.2)	.01 (0.1)	**.83 (2.1)**
-2	.12 (1.1)	.08 (0.4)	.20 (0.8)	.50 (0.9)
-3	-.21(-1.3)	- .14 (-0.9)	- .10 (-0.5)	- .65 (-1.9)
-4	-.13 (-1.3)	- .07 (-0.5)	.22 (0.9)	.04 (0.1)
-5	.15 (1.1)	- .02 (-0.2)	- .08 (-0.5)	.05 (0.1)

-6	.08 (0.5)	.03 (0.2)	- .14 (-1.0)	.12 (0.4)
AV_{0-1}	.07 (0.4)	.32 (1.3)	- .27 (-0.9)	- .01 (-0.0)
AV_{-1-2}	.29 (1.8)	.45 (2.0)	.23 (0.8)	**1.30 (2.4)**
AV_{0-1-2}	.30 (1.2)	.50 (1.3)	- .01 (-0.0)	.84 (0.9)
$AV_{0-1-2-3}$	- .21 (-0.4)	.51 (1.0)	- .22 (-0.3)	- .79 (-0.6)
$AV_{0-1-2-3-4}$	- .79 (-1.1)	.46 (0.7)	.81 (1.3)	- .90 (-0.6)
$AV_{0-1-2-3-4-5}$	- .08 (-0.2)	.27 (0.4)	.62 (0.6)	- .59 (-0.3)
$AV_{0-1-2-3-4-5-6}$	.21 (0.3)	.70 (1.0)	- .50 (-0.6)	- .11 (-0.0)
$AV_{0-1-2-3-4-5-6-7}$	.08 (0.1)	1.11 (1.2)	.75 (0.6)	1.77 (0.6)
$AV_{0-1-2-3-4-5-6-7-8}$	-1.25 (-1.5)	.60 (0.6)	- .68 (-0.6)	-1.81 (-0.9)

[1] Total consumption is regressed on a baseline model containing all variables found to be determinants of any of the subcomponents of total consumption. The baseline model was then retested with the ICE variable added. Results above show the regression coefficient and t-statistic for the ICE variable.

With Table 6B we have the opposite situation we had with Table 6A. The controls used in Table 6B for each separate component of total consumption were the ones found most systematically related to that type of consumption in fairly exhaustive prior testing. Hence, they seem to constitute the best definition of what other influences to control for when testing the influence of ICE. Using these variables as controls, we found no variant of ICE significantly related to variation in only one of the three parts of consumption: nondurables.

For total consumption, the controls used were all the variables found important as controls for any of the three parts. So, for example, the controls here include both the prime interest rate lagged two periods, and the mortgage interest rate. Similarly, both two and three year lagged wealth variables were included. With these controls, two lagged variants of the ICE variable were found significant.

However, we discount these results since previous testing had shown that some of these variables had no significant amount of independent explanatory power after others had been included in the total consumption model (e.g., the wealth variable lagged three periods after the two period lagged values was already in the model). However these additional variables when added to those used in Table 6A, seriously increased the multicollinearity problem within the model, affecting the regression coefficient and t-statistic results for many individual variables. Hence, we discount the total consumption/ICE relationships found in Table 6B in favor of that found in 6A using a less problematic set of controls.

4.3. CONCLUSIONS REGARDING THE RELATIONSHIP OF ICE TO CONSUMPTION

Based on the Table 6A and 6B results, we conclude the ICE is not meaningfully related to either total consumption or its parts when other factors influencing consumption are properly controlled for. However, absent adequate controls on other variables that affect consumption, ICE can proxy for them, appearing to be significantly related to consumption when it really is not.

4.4. COMPARISON OF THE ICS AND ICE FINDINGS FOR CONSUMPTION

No variant of the ICE variable was found related to any component of consumption. With one exception (nondurables) this was also the finding in tests of the ICS variable and total consumption or its individual components. The exception was the significant (1% level) positive relationship found between demand for nondurable goods and last year's ICS.

5.0. TEST OF SENSITIVITY OF INVESTMENT DEMAND TO THE INDEX OF CONSUMER SENTIMENT (ICS)

5.1. TESTS ASSUMING THE DETERMINANTS OF DEMAND ARE THE SAME FOR EACH PART OF TOTAL CONSUMPTION

As noted in section two above, the investment model includes variables traditionally thought to influence investment. One form of such a model is

$$\Delta I = \beta_{D1}\,\Delta ACC + \beta_{D2}\,\Delta DEP + \beta_{D3}\,\Delta CAP_{-1} + \beta_{D4}\,\Delta T_G - \beta_{D5}\,\Delta G - \beta_{D6}\,\Delta r_{-2} + \beta_{D7}\,\Delta DJ_{-2} + \beta D_{I8}\,\Delta PROF_{-2} + \beta_{D9}\,\Delta XR_{AV0123}$$

The variables included in this equation are

ΔACC	=	An accelerator variable $\Delta(Y_t - Y_{t-1})$
ΔDEP	=	Depreciation
ΔCAP_{-1}	=	A measure of last year's capacity utilization
$\Delta PROF_{-1}$	=	A measure of business profitability two years ago
ΔDJ_{-1}	=	Last Year's Dow Jones Composite Index – A Proxy For "Tobin's q "
$PR_{-2}{*}Y_{-4}$	=	The Real Prime Interest Rate Lagged two years Multiplied By The Size of The GDP Two Years Before That (A Way Of Adjusting Interest Rate Effects For Economy Size)

The other variables have the same meanings as in the consumption equations, with lags as noted there. Previous studies (Heim 2009B) had shown these variables would explain 90% of the variance in total investment demand 1960-2000. Econometric estimates of the investment model above show the following results (variables are shown in order of their contribution to explained variance using a stepwise regression procedure):

ΔI	$=.43\,\Delta T_G$	$-.39\Delta G$	$+.29\Delta ACC$	$+ .86\Delta DEP$	$- 1.17\Delta PR_{-2}{*}Y_{-4}$	$+.50\,\Delta DJ_{-1}$	$+.38\,\Delta PROF_{-1}$	$+ 3.77\,\Delta XR_{AV0123}$	$+.17\Delta CAP_{-1}$	$R^2=.90$
(t =)	(4.4)	(-2.2)	(8.5)	(3.0)	(-2.5)	(3.2)	(2.6)	(2.2)	(0.2)	DW =2.3

The University of Michigan's Index of Consumer Sentiment (ICS) variable was added to this fully specified investment model to see if it increased the model's explanatory power. The above model was tested adding the current year and the past two years lagged values of the (ICS_i) or the average lags ICS_{AV0-1} or ICS_{AV-1-2} and retesting. In all cases the ICS was found insignificant. Results are in Table 7 below:

Table 7
Testing the Index Of Consumer Sentiment As A Determinant of Demand For Total Investment (Controlling For Other Major Influences On Investment Demand)

