The Impact of Consumer Confidence on Consumption and Investment Spending

John J. Heim
Rensselaer Polytechnic Institute

Is consumer demand directly affected by changes in consumer confidence, or does consumer confidence simply reflect earlier changes in income, wealth and interest rates that affect consumer demand. This study finds changes in consumer confidence have a major impact on consumer demand. Consumer demand models, similar to Fair's econometric models are tested. Results are compared with VAR methods used by others. Examined for the first time, is whether consumer confidence also affects investment decisions. The measures examined are the Conference Board's Indices of Consumer Confidence (ICC) and Consumer Expectations (ICE). Results suggest causation runs from consumer confidence to consumption and investment, and not the other way around. Results also indicate the ICC is systematically related to consumer spending and the ICE had some impact on investment spending. Effects of declining consumer confidence in 2008 on the GDP in 2009 are estimated and found to explain much of the 2009 decline.

INTRODUCTION AND ANALYSIS OF THE MODEL

If income or wealth decline, theory leads us to expect declining consumption. But, does consumer confidence itself affects consumer spending, controlling for changes in an individual's income or wealth? If consumer confidence is important and can independently influence spending, i.e. through "fear itself" as Roosevelt might have said, public officials must be careful to avoid hyperbole when reporting bad economic news, so as not to create a self fulfilling prophecy. Many believe confidence levels to be important. For example, Carroll, Fuhrer and Wilcox, (1994) note the 1990 collapse of consumer confidence "frequently was cited as an important – if not the leading – cause of the economic slowdown that ensued". 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 chair of the President's Council of Economic Advisors also 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, the managerial implications are that consumer confidence, and particularly public pronouncements by business and government leaders which affect it, may be an important determinant of the level of economic activity. Hence, the need to scientifically examine whether in fact consumer confidence has an independent effect on the economy.

Using methods similar to those used here, Heim (2009E) examined another measure of consumer confidence, the University of Michigan's Index of Consumer Confidence (ICS), and found the ICS related only 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 methods (VAR – based) 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 goods, 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 income as a control variable, to see if ICS significantly contributed to explained variance.

The best known study of the Conference Board's Indices of Consumer Confidence (ICC) and Consumer Expectations (ICE) to date is Bram and Ludvigson's (1998) study. It also used a VAR – like methodology derived from Carroll, Fuhrer and Wilcox, but added interest rates and stock market values to the controls. They found total consumption, motor vehicles consumption and other durable goods 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 implies nondurables spending was not related to the ICC. Using the ICE, they found total consumption, motor vehicles consumption and services consumption significant. Hence, the findings for different types of spending were mixed. They also examined the University of Michigan Indices finding them related to fewer categories of consumer spending: only goods consumption, exclusive of motor vehicles, was found related to the ICS, and only motor vehicles consumption was found related to the ICE.

Their study tested a model of the following type:

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

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. The test is designed to see if adding the ICC or ICE to regressions on the other predictor variables increased forecasting ability.

However, models using dependent variable lags on the right side are biased and inconsistent (Hill, Griffith, Judge 2001), therefore interpretation is problematic. In addition, parameters for exogenous variables can be difficult 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, meaning of the results.

The models tested in this paper will be of a more explanatory type. All variables other recent and historical studies have found to be determinants of consumer behavior will be included as controls, using only lagged values of these variables found significantly related to the dependent variable (and theoretically justifiable). Past values of the dependent variable are not used on the right side. They are but functions of past values of the exogenous variables, which this study attempts comprehensively and explicitly to include, where warranted.

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 explain what makes the economy work, or predict where it will go in the future. For example, let consumption be 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.

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

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

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

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

$$C_0 = (1/1-\gamma)\, \alpha + (1/1-\gamma)\, \beta_1 Y_{-1} + (1/1-\gamma)\, \beta_2 ICC_{-1} \quad (3)$$

Using this process, Professor Fair's consumption equations (Fair 2004), which we would characterize as predictive, can be easily converted to explanatory models.

