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DOES CONSUMER CONFIDENCE, AS MEASURED BY THE CONFERENCE BOARD's INDEX OF CONSUMER CONFIDENCE, AFFECT DEMAND (OR JUST PROXY FOR THINGS THAT DO)?

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DOES CONSUMER CONFIDENCE, AS MEASURED BY THE CONFERENCE BOARD, AFFECT DEMAND (OR JUST PROXY FOR THINGS THAT DO)?

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Abstract: *This paper examines whether consumer confidence, independent of changes in income, affects consumer demand. Consumer demand models, similar to Fair's econometric models are tested. Also examined for the first time, is whether consumer confidence affect investment decisions. The measures examined are the Conference Board's Index of Consumer Confidence, and the Index of Consumer Expectations. Results suggest the direction of causation runs from consumer confidence to consumption or investment, that the ICC (but not the ICE) has a very large impact on consumer spending, and that the ICE has some impact on investment spending. Effects on 2009 GDP are estimated.*

1. INTRODUCTION AND ANALYSIS OF THE MODEL

If income or wealth decline, both theory and empirics lead us to expect declining consumption. Not clear is whether declining consumer confidence affects consumer spending, controlling for changes in an individual's income or wealth. If confidence levels can independently influence consumer (or investment) spending, i.e. through "fear itself" as Roosevelt might have said, public officials must be extremely precise in reporting economic news, so as not to create a self fulfilling prophecy. For example, Mishkin notes one bank's failure can cause a panic which hastens the fall of others (Mishkin, 2007). Kelly (2009) cites declining consumer confidence after the stock market crash in 1929 as one of the 5 major causes of the great depression. The 1990 collapse of consumer confidence "frequently was cited as an important – if not the leading – cause of the economic slowdown that ensued" (Carroll, Fuhrer and Wilcox, 1994). Finally we note that the chair of the President's Council of Economic Advisors recently remarked that

> …Consumer spending depends on many things, including income, taxes, *confidence*, and wealth… (Romer, 2009)

To the extent that these economists are right, consumer confidence, and by implication public officials pronouncements which affect it, may be an important determinant of the level of economic activity. This study wishes to examine its impact on the economy.

Using methods similar to those used here, Heim (2009E) examined the University of Michigan's Index of Consumer Confidence (ICS) and found the ICS related to spending on nondurable goods, but not durables or services. Relationships to investment spending were also tested, but no significant relationships were found. Extensive controls on other factors affecting consumption and investment were used.

Other studies have examined consumer confidence using different, VAR – based, methods than are used in this study. Carroll, Fuhrer and Wilcox (1994) examined the impact of consumer confidence on consumption using the University of Michigan's ICS and found it related to overall consumer spending, and spending for the goods subcategory of overall spending, but not services. Their method involved a VAR methodology in which several lags of the ICS variable were added to a regression already containing several lags of the dependent variable and an income variable, to see if ICS significantly contributed to the regression.

The best known study of the Conference Board's Indices of Consumer Confidence (ICC) and Consumer Expectations (ICE) to date was Bram and Ludvigson's (1998). It also used a VAR – like methodology derived from Carroll, Fuhrer and Wilcox, but added interest rates and stock market values to the controls. Using four lags of the ICC variable and controls, they found total consumption, durable goods (excluding motor vehicles), and motor vehicles consumption significantly related to the ICC, but services consumption, and consumption of all goods (except motor vehicles) insignificant. Since goods consumption is overwhelmingly nondurables, this comes close to a finding that nondurables spending is not related to the ICC. Using the ICE, they found total consumption, motor vehicles consumption and services consumption significant. They also examined the University of Michigan Indices of Consumer Sentiment and its Consumer Expectations subcomponent, finding only goods consumption, exclusive of motor vehicles, related to the ICS, and only motor vehicles consumption related to the ICE index.

Their study tested a model for of the following type:

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

Where the S are the ICC 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, 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 often used for short term forecasting, and this test is designed to see if adding the ICC or ICE to the predictor variables increased forecasting ability.

But the explanatory model parameters implied by the variables in forecasting models using dependent variable lags on the right side are biased and inconsistent (Hill, Griffith, Judge 2001),therefore interpretation is less than clear, and even these parameters difficult (at best) to determine if there are multiple lags of the dependent variable used. Therefore, it can be difficult to assess the economic, as opposed to statistical, significance of the results.

The models tested in this paper will be of the explanatory type. All variables other recent studies have found to be determinants of consumer behavior will be included as

controls, using only the lagged value found most significantly related to the dependent variable. Past values of the dependent variable are not used as explanatory variables, They themselves are driven by exogenous determinants. Inclusion of lagged values of the dependent variable clouds the role played by these variables.

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

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

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

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

Infinite series expansion tells us that with infinite additional backward substitutions in steady state yields

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

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

4) $C_0 = (1/1-\gamma) \alpha + (1/1-\gamma) \beta_1 Y_{-1} + (1/1-\gamma) \beta_2 ICC_{-1}$

Hence, for example, Professor Fair's consumption equations (Fair 2004), which we would characterize as predictive models in the sense that term is used here, can be easily converted to explanatory models, as the term is used here, using this process.

The models tested below are of the type shown in (4) 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 ICC 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.

2.0. METHODOLOGY

2.1. ESTIMATING CONSUMER DEMAND

Table 1 below shows how demand for consumer goods and services was divided between durables, nondurables and services during the 1960 – 2000 period. Typically, durables demand was only 10% of total consumer demand, perhaps explaining the lack of significance when testing the ICC variable against total consumer demand for all three subcategories of consumer goods and services. Note that even as far back as 1960, services were 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 1
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, Tables B2, B7.B16

This paper, econometrically tests whether changes in consumer confidence precede, follow, or are concurrent with changes in consumer demand or investment demand., Recent work by Heim (2009A&B) estimated the separate effects of a large group of variables commonly theorized to determine consumer and investment demand using demand driven models similar to those used in large scale Cowles commission –type econometric models. See for example, Fair (2004). Annual data for1967-2000 was used, taken from the 2002 Economic Report of the President, or other data available from the Commerce Department's Bureau of Economic Analysis. The variables found statistically significant determinants of consumption or investment are used as control variables in this study. Using these controls, the same data set is retested adding the Conference Board's ICC or ICE variable, to see if their t-statistics show them to be systematically related to consumption or investment.