ΔI	$=.30\Delta ACC$	$+.83\Delta DEP$	$-.22\Delta CAP_{-1}$	$+.43\,\Delta T_G$	$-.38\Delta G$	$- 1.21\Delta PR_{-2}\,Y_{-4}$	$+ .51\,\Delta DJ_{-1}$	$+.40\Delta PROF_{-1}$	$+ 3.92\Delta XR_{AV0123}$	$-.26\Delta ICS_0$	$R^2=.90$
(t =)	(7.8)	(3.3)	(-0.1)	(4.5)	(-2.3)	(-2.4)	(3.6)	(2.8)	(2.0)	(-0.3)	DW =2.2
ΔI	$=.29\Delta ACC$	$+.86\Delta DEP$	$+.09\Delta CAP_{-1}$	$+.40\,\Delta T_G$	$-.38\Delta G$	$– 1.04\Delta r_{-2}Y_{-4}$	$+.52\,\Delta DJ_{-1}$	$+.37\,\Delta PROF_{-1}$	$+3.33\,\Delta XR_{AV0123}$	$+.49\,\Delta ICS_{-1}$	$R^2=.90$
(t =)	(7.6)	(2.8)	(0.1)	(4.3)	(-2.0)	(-1.9)	(3.2)	(2.6)	(2.0)	(0.7)	DW =2.2
ΔI	$=.29\Delta ACC$	$+.86\Delta DEP$	$- .14\Delta CAP_{-1}$	$+.42\,\Delta T_G$	$-.40\Delta G$	$– 1.19\Delta r_{-2}Y_{-4}$	$+.50\,\Delta DJ_{-1}$	$+.39\,\Delta PROF_{-1}$	$+3.69\,\Delta XR_{AV0123}$	$+.17\,\Delta ICS_{-2}$	$R^2=.90$
(t =)	(7.1)	(2.8)	(-0.1)	(4.3)	(-2.0)	(-2.4)	(3.2)	(2.9)	(1.9)	(0.2)	DW =2.3
ΔI	$=.29\Delta ACC$	$+.87\Delta DEP$	$+.34\Delta CAP_{-1}$	$+.42\,\Delta T_G$	$-.40\Delta G$	$- 1.12\Delta r_{-2}Y_{-4}$	$+.50\,\Delta DJ_{-1}$	$+.37\,\Delta PROF_{-1}$	$+3.59\Delta XR_{AV0123}$	$+.25\,\Delta ICS_{AV0-1}$	$R^2=.90$
(t =)	(8.1)	(3.2)	(0.2)	(4.3)	(-2.2)	(-2.0)	(3.1)	(2.8)	(1.8)	(0.2)	DW =2.2
ΔI	$=.28\Delta ACC$	$+.87\Delta DEP$	$-.74\Delta CAP_{-1}$	$+.40\,\Delta T_G$	$-.40\Delta G$	$- 1.10\Delta r_{-2}Y_{-4}$	$+.52\,\Delta DJ_{-1}$	$+.40\,\Delta PROF_{-1}$	$+3.15\Delta XR_{AV0123}$	$+.92\,\Delta ICS_{AV-1-2}$	$R^2=.90$
(t =)	(6.4)	(2.8)	(-0.4)	(3.9)	(-2.1)	(-2.2)	(3.3)	(2.7)	(1.5)	(0.6)	DW =2.2

As was the case for consumption, a possible problem here is that I is simultaneously determined with the accelerator variable ($Y-Y_{-1}$). Variation in ICS, could proxy for variance in the accelerator ($Y-Y_{-1}$), if the accelerator was not controlled for

However, testing the models in Table 7 without the accelerator variable did not raise estimates of significance for the ICS variable to even the 5% level of ICS, as shown in Table 8 below. Because there was some intercorrelation between the accelerator and the ICS variable, some strengthening of t-statistics was seen, but not enough to suggest that our Table 7 results of no statistical significance for ICS was caused by the accelerator variable distorting the results. Overall, tables 7 and 8 suggest that consumer confidence levels, either contemporaneously or during the past two years, do not affect total investment in any significant way.

Table 8
Testing the Consumer Sentiment Index (ICS) As A Determinant of Demand For Investment Goods Controlling For Other Major Influences On Investment Demand, Except The Accelerator (ΔY)

$$\Delta I = +.68\Delta DEP - 7.44\Delta CAP_{-1} + .63\,\Delta T_G - .31\Delta G - 2.38\Delta PR_{-2}Y_{-4} + .35\,\Delta DJ_{-1} + .58\,\Delta PROF_{-1} + 3.98\,\Delta XR_{AV0123} + .95\,\Delta ICS_0 \quad R^2=.79$$
(t =) (2.4) (-2.8) (4.5) (-1.4) (-3.4) (1.4) (2.9) (2.3) (0.8) DW =2.4

$$\Delta I = +.59\Delta DEP - 9.45\,\Delta CAP_{-1} + .60\,\Delta T_G - .23\Delta G - 2.31\Delta PR_{-2}Y_{-4} + .42\,\Delta DJ_{-1} + .63\,\Delta PROF_{-1} + 3.77\,\Delta XR_{AV0123} + .88\,\Delta ICS_{-1} \quad R^2=.79$$
(t =) (1.6) (-3.3) (3.4) (-1.0) (-2.9) (1.7) (2.9) (2.1) (0.9) DW =2.4

$$\Delta I = +.60\Delta DEP - 10.56\Delta CAP_{-1} + .64\,\Delta T_G - .28\Delta G - 2.63\Delta PR_{-2}Y_{-4} + .38\,\Delta DJ_{-1} + .68\,\Delta PROF_{-1} + 4.25\Delta XR_{AV0123} + .71\Delta ICS_{-2} \quad R^2=.79$$
(t =) (1.7) (-4.1) (4.3) (-1.1) (-3.8) (-1.6) (3.2) (2.0) (0.6) DW =2.4

$$\Delta I = +.68\Delta DEP - 7.63\Delta CAP_{-1} + .58\,\Delta T_G - .28\Delta G - 12.38\Delta PR_{-2}Y_{-4} + .39\,\Delta DJ_{-1} + .57\Delta PROF_{-1} + 3.24\Delta XR_{AV0123} + 1.72\,\Delta ICS_{AV0-1} \quad R^2=.79$$
(t =) (2.0) (-2.6) (3.7) (-3.1) (-1.2) (1.6) (2.8) (1.9) (1.3) DW =2.4

$$\Delta I = +.62\Delta DEP - 11.14\Delta CAP_{-1} + .57\,\Delta T_G - .27\Delta G - 2.33\Delta PR_{-2}Y_{-4} + .42\,\Delta DJ_{-1} + .67\,\Delta PROF_{-1} + 3.02\,\Delta XR_{AV0123} + 2.22\,\Delta ICSAV_{0-1} \quad R^2=.80$$
(t =) (1.6) (-4.4) (2.8) (-1.1) (-3.0) (-1.7) (3.2) (1.2) (1.1) DW =2.3

Total investment spending in the GDP accounts is broken into three subcomponents: plant and equipment, inventories and residential housing investment. Spending trends since 1960 for these three component is presented in Table 9 below.