METHODOLOGY

The models tested below are of the type shown in (3) above. Empirical tests are linear in their variables and in their effects. Variables used as determinants of consumption, and the specific lagged value used with each, will be taken from previous studies of which variables/lags seem to explain the most variance in consumption. These will be used as control variables. Individual lagged values of ICC or ICE will be added to these previously tested models to, using the same data set they used, to see if they are significantly related to consumption. "t"-statistics on the added ICS or ICE variables are used to evaluate the results.

Regression results for all models tested 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

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. Note that even in 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 the effect of consumer confidence on consumption spending. It tests whether changes in consumer confidence are lagging, leading or concurrent indicators of changes in consumer and/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 structural econometric models like Fair (2004). Annual data for1960-2000 was used, taken from the 2002 Economic Report of the President, or other related 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. 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. Retesting was limited to the 1967 – 2000 availability of the ICC and ICE data.

The 2009A paper assumed that the demand for consumer goods was principally driven by factors suggested by Keynes (1936): income, wealth, fiscal policy (taxes) and possibly the rate of interest. Keynes also noted the need for saving might affect consumption spending. Two other factors were added to this demand model.

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 "current period only" income variables explain far more variance in consumption than do Friedman/Modigliani average income formulations (suggesting these averages mainly 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 explained by the other variables in the demand model. 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 of each variable explaining the most variance was the one added to the stepwise model. Each new variable is added and tested, using its current year value and the preceding four years values, to determine which lag level best explain current consumption.

Results on a consumer demand function of the following type explained 92% of the variance in consumer spending during the 1960 - 2000 period:

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

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 rate changes (Heim, 2007)

The actual regression results obtained were as follows:

ΔC_0	$=.66\Delta(Y\text{-}T_G)_0$	$+.48\Delta T_{G(0)}$	$+.06\Delta G_0$	$-6.81\,\Delta PR_0.$	$+.69\,\Delta DJ_{-2}$	$+1.39\,\Delta XR_{AV0123}$	$R^2 = 92\%$
(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, which 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 this rate was:

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

Further testing also indicated two other variables systematically affected overall consumer demand and were added to the "baseline" model: demand for new housing (HOUSE), since it affects demand for durables (new appliances), 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:

ΔC_0	$=.51\Delta(Y\text{-}T_G)_0$	$+.45\Delta T_{G(0)}$	$+.05\Delta G_0$	$-5.61\,\Delta PR_0.$	$+.74\,\Delta DJ_{-2}$	$+2.71\,\Delta XR_{AV0123}$	$+.36\,\Delta HOUSE$	$+009\Delta POP$	$R^2 = 93\%$
(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), their t statistics decline markedly compared to other tests, as does the regression coefficient on disposable income. 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 to this baseline model and retest. If the t-statistic on the regression coefficient for ICC or ICE is significant at the 5% level or above, we conclude it is systematically related to consumption.

Estimating Investment Demand: Methodology

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

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).

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

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

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. The actual regression results are taken from Heim (2009B). This study had shown these variables would explain 90% of the variance in total investment demand 1960-2000. The econometric results are shown below. Variables are listed in order of their contribution to explained variance (R^2) using the previously mentioned stepwise regression procedure:

$$\Delta I = .43\ \Delta TG\ -.39\Delta G\ +.29\Delta ACC + .86\Delta DEP - 1.17\Delta PR\text{-}2 * Y\text{-}4\ +.50\ \Delta DJ\text{-}1\ +.38\ \Delta PROF\text{-}1 + 3.77\ \Delta XRAV0123\ +.17\Delta CAP\text{-}1 \quad R^2=.90$$
$$(t =)\quad (4.4)\quad (-2.2)\quad (8.5)\quad (3.0)\quad (-2.5)\quad (3.2)\quad (2.6)\quad (2.2)\quad (0.2)\quad DW = 2.3$$

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. If the t-statistic on the regression coefficient for the ICC or ICE variable is significant at the 5% level or above, we will conclude that it does explain variance otherwise unexplained by a well specified investment function.