The 2009A paper assumed that the demand for consumer goods was principally driven by factors suggested by Keynes (1936). Keynes argued in chapter 8 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 Friedman/Modigliani average income formulation (suggesting these averages explain variance mainly because they can serve as imperfect proxies for current income).

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).

These studies used a stepwise regression model to determine which of the above-hypothesized variables actually explained variance in consumer spending. The lagged value explaining the most variance was defined as the one to add to the stepwise model. In the stepwise process, a new (possible) determinant is added and tested. Each new variable is added tested using its current year value and in separate tests, the preceding four years values, to determine which lag level best explain current consumption.

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

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

where

$(Y-T_G)$ = 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
- 1967 – 2000 data from The Economic Report of the President, 2002

The actual regression results obtained were as follows:

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

(t =)   (27.9)   (5.2)   (0.5)   (-3.2)   (5.1)   (2.3)   D.W.= 2.0

We shall take this as a well developed, comprehensive model of consumption's (other) determinants when testing consumer confidence variables below. One modification is made for consistency with other work that follows in this paper: the exchange rate used above, the G-10 rate, was dropped in favor of the Federal Reserve's real Broad exchange rate, to better reflects U.S. trading patterns. The change had 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:

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

(t =)   (29.2)   (5.7)   (0.3)   (-3.2)   (4.9)   (3.2)   D.W.= 2.0

Further testing also indicated two other variables systematically affected overall consumer demand and were added to the "baseline" model: demand for new housing (HOUSE), involves demand for new appliances (durables), and population growth (POP), which affects demand for all kinds of consumer goods independently of the other control variables above. Hence, our final total consumption demand model becomes:

$$\Delta C_0 = .51\Delta(Y-T_G)_0 + .45\Delta T_{G(0)} + .05\Delta G_0 - 5.61\ \Delta PR_0. + .74\ \Delta DJ_{-2} + 2.71\ \Delta XR_{AV0123} + .36\ \Delta HOUSE + 009\Delta POP \qquad R^2 = 93\%$$

(t =)   (6.5)   (4.0)   (0.3)   (-2.6)   (3.9)   (2.5)   (1.6)   (2.0)   D.W.= 2.1

Because changes in housing demand and disposable income are so highly intercorrelated, (.63), both variables t statistics decline markedly compared to other tests, as does the regression coefficient on disposable income. This will cure itself when the consumer confidence variable is added later in this study.

Throughout this paper, for the 1967 -2000 data set used, t-statistics of 2.0 and 2.7 are significant at the 5% and 1% level respectively.

To test whether the (ICC), or later, the (ICE) explain any variation in consumption when the effects of the "baseline" variables above have been controlled for, we then add the ICC or ICE and retest. If the t-statistic on the regression coefficient for the ICC or ICE variable is significant at the 5% level or above, we conclude it is systematically related to consumption.

2.2. ESTIMATING INVESTMENT DEMAND: METHODOLOGY

Total investment spending in the GDP accounts may be broken into three separate parts: plant and equipment, inventories and residential housing investment. Spending trends since 1960 are presented in Table 2 below.

TABLE 2
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

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

$$\Delta I = \beta_1 \Delta ACC + \beta_2 \Delta DEP + \beta_3 \Delta CAP_{-1} + \beta_4 \Delta T_G - \beta_5 \Delta G - \beta_6 \Delta r_{-2} + \beta_7 \Delta DJ_{-2} + \beta_8 \Delta PROF_{-2} + \beta_9 \Delta XR_{AV0123}$$

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 (Heim 2009B) 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
- 1967 – 2000 data from The Economic Report of the President, 2002

This study had shown these variables would explain 90% of the variance in total investment demand 1960-2000.   Detailed econometric results are shown below. Variables are shown in order of their contribution to explained variance using the previously mentioned stepwise regression procedure:

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

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

To test whether the Index of Consumer Confidence (ICC), or its subcomponent, 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 ICC or ICE variable being tested to the above model, and retest it. If the t-statistic on the regression coefficient for the ICC or ICE variable is significant at the 5% level or above (t>= 2.0), we will conclude that it does explain variance otherwise unexplained in a reasonably well specified investment function.

3.0. SENSITIVITY OF CONSUMER DEMAND TO THE (ICC)

The Index of Consumer Confidence (Conference Board, 2009) was added to the baseline consumption model in section 2.1, and the model reestimated for each of a number of different lags. The lags included individual year lags from the current year value (ICC_0), through (ICC_{-5}). Various multiyear averages of the index were tested, from ICC_{AV0-1} through $ICC_{AV0-1-2-3-4-5-6}$ are also tested. The findings were stunningly straightforward and supportive of the hypothesis that last year's consumer confidence level, as measured by the Conference Board's ICC, was systematically related to spending on consumption in total as well as each of its three components: durable goods, nondurable goods and services.

Notice in Table 3 the ICC_{-3} variable for total consumption is negative and significant. This was an isolated finding with a sign contrary to what theory would lead us to expect. Hence, we tend to assess the finding as spurious

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. The Heim 2009A study found the following the determinants of each, using the stepwise regression technique previously mentioned:

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Consumer Durables[1]:

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

R^2/Adj.(DW)	$\|\Delta(Y-T_G)$ $\beta_{1t}(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	$\|\Delta XR_{AV0i23}$ $\beta_3(t)\|$	ΔDJ_{t-2} $\beta_4(t)$	$\|\Delta MORT$ $\beta6_7(t)$	ΔPR $\beta_5(t)$	$\|\Delta HOUSE$ $\beta_8(t)$	ΔPOP $\beta_6(t)$
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]:

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

R^2/Adj.(DW)	$\|\Delta(Y-T_G)$ $\beta_1(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔDJ_{-3} $\beta_3(t)\|$	ΔPR $\beta_4(t)$	ΔPOP $\beta_5(t)$
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]:

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

R^2/Adj.(DW)	$\|\Delta(Y-T_G)$ $\beta_t(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔPOP $\beta_3(t)$	DJ_{-2} $\beta_4(t)$	$\Delta 16-24/65$ $\beta_5(t)$	$\Delta MORT$ $\beta_6(t)$
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)

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

All variables above are as previously defined except (MORT), the current year nominal interest rate on mortgages, and (Δ16-24/65), the percent of young adults in the population relative to very old adults. The theory was that young adults, either because they are students, or just forming households, have less money to spend on services.