TABLE 9
COMPONENTS OF REAL U.S. INVESTMENT 1960 – 2000
(Billions of Chained 2000 Dollars)

Year	Total Investment	Business plant & equipment	Residential Investment (Housing)	Inventory Investment
1960	$ 266.4	$ 140.0	$ 157.2	$ 9.0
1970	426.8	260.1	192.3	4.8
1980	644.0	435.6	239.7	- 7.6
1990	893.3	594.5	298.4	13.8
2000	1,735.5	1,232.1	446.9	56.5
% of Total	100%	64.3%	35.7%	2.8%

Source: Economic Report of the President 2005, Appendix Tables B1, B7

We can also test these subcomponents to see if see which may be sensitive to changes in the ICS measure of consumer confidence. One mechanism through which this might occur is for a change in consumer confidence to directly influence consumption, which simultaneously changes the GDP. This change in GDP would be registered in the investment function through a change in the accelerator, which changes investment. With housing investment, the effect may come directly through the change in income. We might expect the effect on investment to lag the effect on consumption somewhat.

Table 10A below shows regression coefficients and t statistics for lagged values of the ICS. Different subcomponents of investment were used as the dependent variable. The same set of variables used in Table 7 to control for other influences on investment besides the ICS are also used here. They were the ones found most important in explaining total investment.

Table 10A
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICS Variables Using Different Components of Total Investment As The Dependent Variable

Expectations Lag Used	Plant &Equip. β_D (t)	Housing β_{ND} (t)	Inventories β_S (t)	Total Investment β_T (t)
0	- .16 (-0.3)	.29 (0.6)	- .24 (-0.5)	- .26 (0.3)
-1	.40 (0.8)	- .04 (-0.1)	- .01 (-0.0)	.49 (0.7)
-2	.11 (0.3)	**1.43 (2.8)**	-1.01 (-1.0)	.17 (0.2)
-3	- .48 (-1.2)	.38 (0.8)	.25 (0.4)	- .09 (-0.1)
-4	- .53 (-1.3)	**- .73 (-3.2)**	.02 (0.1)	-1.05 (-1.8)
-5	- .23 (-0.8)	-.06 (-0.1)	- .32 (-0.6)	- .55 (-0.9)
-6	.18 (0.4)	- .18 (-0.9)	.18 (0.5)	.17 (0.2)
AV_{0-1}	.25 (0.3)	.23 (0.3)	- .23 (-0.3)	.25 (0.2)
AV_{-1-2}	.71 (0.7)	2.15 (2.7)	-1.57 (-1.6)	.92 (0.6)
AV_{0-1-2}	.49 (0.4)	2.40 (2.4)	-1.79 (-1.6)	.57 (0.4)
$AV_{0-1-2-3}$	- .51 (-0.3)	**3.67 (2.8)**	-1.56 (-1.3)	.48 (0.3)
$AV_{0-1-2-3-4}$	-2.07 (-1.3)	1.93 (1.6)	-1.64 (-1.2)	-1.95 (-1.0)
$AV_{0-1-2-3-4-5}$	-2.45 (-1.6)	1.59 (1.1)	-2.36 (-1.8)	-2.46(-1.1)
$AV_{0-1-2-3-4-5-6}$	-2.30 (-1.3)	.55 (0.3)	-1.93 (-1.4)	-3.97 (-1.9)
$AV_{0-1-2-3-4-5-6-7}$	- .32 (-0.2)	.39 (0.2)	**-3.36 (-2.1)**	-3.95 (-1.4)
$AV_{0-1-2-3-4-5-6-7-8}$	- .81 (-0.3)	.23 (0.1)	-3.46 (-1.3)	-4.89 (-1.6)

In the Table 10A housing tests, several lagged values of the ICS variables were found significantly related to housing demand. But this finding holds only if our controls only includes variables significant in explaining total investment. Three other variables were also found significant in explaining investment in housing in previous studies (Heim 2009D):

- the mortgage interest rate,
- the relative price of housing relative to income, and
- the proportion of the population composed of younger people 16-24

These additional controls were added to the model, and the model was retested. Results are shown in Table 10B below.. When this more appropriate set of controls was used, no lagged values of ICS_2 are found to be statistically significant determinants of housing demand. This suggests our model of the determinants of housing demand in Table 10A, which explains demand for total investment so well, is inadequately specified when used to explain the individual – and different – subcomponents of investment. The omission of key controls in the model is the only reason ICS appears to be a significant determinant of housing demand in Table 10A.

The same studies also indicate that the not all the variables found significantly related to inventory investment in Heim (2009B) are included in the inventory model tested in Table 10A. When they are, all lagged values are found insignificant.

The only type of investment for which the set of determinants used as controls in Table 10A was appropriate, total investment, shows no ICS variable to be statistically significant.

5.2. TESTING THE ICS USING MORE SOPHISTICATED MODELS OF DEMAND FOR SUBCOMPONENTS OF TOTAL CONSUMPTION

As noted above, another study (Heim 2009D) found both differences in the factors driving demand for each of the subcomponents of investment. After extensive examination of a wide range of factors (and lags), found that the following seemed most systematically related to investment spending on the different subcomponents of total investment:

<u>Demand for Total Investment:</u>

$$\Delta I_t = f\ [\ \beta_{1T,1G}\,\Delta(\text{Crowd Out})_t,\ \ \beta_2\,\Delta Dep_t,\ \ \beta_3\,\Delta Acc_t,\ \ \beta_4\,\Delta r_{\,t-2}{*}Y_{\,t-4},\ \ \beta_5\,\Delta DJ_{t-1},\ \ \beta_6\,\Delta Prof_{t-1},\ \ \beta_7\Delta XR_{AV(t-t-3)},\ \beta_8\Delta Cap_{t-1}\ ]$$

R^2/Adj.R^2 (DW) β (t-stat.*)	$\Delta T_{G(t)}$ $\beta_{1t}(t)$	ΔG_t $\beta_{1G}(t)$	ΔACC_t $\beta_3(t)$	ΔDEP_t $\beta_2(t)$	$\Delta r_{t-2}{*}Y_{t-4}$ $\beta_4(t)$	ΔDJ_{t-1} $\beta_5(t)$	$\Delta PROF_{t-1}$ $\beta_6(t)$	$\Delta XR_{AV(t-t-3)}$ $\beta_7(t)$	ΔCAP_{t-1} $\beta_8(t)$
90/87% (2.2)	.43 (4.4)	-.39 (2.2)	.29 (8.5)	.86 (3.0)	-1.2(2.5)	.50 (3.2)	.38 (2.6)	3.77 (2.2)	.17 (0.2)