SENSITIVITY OF CONSUMER DEMAND TO THE (ICC)

The Index of Consumer Confidence was added to the baseline consumption model given in section 2.1, and the model reestimated for each of a number of different lagged values of the ICC. The lags included individual year lags from the current year value (ICC_0), through (ICC_{-5}). Various multiyear averages of the index, from ICC_{AV0-1} through $ICC_{AV0-1-2-3-4-5-6}$ are also tested.

Overall consumption spending is made up of three quite different subcomponents: demand for durable goods, demand for non durable goods and demand for services. The Heim (2009A) study found the following to be the determinants of each type, using the stepwise regression technique previously mentioned (Heim, 2009A, pp.8, 10 and 12):

Consumer Durables:

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

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_{1t}(t)$	$\Delta\, T_G$ β_{2T} (t)	ΔG $\beta_{2G}(t)$	ΔXR_{AV0123} $\beta_3(t)$	$\Delta\, DJ_{t-2}$ $\beta_4(t)$	$\Delta MORT$ $\beta 6_7(t)$	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:

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

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_1(t)$	$\Delta\, T_G$ β_{2T} (t)	ΔG $\beta_{2G}(t)$	$\Delta\, DJ_{-3}$ $\beta_3(t)$	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:

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

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_1(t)$	$\Delta\, T_G$ β_{2T} (t)	ΔG $\beta_{2G}(t)$	ΔPOP $\beta_3(t)$	DJ_{-2} $\beta_4(t)$	Δ16-24/65 $\beta_5(t)$	$\Delta MORT$ $\beta_6(t)$
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)*

All variables above are as previously defined except (MORT), the current year nominal interest rate on mortgages, and Δ(16-24/65), the percent of young adults in the population relative to older adults. The theory was that young adults, either because they are students, or just forming households, have less money to spend on services.

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 (B) AND T-STATISTICS (T) FOR VARIOUS LAGGED ICC VARIABLESUSING 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.

As shown in Table 3, 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 total consumption spending as well as spending on each of its three components: durable goods, nondurable goods and services. For managers, the major implication of this is that it is not the declining consumer spending in 2009 (driven by large 2008 declines in ICC) that should dominate their planning for 2010, but the rising levels of consumer confidence seen in the 2009 ICC which will affect spending next year.

We do notice in Table 3 the ICC_{-4} 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, and ignore it. 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 the (-1) lag which was found significant.

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 the same as those used in Table 3 above for each component of total consumption.

Consumer Durables (Revised Model):

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

R^2/Adj.(DW)	$\Delta(Y\text{-}T_G)$ $\beta_{1t}(t)$	ΔT_G $\beta_{2T}(t)$	ΔG $\beta_{2G}(t)$	ΔXR_{AV0123} $\beta_3(t)$	ΔDJ_{t-2} $\beta_4(t)$	$\Delta MORT$ $\beta(t)$	ΔPR $\beta_5(t)$	$\Delta HOUSE$ $\beta_6(t)$	ΔPOP $\beta_7(t)$	ΔICC_{-1} $\beta_8(t)$
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):

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

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 $\beta_5(t)$	ΔICC_{-1} $\beta_6(t)$
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):

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

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 $\beta_5(t)$	$\Delta MORT$ $\beta_6(t)$	ΔICC_{-1} $\beta_6(t)$
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

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

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

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

Estimated Impact of ICC Decline During 2008 on GDP

The control variables used when estimating the impact of the ICC on each part of consumption were those found to be statistically significant determinants of each part. One would think the best model to use when testing total consumption would be one including as controls all variables found to be significant determinants of any of the individual parts of consumption. However, other studies (Heim 2009A&B) have shown that regression estimates of effects of a variable on parts of a total, such as our tests of the effect of income on different parts of consumption, do not sum to the coefficient obtained when testing the whole, unless the determinants of each of the parts is exactly the same. Here, we have found that different determinants drive the different parts of consumption spending. In this case, we take the sum of our individual estimates of ICC's impact on each of consumption's three parts to be our best estimate of the impact of ICC on total consumption. This procedure is also used later in this paper (Section 6.2) 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 impact of the change in the Index during 2008 is 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 $267.6 billion in section 6.2 after including investment effects).