In addition, from before, we have the variables found statistically significantly related to total consumption in the Heim 2008A study, plus the other two found significant when added in subsequent tests:

Total Consumer Goods & Services[2]

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

$\Delta C_0 = .51\Delta(Y-T_G)_0 + .45\Delta T_{G(0)} + .05\Delta G_0 - 5.61\ \Delta PR_0. + .74\ \Delta DJ_{-2} + 2.71\ \Delta XR_{AV0123} + .36\ \Delta HOUSE + 009\Delta POP \qquad R^2 = 93\%$
$(t =) \quad\quad (6.5) \quad\quad\quad (4.0) \quad\quad (0.3) \quad\quad (-2.6) \quad\quad (3.9) \quad\quad (2.5) \quad\quad\quad\quad (1.6) \quad\quad\quad (2.0) \quad\quad D.W.= 2.1$

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[2] (Heim (2008A), plus additional variables

These models of the determinants of durable and nondurable goods and services will be considered baseline models. The ICC variable will be added, and the models retested. Regression coefficients and t-statistics for the ICC variable are shown below in Table 3.

Table 3
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICC 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)	Total consumption[2]
0	- .02 (-0.2)	.05 (0.3)	.02 (0.1)	- .25 (-0.8)	- .05 (-0.2)
-1	**.20 (2.5)**	**.28 (2.6)**	**.28 (2.1)**	**.97 (4.1)**	**.86 (2.6)**
-2	- .01 (-0.1)	- .08 (-0.8)	.07 (0.6)	.14 (0.5)	- .13 (-0.5)
-3	- .14 (-1.3)	- .15 (-1.4)	-.17 (-1.6)	-.57 (-2.4)	- .56 (-2.2)
-4	- .15 (-2.7)	.00 (0.0)	.14 (0.9)	-.03 (-0.2)	- .05 (-0.2)
-5	.10 (0.8)	-.03 (-0.5)	-.23 (-2.6)	- .26 (-0.9)	- .28 (-1.0)
-6	.02 (0.2)	.11 (0.9)	-.08 (-0.7)	.07 (0.3)	.23 (0.7)
AV$_{0-1}$	**.31 (2.1)**	**.60 (2.9)**	**.62 (2.5)**	**1.94 (2.9)**	**1.35 (2.5)**
AV$_{-1-2}$	.17 (1.3)	.17 (1.4)	.30 (1.4)	.96 (1.9)	.59 (1.2)
AV$_{0-1-2}$	.29 (1.8)	.41 (1.5)	.63 (1.9)	1.38 (1.5)	1.08 (1.4)
AV$_{0-1-2-3}$	.02 (-0.1)	- .03 (-0.8)	.12 (0.3)	.14 (0.1)	- .53 (-0.7)
AV$_{0-1-2-3-4}$	- .59 (-2.5)	- .04 (-0.1)	.50 (1.1)	- .02 (-0.0)	- .59 (-0.9)
AV$_{0-1-2-3-4-5}$	- .27 (-0.7)	- .07 (-0.2)	- .08 (-0.2)	- .61 (-1.5)	-1.10 (-1.0)
AV$_{0-1-2-3-4-5-6}$	- .26 (-0.4)	.24 (0.4)	- .41 (-0.7)	- .13 (-0.1)	- .42 (-0.2)

[1] Total consumption is regressed on a model using as controls all variables found to
be determinants of any subcomponent of total consumption. This baseline model
was then retested with the ICC variable added. Results above show the regression
coefficient and t-statistic for the ICC variable.
[2] From Heim 2008A, with controls for housing demand and population growth added.

Table 3 also suggests the average value of the ICC for the current and past year is also
related to consumption. However, since the current year value was never found
significant alone, this seems only because it is averaged with th e(-1) lag which was
uniformly found significant.

3.3 CONCLUSIONS REGARDING THE RELATIONSHIP OF ICC TO CONSUMPTION

Based on Table 3, we conclude consumer confidence, measured by ICC, is significantly
related to overall consumer demand and each of its parts after a one year lag. The one
year lagged influence was uniform across categories and statistically significant even
though extensive efforts were made to control variation in consumption caused by other
variables. Absent these controls, the ICC could probably function as a proxy for at least
some of them (e.g., income), appearing to explain additional variance.

The following demand equations for durables, nondurables, and consumer services are
revisions of the (Heim 2009A) models. They are revised to include the one year lagged

ICC variable. Demand determinants are those used in Table 3 above for each component of total consumption.

Consumer Durables (Revised Model):

$\Delta C_D = f\,[\,\beta_1\,\Delta(Y\text{-}T_G)_t, + \beta_2\,\Delta\,T_{G\,+}\,\beta_3\,\Delta G + \beta_4\,\Delta\,XR_{AV0123} + \beta_5\,\Delta DJ_{-2}, + \beta_5\,\Delta PR + \beta_6\,\Delta HOUSE + \beta_7\,\Delta POP + \beta_8\,\Delta ICC_{-1}]$

R²/Adj.(DW)	Δ(Y-TG) β₁ₜ(t)	Δ TG β₂ₜ (t)	ΔG β₂ₘ(t)	ΔXRAV0i23 β₃(t)|	Δ DJ t-2 β₄(t)	ΔMORT β (t)	ΔPR β₅(t)	ΔHOUSE β₆(t)	ΔPOP β₇(t)	Δ ICC -1 β₈(t)
94/92% (2.1)	.13 (4.0)	..09 (2.7)	-.06 (-0.7)	1.76 (4.6)	.37 (4.6)		-1.97(-2.7)	.25 (3.0)	-.003(-1.4)	.20 (2.5)

(Note: Adding ICC₋₁ to the regression indicates it is highly statistically significant (t = 2.5 is significant at the 2% level). Nonetheless adjusted R^2 is unchanged. This suggests that the defining ICC significance based on how much it increases adjusted R^2 may give misleading results as to the importance of the ICC variable, compared to other variables.)