Source: Heim, 2009C, Table 2

<u>Demand For Plant And Equipment</u>

$$\Delta I_{P\&E(t)} = f\ [\ \beta_{1T-2G}\,\Delta \text{Crowd Out}_t,\ \ \beta_2\,\Delta Dep_{t-1},\ \ \beta_3\,\Delta Acc_t,\ \ \beta_4\,\Delta r_{\,t-2or3}{*}Y_{\,t-4or5},\ \ \beta_5\,\Delta DJ_{-1},\ \ \beta_6\,\Delta Prof_{t-1},\ \ \beta_7\Delta XR_{AVt\ to\ (t-3)},\ \ \beta_8\Delta Cap_{t-1}\ ]$$

R^2/Adj.R^2 (DW) B (t-stat.***)	ΔDJ_{t-1} $\beta_{1T}(t)$	$\Delta PROF_{t-1}$ $\beta_{1G}(t)$	$\Delta T_{G(t)}$ $\beta_3(t)$	ΔG_t $\beta_2(t)$	ΔDEP_{t-1} $\beta_4(t)$	$\Delta XR_{avt-(t-3)}$ $\beta_5(t)$	$\Delta ACC{=}\Delta Y_t$ $\beta_6(t)$	$\Delta r_{t-3}{*}Y_{t-5}$ $\beta_7(t)$	ΔCAP_{t-1} $\beta_8(t)$
93/91% (1.8)	.65 (8.6)	.43 (4.6)	.19 (5.3)	- .37 (-3.8)	.89 (7.6)	3.79 (4.0	.06 (3.8)	-.53 (-2.7)	1.19 (1.5)

Source: Heim, 2009B, Table 7

<u>Demand For Residential Housing:</u>

$$\Delta I_{RES(t)} = f\ [\beta_1\,\Delta Y\text{-}T_{G(t)},\ \ \beta_{2T-2G}\,\Delta \text{Crowd Out Variable(s)}_t,\ \beta_3\,\Delta Acc_t,\ \beta_4\,\Delta r_{\,t-2or3}{*}Y_{\,t-4or\,5},\ \beta_5\,\Delta DJ_{-2},\ \beta_6\,\Delta P_{HOUSE(t-1)},\ \beta_7\,\Delta POP_{16-24(t)},\ B_8\,\Delta XR_{AVt\ to\ (t-3)}]$$

R^2/Adj.R^2 (DW) B (t-stat.**)	$\Delta P_{HOUSE(t-1}$ $\beta_{1T}(t)$	$\Delta T_{G(t)}$ $\beta_{2T}(t)$	ΔG_{tt} $\beta_{2G}(t)$	$\Delta r_{MORT}Y_{-4}$ $\beta_3(t)$	ΔACC_t $\beta_4(t)$	$\Delta(Y\text{-}T_{G(t)})$ $\beta_5(t)$	ΔDJ_{t-2} $\beta_6(t)$	ΔPOP_{16-24} $\beta_7(t)$	$\Delta XR_{AVt-(t-3)}$ $\beta_8(t)$
83/78% (1.5)	-.021(-2.4)	.22 (5.3)	-.24 (-2.4)	-2.13 (-4.6)	.05 (2.0)	.07 (2.4)	-.22 (-2.0)	122.2(1.1)	.70 (1.2)

Note: Accelerator Used Is $\Delta(Y\text{-}T_G)$
Source: Heim, 2009B, Table 11

Demand For Inventories:

$\Delta I_{INV(t)} = f$ [β_1 ACC_t, β_2 ΔDEP_t, β_{3T-3G} ΔCrowd Out Variable(s)$_t$, β_4 $\Delta r_{t-2}*Y_{t-4}$, β_5 ΔC_t]

R^2/Adj.R^2 (DW) B (t-stat.**)	ΔACC_0 β_{1T}(t)	$\Delta T_{G(0)}$ β_{2T} (t)	ΔG_0 β_{2G}(t)	$\Delta r_{PR-2}Y_{-4}$ β_3(t)	ΔC_0 β_4(t)	ΔDEP_0 β_5(t)
67/62% (2.4)	.17 (5.3)	.17 (3.5)	.02 (0.1)	.70 (-1.9)	-.16 (-2.7)	.54 (2.4)

Source: Heim, 2009B, Table 14

These models will be considered the baseline models. To test the ICS variable, it will be added to each of these baseline models and retested. Results presented in Table 10B below indicate the regression coefficient and t-statistic obtained when doing so.

Table 10B
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICS Variables Using Components of Total Investment As The Dependent Variable

Expectations Lag Used	Plant &Equip. β_D (t)	Housing β_{ND} (t)	Inventories β_S (t)	Total Investment[1] β_T (t)
0	- .23 (-0.7)	.27 (0.8)	.07 (0.1)	.22 (0.4)
-1	.03 (0.1)	.04 (0.1)	.18 (0.4)	.94 (1.7)
-2	-.26 (-0.5)	.15 (0.5)	- .74 (-1.3)	.21 (0.3)
-3	-.23 (-0.9)	- .35 (-1.1)	.04 (0.1)	.30 (0.9)
-4	-.05 (-0.2)	- .20 (-0.7)	- .13 (-0.4)	- .67 (-1.7)
-5	-.15 (-0.6)	.44 (1.6)	- .20 (-0.5)	- .20 (-0.7)
-6	.26 (0.8)	.33 (1.3)	.06 (0.2)	.80 (1.6)
AV_{0-1}	.09 (0.2)	.40 (0.7)	.23 (0.3)	1.10 (2.7)
AV_{-1-2}	.10 (0.1)	.19 (0.3)	- .84 (-1.6)	1.27 (1.1)
AV_{0-1-2}	- .17 (-0.2)	.85 (0.8)	- .87 (-1.6)	1.61 (1.5)
$AV_{0-1-2-3}$	- .84 (-0.6)	..09 (0.1)	- .85 (-0.8)	**2.91 (2.0)**
$AV_{0-1-2-3-4}$	- .96 (-0.7)	-.36 (-0.2)	-1.32 (-0.9)	1.12 (0.5)
$AV_{0-1-2-3-4-5}$	-1.28 (-0.9)	1.01 (0.8)	-1.83 (-1.2)	.14 (0.1)
$AV_{0-1-2-3-4-5-6}$	- .44 (-0.3)	1.98 (1.6)	-1.63 (-1.2)	4.98 (1.4)
$AV_{0-1-2-3-4-5-6-7}$	- .52 (-0.3)	1.82 (1.4)	-1.50(-1.2)	**5.89 (2.4)**
$AV_{0-1-2-3-4-5-6-7-8}$	- .63 (-0.3)	1.00 (0.6)	-1.81 (-0.9)	2.11 (0.5)

[1] All variables used as explanatory variables in any of the subcomponent models were used in the total investment model.

No variant of the ICS variable found significantly related to any one of investment's components.