This result is for the largest annual decline ever in the ICC. The BEA reports 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 zero for the second half, the overall growth rate will be approximately -1.62 %. This estimate suggests the drop in consumer confidence in 2008 so significantly may affect GDP as to account, alone, for an even larger drop of 1.9%, offset in part by other factors pushing GDP in the opposite direction. We conclude declining consumer confidence in 2008 significantly impacted the depths to which the GDP will fall in 2009. From the managerial perspective, the good news is that the recovery in consumer confidence witnessed so far in 2009 will almost certainly lead to significant growth in consumer spending in 2010, which managers should plan for. (Historically, there were other years in which the CCI dropped significantly. The drop in 1979 was 14.1 points; in 1974 it was 27.4 points. These were also 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 changes in consumer confidence are a factor about three quarters of the time, they typically have less than half the estimated impact of the 2008 change.

CONSUMER DEMAND: TESTING 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 the ICE, with exactly the same controls. *Here again, the results were strikingly consistent: in this case, no lagged variant of the ICE whatsoever was found significantly related (with the theoretically correct sign) to either total consumption or any of its parts.* The one exception was the (ICE_{AV-1-2}) variant. We consider a spuriously significant finding, since neither of its two component lags was found significantly related to total consumption.

SENSITIVITY OF INVESTMENT DEMAND TO THE (ICC)

The investment model in Section 2.2 includes most variables commonly thought to influence investment. Econometric estimates of the model 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 =2.2

To this model, the Conference Board's Index of Consumer Confidence (ICC) variable was added, and the model re-estimated. This was done to test the hypotheses that businesses expect changes in consumer confidence to affect consumer spending, and tailor their investment decisions accordingly. The model above was tested with a wide range of different individual and average ICC lags. T-statistics for the ICC variable were used as the criteria for evaluation. In all cases the ICC was found insignificant (or had the wrong sign).

Should we presume that controlling for variables found to be significant determinants of total investment provide an adequate set of controls when testing individual parts of investment? Heim (2009B&D) found that factors not significant when testing total investment, sometimes were significant determinants of individual, smaller parts of investment: plant and equipment, housing or inventories. This lack of significance in total investment may occur because the variation in total investment was much larger than for the individual part, and the variable found significantly related to the part was "drowned out" when regressed against total investment. For example, three variables found significant in explaining housing investment (about a third of total 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 their statistically significant determinants.

After extensive examination of a wide range of factors (and lags), the variables shown below seemed most systematically related to spending on the three individual parts of investment.

Demand For Plant And Equipment

$\Delta I_{P\&E(t)} = f$ [$\beta_{1T\text{-}2G}\ \Delta$ 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)	ΔDJ_{t-1}	$\Delta PROF_{t-1}$	$\Delta T_{G(t)}$	ΔG_t	ΔDEP_{t-1}	$\Delta XR_{avt-(t-3)}$	$\Delta ACC{=}\Delta Y_t$	$\Delta r_{t-3}{*}Y_{t-5}$	ΔCAP_{t-1}
B (t-stat.***)	β_{1T}(t)	β_{1G} (t)	β_3(t)	β_2(t)	β_4(t)	β_5(t)	β_6(t)	β_7(t)	β_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:

$\Delta I_{RES(t)} = f$ [$\beta_1\ \Delta Y\text{-}T_{G(t)}$, $\beta_{2T\text{-}2G}\ \Delta$Crowd Out Variable(s)$_t$, $\beta_3\ \Delta Acc_t$, $\beta_4\ \Delta r_{t-2or3}{*}Y_{t-4or5}$, $\beta_5\ \Delta DJ_{-2}$, $\beta_6\ \Delta P_{HOUSE(t-1)}$, $\beta_7\ \Delta POP_{16\text{-}24(t)}$, $B_8\ \Delta XR_{AVt\ to\ (t-3)}$]