Consumer Non-Durables (Revised Model):

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

R²/Adj.(DW)	Δ(Y-TG) β₁(t)	Δ TG β₂ₜ (t)	ΔG β₂ₘ(t)	Δ DJ -3 β₃(t)|	ΔPR β₄(t)	ΔPOP β₅(t)	Δ ICC -1 β₆(t)
90/88% (1.8)	.12(4.4)	.16 (4.3)	-.16(-2.1)	.33 (4.5)	-2.80(-2.8)	.004 (2.1)	.28 (2.6)

Consumer Services (Revised Model):

$\Delta C_s = f\,[\,\beta_1\,\Delta(Y\text{-}T_G)_t, + \beta_{2T\&2G}\,\Delta(\text{Crowd Out})_t, + \beta_3\,\Delta POP + \beta_4\Delta DJ_{-2}, + \beta_5\,\Delta(16\text{-}24)/65, + \beta_6\,\Delta\,MORT + \beta_6\Delta ICC_{-1}\,]$

R²/Adj.(DW)	Δ(Y-TG) β₁(t)	Δ TG β₂ₜ (t)	ΔG β₂ₘ(t)	ΔPOP β₃(t)	DJ -2 β₄(t)	Δ16-24/65 β₅(t)	ΔMORT β₆(t)	Δ ICC -1 β₆(t)
88/84% (2.3)	.14 (3.5)	.10 (4.5)	.23 (2.4)	.017 (6.0)	.26 (2.9)	94.67(0.6))	-7.84(-2.9)	.28 (2.1)

Total Consumer Goods & Services[2]

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

$\Delta C_0 = .41\Delta(Y\text{-}T_G)_0 + .33\Delta T_{G(0)} + .11\Delta G_0 - 6.77\,\Delta PR_0. + .82\,\Delta DJ_{-2} + 2.06\,\Delta XR_{AV0123} + .64\,\Delta HOUSE + 016\Delta POP + .86\,\Delta ICC$ $R^2 = 93\%$

(t =)   (4.2)   (2.7)   (0.6)   (-2.6)   (4.2)   (1.7)   (2.3)   (3.0)   (2.6)   D.W.= 2.1

3.3.1. ESTIMATED IMPACT ON GDP OF ICC DECLINE 2008 – 2009

The controls used in estimating the impact of the ICC on each of the individual parts of consumption were those found to be statistically significant determinants of each part. but did so in a way which did not plague the regression findings with multicollinearity problems that would have occurred had we used all of these variables as controls in any one regression. One would think the best model to test total consumption would be one including as controls all variables found to be significant determinants of any of the parts. However, testing revealed severe multicollinearity problems, which affect regression coefficients and t-statistics, when doing so. Hence, we take the sum of our

estimates of ICC's impact on each of consumption's parts as our best estimate of the impact of ICC on total consumption. This procedure is also used in Section 6.3.1 when estimating investment effects.

The Index of Consumer Confidence averaged 103.36 during 2007, and fell to and average of 57.95 for 2008, a drop of 45.41 points. The first six months of 2009, the index averaged 39.10, rising in three of the last four of these months and suggesting the index may be "bottoming out" and turning around.

The impact of the change in the Index during 2008 (- 45.41 points) is treated as likely to be associated with an exogenously – caused drop in consumer demand one year later, in 2009. The equations above suggest that every point drop in the ICC is associated with a drop on consumption a year later of $(.20+.28+.28 = .76) billion. The initial change caused by the confidence decline shown in the index drop is ($.76 billion)*(-45.41) = $-34.51 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 in real GDP (during 2009) due to the 2008 decline in the ICC is

(5.88)*($ -34.51 billion) = $ -202.924 billion total decline in 2009 GDP (in real 1996 dollars) resulting from the 2008 decline in ICC, (*ceteris paribus*).

The GDP price deflator has increased approximately 30% since 1996, so our $-202.92 estimate in 1996 dollars is approximately 1.9 percent of the GDP or $263.8 billion in 2009 dollars (increased to $269.6 billion in section 6.3.1 after including investment effects).

This result is for the largest annual decline ever in the ICC. By comparison, the BEA reported declines in the GDP for the first quarter of 2009 of 5.5% and 1.0% in the second quarter   (BEA News Release, 6/25/2009). If the economy's decline for the first half of 2009 is approximately 3.25 % but be zero in the second half of the year, the overall growth rate will be approximately -1.62 %.   Our estimates suggest the drop in consumer confidence in 2008 was so significant as to account for an even larger drop of 1.9%, but offset in part by other factors pushing GDP in the opposite direction. In short, declining consumer confidence appears to have significantly impacted the depths to which the GDP fell in the recession in 2009.

(By comparison, the drop in 1979 was only 14.1 points and the drop in 1974 was 27..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 ICC 1961 - 2000 was 12.8 index points (in absolute terms) or about 28% of the 2008 change.   72% of the changes 1961 – 2000 were less than 20 index points. Hence, while a factor, changes in consumer confidence

measured by the ICC 72% of the time seem to typically have less than half the estimated impact of the 2008 change, which was the largest annual change ever.

4.0. CONSUMER DEMAND: RESULTS OF TESTING THE INDEX OF CONSUMER EXPECTATIONS (ICE)

Changing the test variable from the ICC to its component part, the Index of Consumer Expectations (ICE), all the tests applied to the ICC in Section 3 to determine ICC's significance were again repeated, using exactly the same controls.. Here again, the results were strikingly consistent: no lagged variant of the ICE whatsoever was found significantly related (with the right sign) to either total consumption or any of its parts, except the (ICE-1-2) variant, which we consider a spuriously significant finding, since neither of its two component lags was found significantly related to total consumption.

Also, again we found a few other lagged values significantly related, but with a negative sign, so we treat them as spurious. Results are presented in Table 4.