Total investment, was not found related to any of the individual period ICS lags. However, the average lag for the current and seven past periods, and the average lag for the current and past three periods, were found related. However, it is difficult to formulate a reasonable theory to explain why, for example, the current and last one or two years average value of the ICS does not systematically influence investment, but the impact of the ICS three years ago, when added to the average makes it significant, especially when the individual lag (-3) is not significant by itself. In addition, adding all the variables found significant in any of component regressions increases multicollinearity markedly, making individual estimates of coefficients and t- statistics less reliable, and subject to major change when slight changes to the model are made, reducing their credibility. Removing the consumption variable from the Table 10B total investment regression, for example, leaves these same two lags insignificant. This suggests the underlying multicollinearity problems were the only reason we obtained significant findings. Hence, we are inclined to view the statistical significance of these two average findings as for total investment as spurious. Our Table 10A total investment results, based on a model that used as controls only variables previously found significantly related to total investment seems to methodologically be superior. It found not variant of ICS related to total investment.

5.3. CONCLUSIONS REGARDING THE RELATIONSHIP OF ICS TO INVESTMENT

Based on the Table 10A and 10B results, we conclude the ICS is not systematically related to total investment or its three component parts when appropriate other variables related to investment are controlled for. However, absent these controls it can function as an proxy for the missing controls, explaining some variance.

6.0. TEST OF SENSITIVITY OF INVESTMENT DEMAND TO THE INDEX OF CONSUMER EXPECTATIONS (ICE)

6.1. TESTS ASSUMING THE DETERMINANTS OF DEMAND ARE THE SAME FOR EACH PART OF TOTAL CONSUMPTION

Since businesses plan for the future, they may gear their plans to their understanding of consumer expectations for the future, rather than the ICS. To test this hypothesis, we repeat our testing procedure from above, changing only the measure of consumer confidence from the ICS to to its subcomponent, the Index of Consumer Expectations (ICE). Table 11 below presents findings regarding the relationship of total investment to the ICE.

Table 11
Testing Consumer Expectations Index (ICE) As Determinant Of Total Investment Goods Demand Controlling For Other Major Influences On Investment Demand

$\Delta I = .30\Delta ACC + .82\Delta DEP - 1.41\Delta CAP_{-1} + .44\,\Delta T_G - .37\Delta G - 1.21\Delta PR_{-2}\,Y_{-4} + .49\,\Delta DJ_{-1} + .47\Delta PROF_{-1} + 4.41\Delta XR_{AV0123} - .84\Delta ICE_0 \quad R^2 = .90$
(t =) (7.8) (3.5) (-0.7) (5.0) (-2.4) (-2.4) (3.6) (3.4) (2.5) (-1.3) DW =2.2

$\Delta I = .28\Delta ACC + .90\Delta DEP - .14\Delta CAP_{-1} + .40\,\Delta T_G - .38\Delta G - 1.04\Delta r_{-2}Y_{-4} + .52\,\Delta DJ_{-1} + .37\,\Delta PROF_{-1} + 3.33\,\Delta XR_{AV0123} + .84\,\Delta ICE_{-1} \quad R^2 = .90$
(t =) (6.3) (3.2) (-0.1) (4.3) (-2.0) (-1.9) (3.2) (2.6) (2.0) (1.3) DW =2.2

$\Delta I = .29\Delta ACC + .87\Delta DEP - .07\Delta CAP_{-1} + .42\,\Delta T_G - .40\Delta G - 1.16\Delta r_{-2}Y_{-4} + .50\,\Delta DJ_{-1} + .39\,\Delta PROF_{-1} + 3.63\,\Delta XR_{AV0123} + .21\,\Delta ICE_{-2} \quad R^2 = .90$
(t =) (9.8) (2.7) (-0.0) (3.9) (-2.0) (-2.4) (3.2) (2.8) (1.8) (0.2) DW =2.2

$\Delta I = .29\Delta ACC + .87\Delta DEP + .324\Delta CAP_{-1} + .42\,\Delta T_G - .39\Delta G - 1.14\Delta r_{-2}Y_{-4} + .50\,\Delta DJ_{-1} + .37\,\Delta PROF_{-1} + 3.63\Delta XR_{AV0123} + .19\,\Delta ICE_{AV0\text{-}1} \quad R^2 = .90$
(t =) (7.5) (3.2) (0.2) (4.5) (-2.2) (-2.2) (3.1) (2.7) (1.9) (0.2) DW =2.2

$\Delta I = .29\Delta ACC + .94\Delta DEP - .89\Delta CAP_{-1} + .38\,\Delta T_G - .42\Delta G - .95\Delta r_{-2}Y_{-4} + .49\,\Delta DJ_{-1} + .41\,\Delta PROF_{-1} + 2.79\Delta XR_{AV0123} + 1.40\,\Delta ICE_{AV\text{-}1\text{-}2} \quad R^2 = .90$
(t =) (7.4) (3.1) (-0.5) (4.0) (-2.3) (-1.8) (3.1) (3.2) (1.6) (1.4) DW =2.3

None of ICE variants tested in Table 11 were found significantly related to total investment when other variables known to affect total investment were controlled for.

The next test is whether any of the three subcomponents of total investment (plant and equipment, business inventories and residential housing) are affected by changes in the ICE, controlling for the same other variables previously found significantly related to total investment and used as controls in Table 11 above. Table 12A below tests the ICE variable lagged 0 to six periods, and a variety of average lags for multiple periods from (0 and -1) to (0 to -8). The three separate parts of investment are used as the dependent variable in these tests. For comparison purposes, the results for total investment are also shown. Results indicate the regression coefficient and t-statistic found on the ICE variable tested. Other variables' results were very similar to those obtained in Table 11 above and are not shown here.

Table 12A
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICE Variables
Using Different Components of Total Investment As The Dependent Variable

Expectations Lag Used	Plant &Equip. β_D (t)	Housing β_{ND} (t)	Inventories β_S (t)	Total Investment (See also Table11) β_T (t)
0	- .48 (-1.6)	- .20 (-0.6)	- .06 (-0.2)	- .84 (-1.3)
-1	.71 (1.6)	- .08 (-0.2)	.06 (0.1)	.84 (1.3)
-2	.10 (0.3)	**1.12 (3.1)**	- .71 (-0.9)	.21 (0.2)
-3	-.57 (-1.6)	.33 (0.9)	.09 (0.2)	- .38 (-0.7)
-4	- .10 (-0.4)	**-.45 (-2.0)**	- .09 (-0.2)	- .48 (-1.0)
-5	-.51 (-1.5)	-.05 (-0.1)	- .04 (0.1)	- .58 (-1.1)
-6	.21 (0.9)	-.20 (-1.0)	.12 (0.4)	.15 (0.3)
AV_{0-1}	.36 (0.5)	-.27 (-0.4)	.01 (-0.0)	.19 (0.2)
AV_{-1-2}	1.08 (1.6)	1.29 (2.7)	- .81 (-1.3)	1.40 (1.4)
AV_{0-1-2}	.60 (0.8)	1.15 (1.6)	- .93 (-1.2)	.54 (0.5)
$AV_{0-1-2-3}$	- .58 (-0.6)	2.36 (1.9)	-1.05 (-1.1)	- .20 (-0.2)
$AV_{0-1-2-3-4}$	-1.10 (-0.7)	1.56 (1.5)	-1.75 (-1.2)	-1.95 (-1.0)
$AV_{0-1-2-3-4-5}$	-2.28 (-1.8)	1.03 (0.8)	-1.43 (-1.1)	-3.11 (-1.7)
$AV_{0-1-2-3-4-5-6}$	-1.51 (-1.2)	- .10 (-0.1)	- .79 (-0.7)	-2.57 (-1.9)
$AV_{0-1-2-3-4-5-6-7}$	- .66 (-0.6)	- .12 (-0.1)	-2.48 (-1.9)	-3.45 (-1.9)
$AV_{0-1-2-3-4-5-6-7-8}$	- .58 (-0.3)	- .56 (-0.3)	-2.11 (-1.2)	-3.95 (-1.9)

Also like Table 10A, consumer expectations appear to influence housing demand after a two year lag. Only the (ICE_{-2}.).single-year component of the average that was found statistically significant and with the right sign. The (ICE_{-4}.).was significant, but had a sign counter to what theory would lead us to expect, hence we consider it spurious

More importantly, the model used to test housing demand did not include three variables found to be key determinants of housing demand in previous studies (Heim 2009B):the mortgage interest rate, housing prices and the proportion of the population in the 16-24 age group. Add them, as we do in Table 12B below, and no variant of ICE is found statistically insignificant to housing.

No variant of ICE was found related to plant and equipment investing, inventory investing or total investment.

6.2. TESTING THE ICS USING MORE SOPHISTICATED MODELS OF DEMAND FOR SUBCOMPONENTS OF TOTAL CONSUMPTION

As noted earlier, (Heim 2009B) analyzed separately the determinants of demand for each of the three subcomponents of total investment: plant and equipment, housing and inventory demand. The following seemed most systematically related to investment spending for each of the three different subcomponents. Those findings are repeated here for easy reference:

Demand for Total Investment:

$$\Delta I_t = f\ [\ \beta_{1T,1G}\,\Delta(\text{Crowd Out})_t,\ \ \beta_2\,\Delta Dep_t,\ \ \beta_3\,\Delta Acc_t,\ \ \beta_4\,\Delta r_{\,t-2}{*}Y_{\,t-4},\ \ \beta_5\,\Delta DJ_{t-1},\ \ \beta_6\,\Delta Prof_{t-1},\ \ \beta_7\Delta XR_{AV(t\text{-}t\text{-}3)},\ \beta_8\Delta Cap_{t-1}\ ]$$

R^2/Adj.R^2 (DW) β (t-stat.*)	$\Delta T_{G(t)}$ $\beta_{1t}(t)$	ΔG_t $\beta_{1G}(t)$	ΔACC_t $\beta_3(t)$	ΔDEP_t $\beta_2(t)$	$\Delta r_{\,t-2}{*}Y_{\,t-4}$ $\beta_4(t)$	$\Delta DJ_{\,t-1}$ $\beta_5(t)$	$\Delta PROF_{\,t-1}$ $\beta_6(t)$	$\Delta\ XR_{AV(t\text{-}t\text{-}3)}$ $\beta_7(t)$	$\Delta CAP_{\,t-1}$ $\beta_8(t)$
90/87% (2.2)	.43 (4.4)	-.39 (2.2)	.29 (8.5)	.86 (3.0)	-1.2(2.5)	.50 (3.2)	.38 (2.6)	3.77 (2.2)	.17 (0.2)

Source: Heim, 2009B, Table 2

Demand For Plant And Equipment

$$\Delta I_{P\&E(t)} = f\ [\ \beta_{1T-2G}\,\Delta \text{Crowd Out}_t,\ \ \beta_2\,\Delta Dep_{t-1},\ \ \beta_3\,\Delta Acc_t,\ \ \beta_4\,\Delta r_{\,t-2or3}{*}Y_{\,t-4or5},\ \ \beta_5\,\Delta DJ_{-1},\ \ \beta_6\,\Delta Prof_{t-1},\ \ \beta_7\Delta XR_{AVt\ to\ (t-3)},\ \ \beta_8\Delta Cap_{t-1}\ ]$$

R^2/Adj.R^2 (DW) B (t-stat.***)	$\Delta DJ_{\,t-1}$ $\beta_{1T}(t)$	$\Delta PROF_{t-1}$ $\beta_{1G}(t)$	$\Delta T_{G(t)}$ $\beta_3(t)$	$\Delta G_{\,t}$ $\beta_2(t)$	$\Delta DEP_{\,t-1}$ $\beta_4(t)$	$\Delta XR_{avt-(t-3)}$ $\beta_5(t)$	$\Delta ACC{=}\Delta Y_{\,t}$ $\beta_6(t)$	$\Delta r_{\,t-3}{*}Y_{\,t-5}$ $\beta_7(t)$	ΔCAP_{t-1} $\beta_8(t)$
93/91% (1.8)	.65 (8.6)	.43 (4.6)	.19 (5.3)	- .37 (-3.8)	.89 (7.6)	3.79 (4.0	.06 (3.8)	-.53 (-2.7)	1.19 (1.5)

Source: Heim, 2009B, Table 7

Demand For Residential Housing:

$$\Delta I_{RES(t)} = f\ [\beta_1\,\Delta Y\text{-}T_{G(t)},\ \ \beta_{2T-2G}\,\Delta \text{Crowd Out Variable(s)}_t,\ \beta_3\,\Delta Acc_t,\ \beta_4\,\Delta r_{\,t-2or3}{*}Y_{\,t-4or\ 5},\ \beta_5\,\Delta DJ_{-2},\ \beta_6\ \Delta P_{HOUSE(t)},\ \beta_7\,\Delta POP_{16-24(t)},\ B_8\,\Delta XR_{AVt\ to\ (t-3)}]$$

R^2/Adj.R^2 (DW) B (t-stat.**)	$\Delta P_{HOUSE(t)}$ $\beta_{1T}(t)$	$\Delta\ T_{G(t)}$ $\beta_{2T}(t)$	ΔG_{tt} $\beta_{2G}(t)$	$\Delta r_{\,MORT}Y_{-4}$ $\beta_3(t)$	$\Delta ACC_{\,t}$ $\beta_4(t)$	$\Delta(Y\text{-}T_{G(t)})$ $\beta_5(t)$	$\Delta DJ_{\,t-2}$ $\beta_6(t)$	$\Delta\ POP_{16-24}$ $\beta_7(t)$	$\Delta\ XR_{AVt-(t-3)}$ $\beta_8(t)$
83/78% (1.5)	-.021(-2.4)	.22 (5.3)	-.24 (-2.4)	-2.13 (-4.6)	.05 (2.0)	.07 (2.4)	-.22 (-2.0)	122.2(1.1)	.70 (1.2)