Table 4
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)	Total Consumption[2]
0	- .18 (-2.5)	- .08 (-0.8)	- .04 (-0.3)	- .60 (-2.5)	- .51 (-2.4)
-1	.06 (0.7)	.23 (1.9)	.11 (0.9)	.48 (1.8)	.43 (1.6)
-2	.09 (0.8)	.10 (1.0)	.18 (1.0)	.58 (1.4)	.38 (1.1)
-3	-.10(-0.7)	- .15 (-1.0)	- .38 (-2.9)	- .59 (-2.2)	- .61 (2.2)
-4	-.15 (-1.8)	.01 (0.1)	.19 (1.4)	.02 (0.1)	.12 (0.4)
-5	.12 (1.2)	- .05 (-0.6)	- .05(-0.4)	- .09 (-0.3)	- .08 (-0.2)
-6	.04 (0.4)	- .00 (-0.0)	- .19 (-1.6)	- .18 (-0.7)	- .08 (-0.3)
AV_{0-1}	- .18 (-0.9)	.22 (1.1)	.04 (0.2)	- .29 (-0.6)	- .18 (-0.4)
AV_{-1-2}	.17 (1.1)	.38 (1.9)	.31 (1.5)	**1.15 (2.6)**	.90 (1.6)
AV_{0-1-2}	- .06 (-0.2)	.50 (1.4)	.40 (1.7)	.92 (1.0)	.54 (0.7)
$AV_{0-1-2-3}$	- .56 (-1.7)	.33 (1.0)	- .52 (-1.0)	- .64(-0.5)	-1.59 (-1.5)
$AV_{0-1-2-3-4}$	- 1.89 (-2.7)	.66 (1.2)	.55 (0.7)	- 94 (-0.6)	-1.66 (-1.1)
$AV_{0-1-2-3-4-5}$	- .89 (-1.6)	.31 (0.6)	.11 (0.1)	-1.55 (-0.8)	-1.95 (-1.0)
$AV_{0-1-2-3-4-5-6}$	-.56 (-1.1)	.36 (0.5)	- .76 (-1.0)	-2.27 (-1.5)	-1.89 (-1.1)

[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.
[2] From Heim 2008A, with controls for housing demand and population growth added.

4.1. CONCLUSIONS REGARDING THE RELATIONSHIP OF ICE TO CONSUMPTION

Based on the Table 4 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 affecting consumption, ICE can proxy for them, appearing to be significantly related to consumption when it really is not.

4.2. COMPARISON OF THE ICC AND ICE FINDINGS FOR CONSUMPTION

No variant of the ICE variable was found related to any component part of consumption with the appropriate sign. For ICC, the one year lagged version was found significantly related to all three parts of total consumption, and total consumption as well. We also found that the sum of the estimated effects of the ICC decline in 2008 were capable of fully explaining, the total decline in the GDP projected for 2009, attesting to the importance of consumer confidence in stabilizing the economy, and the need for public officials to avoid the possibility of self fulfilling prophecy by slipping into hyperbole when describing the state of the economy.

5.0. SENSITIVITY OF INVESTMENT DEMAND TO THE (ICC)

As noted in Section 2.2, the investment model includes variables traditionally thought to influence investment. The model might be expressed as:

$$\Delta I = \beta_1 \Delta ACC + \beta_2 \Delta DEP + \beta_3 \Delta CAP_{-1} + \beta_4 \Delta T_G - \beta_5 \Delta G - \beta_6 \Delta r_{-2} + \beta_7 \Delta DJ_{-2} + \beta_8 \Delta PROF_{-2} + \beta_{D9} \Delta XR_{AV0123}$$

where the variables in this model 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. A previous study (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):

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

All but the capacity utilization variable were found to be statistically significant determinants of investment.

The Conference Board's Index of Consumer Confidence (ICC) variable was added to this investment model to see if it also was significantly related to investment. By adding ICC we test the hypotheses that businesses try to discern changes in market conditions, including consumer confidence, which may affect consumer spending, and tailor investment accordingly. As was the case with consumption, the baseline model was tested with a wide range of different lags to see if the hypothesis was supported by the data. t-statistics for the ICC variable were again used as the criteria for evaluation. ICC lags from ICC_0 (current year) to ICC_{-6} (the ICC six years ago) were added to the baseline model above, and the model was reestimated. Tests were also performed using the average lags ICC_{AV0-1} to $ICC_{AV-0-1-2-3-4-5-6}$. In all cases the ICC was found insignificant (or had the wrong sign). Results are shown in Table 5 below.

These findings presume that controlling for variables found to be significant determinants of total investment provide an adequate set of controls when testing investment's individual parts. In fact, Heim (2009B&D) found that factors not found significantly related to total investment in the tests above, were found to be significant determinants of some specific part of investment. This may occur because the variation in total investment was much larger than for any one part, and the variable found significantly related to one part was "drowned out" when regressed against total investment. For example, three variables found significant in explaining housing investment, were not found to be statistically significant determinants of total investment:

- 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 and the housing investment model retested. Plant and equipment investment and inventory investment were also retested using only the combination of controls found to be statistically significant determinants of them.

After extensive examination of a wide range of factors (and lags), the variables shown in the models below seemed most systematically related to investment spending on the different subcomponents of total investment. These models will be considered the baseline models. To test the ICC variable, each variant will be added to the baseline models and retested. Results are presented in Table 5 below, and indicate the regression coefficient and t-statistic obtained for the ICC variable in the retest.

No variant of the ICC variable found significantly related to demand for plant and equipment. Only one variant (ICC_{-5}) was positively related to demand for housing, and

this relationship we conclude is probably spurious, since it is difficult to conceive of a reasonable theory of why consumer confidence five years ago but not since, would affect consumer behavior today.

Demand for Total Investment (Repeated From Above):

$$\Delta I_t = f\,[\,\beta_{1T,1G}\,\Delta(\text{CROWD OUT})_t,\ \beta_2\,\Delta DEP_t,\ \beta_3\,\Delta ACC_t,\ \beta_4\,\Delta r_{t-2}*Y_{t-4},\ \beta_5\,\Delta DJ_{t-1},\ \beta_6\,\Delta PROF_{-1},$$
$$\beta_7\Delta XR_{AV(t-t-3)},\ \beta_8\Delta CAP_{t-1}\,]$$

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} $\beta_5(t)$	$\Delta PROF_{-1}$ $\beta_6(t)$	$\Delta XR_{AV(0-3)}$ $\beta_7(t)$	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

Demand For Plant And Equipment

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

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

Demand For Residential Housing:

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

R^2/Adj.R^2 (DW) B (t-stat.**)	$\Delta P_{HOUSE(-1)}$ $\beta_{1T}(t)$	$\Delta T_{G(t)}$ $\beta_{2T}(t)$	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:

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

R^2/Adj.R^2 (DW) B (t-stat.**)	ΔACC_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 $\beta_4(t)$	ΔDEP_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, 2009B, Table 14

Total investment, using the determinants of total investment discussed above, showed no statistically significant positive relationship the ICC. However, when all variables found related to any part of investment were used as controls, we see evidence of the ICC affecting total investment positively, with a one year lag. It is difficult to know how much confidence to put in this finding, since the this test equation is fraught with multicollinearity, from inclusion of three separate interest rates, two separate accelerators and two separate profit variables, among others, as was the case with the comparable consumption model discussed earlier. Our inclination is to conclude that investment has little if any relationship to consumer confidence, at least as measured by the ICC.