Note: Accelerator Used Is $\Delta(Y\text{-}T_G)$
Source: Heim, 2009B, Table 11

Demand For Inventories:

$$\Delta I_{INV(t)} = f\ [\beta_1\,ACC_t,\ \ \beta_2\,\Delta DEP_t,\ \beta_{3T-3G}\,\Delta \text{Crowd Out Variable(s)}_t,\ \beta_4\ \Delta r_{\,t-2}{*}Y_{t-4},\ \beta_5\,\Delta C_t]$$

R^2/Adj.R^2 (DW) B (t-stat.**)	$\Delta ACC_{\,0}$ $\beta_{1T}(t)$	$\Delta T_{G(0)}$ $\beta_{2T}(t)$	ΔG_0 $\beta_{2G}(t)$	$\Delta r_{PR-2}Y_{-4}$ $\beta_3(t)$	ΔC_0 $\beta_4(t)$	$\Delta DEP_{\,0}$ $\beta_5(t)$
67/62% (2.4)	.17 (5.3)	.17 (3.5)	.02 (0.1)	.70 (-1.9)	-.16 (-2.7)	.54 (2.4)

Source: Heim, 2009C, Table 14

These variables in each of these models will be used as controls on other factors affecting the particular subcomponent of total investment being tested. Results of retesting by adding the ICE variable to the model are presented in Table 12B below. Results indicate the regression coefficient and t-statistic obtained for the ICE variable in the test.

Overall, Table 12B, using the most correctly specified models of P&E, housing, and inventory demand, failed to find any lagged version of ICE significantly related to demand for any of these parts of total investment.

Table 12B
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICE Variables Using Components of Total Investment As The Dependent Variable

Expectations Lag Used	Plant &Equip. β_D (t)	Housing β_{ND} (t)	Inventories β_S (t)	Total Investment[1] β_T (t)
0	- .25 (-1.0)	.21 (0.8)	- .06 (-0.2)	.30 (0.6)
-1	.58 (1.9)	.04 (0.1)	.26 (0.6)	**1.37 (3.2)**
-2	- .23 (-0.6)	.20 (0.7)	- .51 (-0.9)	.13 (0.2)
-3	- .26 (-1.3)	- .19 (-0.6)	- .21 (-0.5)	.22 (0.5)
-4	- .04 (-0.2)	- .30 (-1.5)	- .04 (-0.1)	- .42 (-1.8)
-5	- .11 (-0.5)	.40 (1.9)	- .12 (-0.3)	- .22 (-0.7)
-6	.18 (0.7)	.20 (1.1)	.04 (0.1)	.77 (1.7)
AV_{0-1}	.39 (1.0)	.35 (0.8)	.18 (0.3)	**1.52 (2.5)**
AV_{-1-2}	.39 (0.8)	.23 (0.4)	- .31 (-0.8)	1.34 (1.8)
AV_{0-1-2}	.17 (0.3)	.79 (1.0)	- .39 (-0.9)	1.73 (1.9)
$AV_{0-1-2-3}$	- .41 (-0.4)	.75 (0.7)	- .81 (-1.1)	**3.02 (2.3)**
$AV_{0-1-2-3-4}$	- .55 (-0.5)	- .36 (-0.2)	-1.19 (-0.8)	2.16 (1.3)
$AV_{0-1-2-3-4-5}$	- .78 (-0.7)	1.07 (0.9)	-1.30 (-1.0)	.82 (0.3)
$AV_{0-1-2-3-4-5-6}$	- .02 (-0.0)	1.37 (0.6)	-1.02 (-0.9)	4.34(1.6)
$AV_{0-1-2-3-4-5-6-7}$	- .42 (-0.3)	1.95 (1.9)	-1.47 (-1.4)	**6.32 (3.1)**
$AV_{0-1-2-3-4-5-6-7-8}$	- .22 (-0.2)	.97 (0.7)	-1.36 (-0.9)	3.85 (1.1)

[1] All variables used as explanatory variables in any of the subcomponent models were used in the total investment model.

Total investment was found significantly related to ICE_{-1}. But as noted when discussing Tables 10A&B above, this model of the determinants of total investment includes many highly multicollinear variables in addition to those previously found systematically related to total investment. It was noted there that removal of a highly multicollinear variable, such as consumption, caused the findings of significance to disappear. The same is true here. Hence, we consider the Table 12B finding spurious. We consider the Table 12A finding for total investment, which found no significant relationship between ICE and total investment, to be more credible, since the model appears more correctly specified: When testing ICE, it controls only for variables found in previous studies to be related to total investment.

6.3. Conclusions Regarding the Relationship of ICE to Investment

Based on the Tables 12A and 12B results, we conclude ICE is not systematically related to total investment or any of its subcomponent parts when controlling for other variables known to affect investment. However, absent these controls, ICE can function as an proxy for them, and appear to be explaining some variance explained better by other variables.

7.0 ESTABLISHING DIRECTION OF CAUSATION: ALTERNATE APPROACHES

7.1. COMPARING ABILITY TO EXPLAIN VARIATION: *C= ƒ(ICS)* *vs.* *ICS= ƒ(C)*

The tests in Sections 3 through 6 above test whether ICS or ICE are leading, or at least concurrent indicators of changes in consumption and investment. An alternate approach is to test the regression

Consumption = ƒ(Lagged Consumer Confidence)

And compare its results to the regression

Consumer Confidence = ƒ(lagged Consumption)

with no other variables included except for adding constant term (to avoid some regression results producing a negative R^2). This provides a means of examining whether changes in consumption behavior are related to subsequent changes in consumer sentiment or vice versa Table 13 below more shows results of such a test. R^2 values for the zero lag of one variable regressed on the zero lag of the other are the same, regardless of which is used on the right side, as might be expected..

However, for the (-1) lag, the story is markedly different. Clearly last year's value of ICS is a better predictor of current year's consumption than last year's consumption is of current year ICS. Hence, our direction of causation seems established. This is consistent with our Table 2B finding that even with appropriate controls for other variables, nondurables consumption was significantly related to prior year levels of the ICS.

The two year lags explained the same amount of variance, regardless of which of the two was being used to explain the other. Post 2 year lags had essentially zero R^2, regardless of which variable was used to explain the other.

For investment, essentially the same results obtained However even though the R^2 is much higher when investment is run as a function of last year's ICS, our earlier tests (Table 12A), found no significant relationship when other variables influencing investment were adequately controlled for. Hence, our finding here seems to indicate that ICS_{-1} can proxy for variables related to investment, absent adequate controls for other variables.