For inventory investment, there are six tests which show a statistically significant relationship with business inventories, and all indicate a theoretically reasonable (i.e., negative) relationship: earlier results indicated improvements in consumer confidence increased demand for consumer goods one year later. Other things equal, this would reduce inventories. However, the inventory results suggest the decline takes place the current year. This is contrary to our previous finding of a one year lagged effect for consumption. Closer examination of the inventory equation revealed an extra ordinarily

Table 5
Regression Coefficients (β) And t-Statistics (t) For Various Lagged ICC Variables Using Components of Total Investment As The Dependent Variable

Lag Used	Plant &Equip. β (t)	Housing β (t)	Inventories β (t)	Total Investment β (t)	Total Investment[1] β (t)
0	- .33 (-1.7)	.30 (1.6)	**- .61 (2.1)**	-1.33 (-3.0)	- .27 (-1.1)
-1	.31 (1.7)	- .02 (-0.1)	.14 (0.5)	.57 (1.5)	**.80 (2.4)**
-2	-.02 (-0.1)	.00 (0.0)	- .37 (-1.0)	- .03 (-0.1)	.18 (0.3)
-3	.08 (0.5)	- .23 (-0.9)	- .01 (-0.0)	- .27 (-0.5)	- .06 (-0.1)
-4	-.10 (-0.5)	.05 (0.5)	- .13 (-0.8)	- .54 (-1.7)	- .35 (-1.7)
-5	-.02(-0.2)	**.30 (2.5)**	- .04 (-0.2)	.03 (0.1)	.03 (0.2)
-6	.18 (0.9)	.01 (0.1)	.06 (0.3)	.30 (0.6)	.36 (2.1)
AV_{0-1}	.12 (0.4)	.28 (0.7)	- .34 (-0.8)	- .51 (-0.7)	.91 (1.5)
AV_{-1-2}	.29 (1.0)	- .01 (-0.0)	- .32 (-0.7)	.67 (1.0)	**1.27 (2.1)**
AV_{0-1-2}	.08 (0.2)	.27 (0.6)	**- .99 (-2.4)**	- .75 (-0.9)	1.33 (1.5)
$AV_{0-1-2-3}$	.21 (0.7)	- .38 (-0.6)	**-1.33 (-2.7)**	-1.32 (-1.5)	2.40 (1.6)
$AV_{0-1-2-3-4}$	.13 (0.3)	-.13 (-0.2)	**-1.33 (-3.3)**	-2.25 (-1.9)	- .16 (-0.2)
$AV_{0-1-2-3-4-5}$	- .14 (-0.3)	1.05 (1.3)	**-1.51 (-2.9)**	-2.52 (-2.8)	- .71 (-0.7)
$AV_{0-1-2-3-4-5-6}$	.14 (0.2)	1.11 (1.4)	**-1.24 (-2.4)**	-1.97 (-1.5)	**3.59 (2.5)**

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

high multicollinearity level between the consumption variable and all lagged values of the ICC variable (.60 -.70 levels of correlation), which can seriously distort coefficients and significance levels. Removing the consumption variable from the model and rerunning all the tests reduced explained variance modestly (7% points), but left all variants of the ICC variable statistically insignificant. For this reason, we also conclude the ICC variable is not truly systematically related to inventory demand.

5.3. CONCLUSIONS REGARDING THE RELATIONSHIP OF ICC TO INVESTMENT

Based on the Table 5 results and the above analysis, we conclude the ICC is not systematically related to total investment or any of its three component parts when we have controlled for other variables related to investment.

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

Since businesses plan for the future, they may gear their plans to consumer expectations are for the future, rather than their current confidence levels. To test this hypothesis, we repeat our investment testing procedure from above, changing only the measure of consumer confidence from the ICC to its subcomponent, the Index of Consumer Expectations (ICE). Table 6 below presents findings regarding the relationship of total investment to the ICE.

Only one of the ICE variants tested in Table 6 was found to have the right sign and be significantly related to total investment when other variables known to affect total investment were controlled for, the ICE average for the past two years: (ICE_{AV-1-2}.).

Additional testing of the component parts of investment was undertaken. Control variables used for each component part were the same as used above in testing the ICC. These variables will be used as controls on other factors affecting the particular subcomponent of investment being tested. Results of retesting individual components of investment by adding the ICE variable to the baseline model are presented in Table 6 below. The results indicate the regression coefficient and t-statistic obtained for the ICE variable used in the test.

Results shown in Table 6 indicate the Conference Board's ICE measure of consumer expectations is unrelated to plant and equipment investment. However, investment in housing was found positively related to the average ICE for the current and past two years ($ICE_{AV0-1-2}$), and inventory investment negatively related for the same period. Both of these results are significant in the theoretically right direction. Hence, there appears to be evidence both housing and inventory investment are systematically related to the ICE average for the current and past two years. In addition, inventory investment also appears negatively related to the 0-3, 0-4 and 0-5 year ICS average values. However, we evaluate these findings as spurious: They are highly correlated

with the consumption control variable in the inventory function, and when it is removed and the model retested, only the (0,-1,-2) average lag remains significant. The other average lag values also become insignificant if either the 0 or -2 lag is dropped from the average, again indicating only the (0,-1,-2) lag average is fundamentally significant, and that the others are significant only because of their capacity to function as proxies.

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

Lag Used	Plant &Equip. β (t)	Housing β (t)	Inventories β (t)	Total Investment β_T (t)	Total Investment[1]
0	- .29 (-1.6)	.13 (0.9)	- .42 (-1.4)	-1.19 (-3.5)	- .28 (-0.8)
-1	.34 (1.8)	.03 (0.2)	.36 (1.1)	.61 (1.6)	.61 (1.8)
-2	- .06 (-0.2)	.37 (1.8)	- .56 (-1.3)	.14 (0.2)	.01 (0.0)
-3	- .02 (-0.1)	- .28 (-1.6)	.00 (0.1)	- .04 (-0.1)	.00 (0.0)
-4	- .04 (-0.3)	- .23 (-1.9)	- .04 (-0.1)	- .27 (-1.0)	- .15 (-0.8)
-5	- .19 (-1.1)	.23 (1.4)	- .19 (-0.6)	- .46 (-1.1)	- .42 (-2.3)
-6	.12 (0.6)	.10 (0.6)	.19 (1.2)	.30 (0.7)	.64 (3.3)
AV_{0-1}	.20 (0.7)	.26 (0.7)	- .06 (-0.1)	- .85 (1.1)	.74 (1.6)
AV_{-1-2}	.39 (0.9)	.46 (1.3)	- .13 (-0.4)	**1.23 (2.0)**	**1.13 (2.0)**
AV_{0-1-2}	.08 (0.1)	**.97 (2.3)**	**- .87 (-2.1)**	- .75 (-0.8)	.83 (1.0)
$AV_{0-1-2-3}$	.10 (0.1)	1.15 (1.8)	**-1.51(-3.1)**	-1.25 (-1.1)	1.48 (1.1)
$AV_{0-1-2-3-4}$	- .04 (-0.0)	- .06 (-0.1)	**-2.01 (-2.4)**	-3.51 (-2.1)	.44 (0.3)
$AV_{0-1-2-3-4-5}$	- 1.21 (-1.0)	1.29 (1.4)	**-2.76 (-2.4)**	-5.19 (-2.9)	-3.22 (-2.2)
$AV_{0-1-2-3-4-5-6}$	- .81 (-0.8)	1.81 (1.1)	-1.72 (-1.3)	-3.69 (-2.6)	1.88 (0.9)

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

Table 6 also presents two sets of findings for total investment, one of which is based on a larger number of control variables than the other. These findings are more difficult to evaluate. For (Total Investment[1]) all variables found related to any individual part of investment were used as controls. The findings indicate a positive and significant finding for the (-1-2) year ICE average. The same is true for the findings using the smaller number of control variables. However, both of these findings are considered problematic. Neither represent the same three year average lag found significant for the individual components of total investment (0,-1,-2), and neither have any of their component parts found significant. It is true that the two components found significant (housing and inventories) do not have a total investment finding of significance for the same lag. However, these two components only total about 1/3 of total investment in an average year, and the component typically accounting for two thirds was found unrelated. Hence, it is more likely that our finding for total investment and ICE should

be one of statistical insignificance, except for one spurious result. We would also add that the findings for the two year total investment average were barely significant at the five percent level, while the findings for the three year average for the parts were stronger.

6.3. CONCLUSIONS REGARDING THE RELATIONSHIP OF ICE TO INVESTMENT

Based on the Table 6 results, we found the three year average value of the index of consumer expectations ($ICE_{AV0-1-2}$) systematically related to housing investment and inventory investment. With one exception which we considered spurious, no relation to total investment was found.

Revised baseline models for housing and inventory , incorporating these results, are shown below:

<u>Demand For Residential Housing (Revised Model):</u>

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

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} $\beta_{2G}(t)$	$\|\Delta r_{\,MORT}Y_{-4}\|$ $\beta_3(t)$	$\Delta ACC_{\,t}$ $\beta_4(t)$	$\|\Delta(Y\text{-}T_G)$ $\beta_5(t)$	$\|\Delta DJ_{\,t\text{-}2}\|$ $\beta_6(t)$	$\Delta\,POP_{16\text{-}24}$ $\beta_7(t)$	$\|\Delta\,XR_{AVt\text{-}(t\text{-}3)}$ $\beta_8(t)$	$\|\Delta ICE_{\,AV0\text{-}1\text{-}2}$ $\beta_9(t)$
90/85% (1.8)	|-.026(-2.6)|	.18 (4.7)	|-.07(-0.6)|	-1.95(5.2)|	.03 (0.9)	|.07 (2.3)	|-.26(-2.2)|	295.3(2.0)|	-.39 (-0.5)	|-.97 (2.3)

Note: Accelerator Used Is $\Delta(Y\text{-}T_G)$
Source: Heim, 2009B, Table 11, augmented to include $ICE_{AV0-1-2}$ and reestimated.

<u>Demand For Inventories(Revised Model):</u>

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

R^2/Adj.R^2 (DW) B (t-stat.**)	$\|\Delta ACC_{\,0}\|$ $\beta_{1T}(t)$	$\Delta T_{G(0)}$ $\beta_{2T}\,(t)$	ΔG_{0} $\beta_{2G}(t)$	$\|\Delta r_{PR\text{-}2}Y_{-4}\|$ $\beta_3(t)$	ΔC_{0} $\beta_4(t)$	$\|\Delta DEP_{\,0}\|$ $\beta_5(t)$	$\|\Delta ICE_{\,AV0\text{-}1\text{-}2\text{-}3}$ $\beta_6(t)$
71/64% (2.3)	| .18 (5.3)	| .20 (4.2)	|.00 (0.0)	|-.77(-1.8)	|-.14(-2.6)	| .44 (2.1)	|- .87 (-2.1)

Source: Heim, 2009C, Table 14, augmented to include $ICE_{AV0-1-2-3}$ and reestimated.

6.3.1. ESTIMATED IMPACT ON 2009 GDP OF ICE DECLINE IN 2008

We take as our best evidence of the impact of ICE on total investment, the sum of our estimates of ICE's impact on housing and inventory investment, the two parts of investment found significantly related to the ICE. This procedure is the same as that used in Section 3.3.1 when estimating consumption effects.

The Conference Board's ICE averaged 86.39 in 2007 and declined to an average of 49.98 for 2008, a drop of 36.41 points. Our results above suggest this would have had

a minus impact on housing demand in 2009 equal to $(0.97)^* (\Delta ICE_{AV0-1-2}) = (0.97)^*(2/3^* -36.41) = -\$25.02$ billion (1996 dollars), where the 2/3 refers to the fact that changes in 2008 have one third of the total effect that year and another 1/3 in 2009, making the total effect in 2009 two thirds of the total effect over the three years the ICE average will be adjusting to show the 2008 change.