Table 13
Variance In Consumption Explained By ICS (And Vice Versa)

Function Tested Consumption:	R^2	Function Tested Investment:	R^2
$C_0 = f(c, ICS_0)$	.14	$I_0 = f(c, ICS_0)$	.15
$C_0 = f(c, ICS_{-1})$	**.26**	**$I_0 = f(c, ICS_{-1})$**	**.33**
$C_0 = f(c, ICS_{-2})$	.10	$I_0 = f(c, ICS_{-2})$	.02
$C_0 = f(c, ICS_{-3})$	.01	$I_0 = f(c, ICS_{-3})$	.00
$C_0 = f(c, ICS_{-4})$	.01	$I_0 = f(c, ICS_{-4})$	.00
$C_0 = f(c, ICS_{-5})$	.00	$I_0 = f(c, ICS_{-5})$	.01
$C_0 = f(c, ICS_{-6})$	.00	$I_0 = f(c, ICS_{-6})$	.00
$ICS_0 = f(c, C_0)$	.14	$ICS_0 = f(c, I_0)$	.15
$ICS_0 = f(c, C_{-1})$	.03	$ICS_0 = f(c, I_{-1})$	.09
$ICS_0 = f(c, C_{-2})$	.10	$ICS_0 = f(c, I_{-2})$	.03
$ICS_0 = f(c, C_{-3})$	.02	$ICS_0 = f(c, I_{-3})$	.00
$ICS_0 = f(c, C_{-4})$	.00	$ICS_0 = f(c, I_{-4})$	.03
$ICS_0 = f(c, C_{-5})$	.02	$ICS_0 = f(c, I_{-5})$	.01
$ICS_0 = f(c, C_{-6})$	.01	$ICS_0 = f(c, I_{-6})$	.01

7.2. EVALUATING DIRECTION OF CAUSATION USING GRANGER CAUSALITY TESTS

Granger Causality Tests (2 and 4 lags) were also run testing the direction of Granger causality between ICS and total consumption (C_T), durables (C_D), Nondurables(C_{ND}) and Services consumption (C_S). Results are given in Table 14 below:

Table 14
Pairwise Granger Causality Tests

Null Hypothesis :	Reject/Don't Reject 5% Level (F-Stat. Prob.Level)			
	C_T	C_D	C_{ND}	C_S
2 Lags.				
ICS does not Granger Cause C	**Reject** (.007)	Don't (.08)	**Reject** (.001)	**Reject** (.02)
C does not Granger Cause ICS	Don't (.34)	Don't (.62)	Don't (.34)	Don't (.27)
4 Lags.				
ICS does not Granger Cause C	Don't (.12)	Don't (.63)	**Reject** (.008)	Don't (.34)
C does not Granger Cause ICS	Don't (.23)	Don't (.60)	Don't (.0	Don't (.08)

When testing two lags, results clearly indicate ICS Granger-causes C, but not vice versa, fairly clearly establishing the direction of Granger causation for all consumption except durables.. For the four lag tests, the results were more ambiguous; neither null hypothesis could be rejected except for nondurables, generally leaving the (Granger) direction of causation unclear.

The stronger suggestion of a direction of causation that runs from ICS to C in the 2 Lag results compared to 4 lag results seems more consistent with our R^2 tests in Table 13 which showed a one relationship of last year's ICS and this year's consumption levels.

However, our findings in Section 3.3 indicate that when other variables affecting consumption are controlled for adequately, only demand for nondurables can be shown to be systematically related to changes in consumer confidence measured by the ICS. This is much more consistent with the 4-lag Granger finding.

8.0. REFERENCES

Bram, J. and Ludvigson, S. Does consumer Confidence forecast Household Expenditure? A Sentiment Index Horse Race. Economic Policy Review. Federal Reserve Bank of New York. June 1998.

Carroll, C.D., Fuhrer, J.C. and Wilcox, D.W. "Does Consumer Sentiment Forecast Household Spending? If so, Why?" American Economic Review. Vol. 84(5). Dec. 1994.

Fair, Ray C. (2004) Estimating How The Macroeconomy Works. Cambridge: Harvard University Press. 2004 (Prepublication version available at http://fairmodel.econ.yale.edu/rayfair/pdf/2003A.HTM)

Heim, John J. (2007) Do Friedman/Modigliani – Type Consumption Functions Explain Consumer Demand As Well As Keynesian Functions? *Review of Business Research*, Vol. 7(1). 2007

Heim, John J. (2008A) The Consumption Function. *Review of Business Research*, Vol. 8(2). 2008.

Heim, John J. (2008B) How Falling Exchange Rates have Affected The U.S. Economy and Trade Deficit. *Journal of International Business and Economics.* Vol.8, No.1, 2008.

Heim, John J. (2009A) Consumer Demand For Durable Goods, Non-Durables And Services. . Rensselaer Polytechnic Institute, Department of Economics. RPI Working Papers in Economics, No. 903. July 2009 also to be published under same title in *Journal of the Academy of Business and Economics,* Oct. 2009.

Heim, John J. (2009B) Determinants of Demand For Different Types Of Investment Goods. Rensselaer Polytechnic Institute, Department of Economics. *RPI Working Papers in Economics, No. 902.* February 2009

Heim, John J. (2009C) The Effects of Import Prices On U.S. Demand for Domestically Produced Goods. *Applied Econometrics and International Development*. (In Press)

Heim, John, J. (2009D) U.S. Demand For different Types of Imported and Domestic Investment Goods. *International Journal of Applied Econometrics and Quantitative Studies*, Vol 7. (Publication Date September 2009)

Heim, John J. (2009E) Does Consumer Confidence, As Measured by the Conference Board's Index of Consumer Confidence, Affect Demand for Consumer and Investment Goods (Or Just Proxy for Things That Do)?. Rensselaer Polytechnic Institute, Department of Economics. *RPI Working Papers in Economics, No. 904*. August 2009.

Jorgenson, D. Econometric Studies of Investment Behavior: A survey. *Journal of Economic Literature*, Vol. 9 (4) Dec. 1971.

Kelly, Martin. (2009) Top 5 Causes of the Great Depression. http://americanhistory.about.com/od/greatdepression/tp/greatdepression.htm

Keynes, J.M. (1936) *The General Theory of Employment, Interest and Money*. New York: Harcourt, Brace & World. 1964 Print.

Mishkin, F.S. (2007). *The Economics of Money, Banking and Financial Markets.* Boston: Pearson/Addison Wesley.

Romer, Christina. (2009) *The Economic Crisis: Causes, Policies, and Outlook*. Testimony before the Joint Economic Committee of Congress, April 30, 2009. Available at ec.senate.gov/index.cfm?FuseAction=Files.View&FileStore_id=9ae99fef-abc7-42f9-b748-a60...

Reuters/University of Michigan. *Surveys of Consumers Sentiment. Time Series Archive*. Available at http://www.sca.1st.UMich.edu/main.php

Spencer, R.W. & Yohe, W.P. (1970) The "Crowding Out" of Private Expenditures by Fiscal Policy Action. Federal Reserve Bank of St. Louis *Review*. October 1970, pp.12-24

Terragrossa, R.A. (1997)Capital Depreciation and Investment Demand. *Quarterly Review of Economics and Finance.* Vol. 37, No. 1, Spring 1997