The same decline suggests that positive inventory investment may have occurred (unintentionally) in 2009 equal to $(-0.87)^*(\Delta ICE_{AV0-1-2}) = (-0.87)^* (2/3^* -36.41) = \$+24.27$ billion (1996 dollars) inventory investment.

The net of the two effects is $+0.75 billion (1996 dollars). The GDP deflator has increased approximately 30% since then, so the estimated net effect on 2009 investment in 2009 dollars would be $0.98 billion. Our estimated multiplier effect on the GDP of this exogenous change is 5.88 (Heim 2008B). Hence the total effect on the GDP through the investment channel, is 5.88 * $-0.98 = $-5.76 billion.

Our earlier finding (Sections 3.3.1and 4.1) that though the effect of the ICE though the consumption channel was not significant, the effect through the consumption channel of the ICC was, and the drop in the ICC in 2008 caused an estimated loss of $ -263.8 in the 2009 GDP through this channel. Adding the estimated net negative effects through the investment channel resulting from declining housing investment almost offsetting inventory accumulation increases this loss by $5.76 billion.

 This increases our estimate of the net negative effect of 2008 changes in consumer confidence on the 2009 GDP, as measured by the Conference Board's ICC and ICE indices, to $ -269.56 billion.

7.0 ESTABLISHING DIRECTION OF CAUSATION: ALTERNATE APPROACHES

7.1. COMPARING ABILITY TO EXPLAIN VARIANCE: *C= ƒ(ICC)* *vs.* *ICC= ƒ(C)*

The tests in Sections 3 through 6 above test whether ICC or ICE are leading, or at least concurrent indicators of changes in consumption and investment. We need to also test whether they are lagging indicators, i.e., whether lagged values of consumer and investment spending better explain current consumer confidence, or vice versa as tested above.   One test would be to compare the regressions

Consumption = ƒ(Lagged Consumer Confidence)

With Consumer Confidence = ƒ(Lagged Consumption)

This test is undertaken with no other variables included. However, a constant term is added to avoid some regression results producing a negative R^2. This model provides a means of examining whether changes in consumer confidence are better related to subsequent changes in consumer demand behavior in or vice versa. Table 7 below

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 results are markedly different. Last year's ICS does a much better job of explaining Current year variance in consumption is much better explained by last year's ICC than vice versa. Hence, our direction of causation seems established as running from ICC to consumption. This is consistent with our Table 3B finding that even with appropriate controls for other variables that might be related to consumption, all three individual components of consumption were significantly related to one year lagged levels of the ICC.

Also, the two, three and four year lags of the ICC variable explained more variance in current consumption, than the same lags in consumption explain of current year ICC. The four, five and six year lags explained virtually none of the variance in either variable

Table 7
Variance In Consumption Explained By ICC (And Vice Versa)

Function Tested Consumption:	R^2	Function Tested Investment:	R^2
$C_0 = f(c, ICC_0)$	.54	$I_0 = f(c, ICC_0)$	.44
$C_0 = f(c, ICC_{-1})$	.18	$I_0 = f(c, ICC_{-1})$	.12
$C_0 = f(c, ICC_{-2})$	.04	$I_0 = f(c, ICC_{-2})$	.13
$C_0 = f(c, ICC_{-3})$	.08	$I_0 = f(c, ICC_{-3})$	.11
$C_0 = f(c, ICC_{-4})$	.00	$I_0 = f(c, ICC_{-4})$	.03
$C_0 = f(c, ICC_{-5})$	.00	$I_0 = f(c, ICC_{-5})$	.05
$C_0 = f(c, ICC_{-6})$	.00	$I_0 = f(c, ICC_{-6})$	.01
$ICC_0 = f(c, C_0)$	.54	$ICC_0 = f(c, I_0)$	.44
$ICC_0 = f(c, C_{-1})$	.00	$ICC_0 = f(c, I_{-1})$	.02
$ICC_0 = f(c, C_{-2})$	.08	$ICC_0 = f(c, I_{-2})$	.03
$ICC_0 = f(c, C_{-3})$	.07	$ICC_0 = f(c, I_{-3})$	.03
$ICC_0 = f(c, C_{-4})$	.00	$ICC_0 = f(c, I_{-4})$	.01
$ICC_0 = f(c, C_{-5})$	.00	$ICC_0 = f(c, I_{-5})$	.02
$ICC_0 = f(c, C_{-6})$	.01	$ICC_0 = f(c, I_{-6})$	.01

For investment, the results are the same. The variance explained is much higher when current investment is run as a function of the past three years' ICC than when the ICC is run as a function of lagged investment for the same periods. For lags 4-6 the ICC also explained variation in investment better than investment could explain variation in ICC

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 tin Table 8 below:

Table 8
Pairwise Granger Causality Tests

Null Hypothesis :	Test Results			
	Reject/Don't Reject@5% Level;(F-Stat. Prob. Level)			
	C_T	C_D	C_{ND}	C_S
2 Lags.				
ICC does not Granger Cause C	Don't (.44)	Don't (.30)	Don't (.48)	Don't (.54)
C does not Granger Cause ICS	Don't (.11)	Don't (.06)	Don't (.22)	Don't (.18)
4 Lags.				
ICS does not Granger Cause C	Don't (.61)	Don't (.78)	Don't (.60)	Don't (.72)
C does not Granger Cause ICS	Don't (.32)	Don't (.22)	Don't (.50)	Don't (.26)

For both the two and four lag tests, the results were unclear as to direction of causation; neither null hypothesis could be rejected for either total consumption or its parts.

The Granger results indicate there is insufficient information to determine whether consumer confidence causes (lags) consumption or vice versa. However, Granger results are not consistent with our previous R^2 tests in Table 7 which showed a fairly strong relationship of last year's ICC and this year's consumption levels, and virtually no relationship the other way around. The Table 7 results are consistent with our findings in Section 3.3, indicating that demand for each part of consumption can be shown to be systematically related to lagged values of consumer confidence, even controlling for other variables affecting consumption.

8.0. REFERENCES

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