R^2/Adj.R^2 (DW)	$\Delta P_{HOUSE(-1)}$	$\Delta T_{G(t)}$	ΔG_{tt}	$\Delta r_{MORT} Y_{-4}$	ΔACC_t	$\Delta(Y\text{-}T_{G(t)})$	ΔDJ_{t-2}	$\Delta POP_{16\text{-}24}$	$\Delta XR_{AVt-(t-3)}$
B (t-stat.**)	β_{1T}(t)	β_{2T} (t)	β_{2G}(t)	β_3(t)	β_4(t)	β_5(t)	β_6(t)	β_7(t)	β_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, $\beta_2\ \Delta DEP_t$, $\beta_{3T\text{-}3G} \Delta$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)	ΔACC_0	$\Delta T_{G(0)}$	ΔG_0	$\Delta r_{PR-2} Y_{-4}$	ΔC_0	ΔDEP_0
B (t-stat.**)	β_{1T}(t)	β_{2T} (t)	β_{2G}(t)	β_3(t)	β_4(t)	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 Index of Consumer Confidence (ICC) variable, each ICC variant was added to the baseline models and retested.

Conclusions Regarding the Relationship of ICC to Investment

As a resulting of the retesting, we conclude the ICC is not related to total investment or any of its three parts when we have controlled for other variables that can influence investment. Individual lagged variants of the ICC were almost always found statistically insignificant. In the few cases where there was a significant finding (e.g., the ICC was found significantly related to housing investment five years later, but no other year before or after five was related), it appeared to be related for spurious reasons, not reason grounded in investment theory.

INVESTMENT AND THE INDEX OF CONSUMER EXPECTATIONS (ICE)

Businesses operate based on plans for the future. These plans may reflect their sense that consumer expectations for the future are the likely basis for consumer future spending. To test this hypothesis, we repeat the investment testing procedure used with the ICC, changing only the measure of consumer confidence from the ICC to its subcomponent, the Index of Consumer Expectations (ICE). Table 4 below presents findings for total investment and the ICE.

Only one ICE variant was found to have the right sign and be significantly related to total investment when other variables were controlled for: the past two years ICE average (ICE_{AV-1-2}).

Tests of the three parts of investment were also undertaken. Control variables were the same as described earlier and used when testing the ICC. These results are also presented in Table 6 below, and show the regression coefficient and t-statistic obtained for each variant of ICE tested.

Consumers' future expectations were found unrelated to business decisions to invest in plant and equipment. However, residential housing spending was found positively related to the average level of the ICE for the current and past two years ($ICE_{AV0\text{-}1\text{-}2}$), and inventory investment was negatively related to the ICE for the same period. These two results nearly cancel each other out in terms of their net impact on investment. 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 0-3, 0-4 and 0-5 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 significant.

TABLE 4
REGRESSION COEFFICIENTS (B) 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)	Total Investment[1] β (t)
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)
$AV_{0\text{-}1}$	.20 (0.7)	.26 (0.7)	- .06 (-0.1)	- .85 (1.1)	.74 (1.6)
$AV_{\text{-}1\text{-}2}$	.39 (0.9)	.46 (1.3)	- .13 (-0.4)	**1.23 (2.0)**	**1.13 (2.0)**
$AV_{0\text{-}1\text{-}2}$	.08 (0.1)	**.97 (2.3)**	**- .87 (-2.1)**	- .75 (-0.8)	.83 (1.0)
$AV_{0\text{-}1\text{-}2\text{-}3}$	.10 (0.1)	1.15 (1.8)	**-1.51(-3.1)**	-1.25 (-1.1)	1.48 (1.1)
$AV_{0\text{-}1\text{-}2\text{-}3\text{-}4}$	- .04 (-0.0)	- .06 (-0.1)	**-2.01 (-2.4)**	-3.51 (-2.1)	.44 (0.3)
$AV_{0\text{-}1\text{-}2\text{-}3\text{-}4\text{-}5}$	- 1.21 (-1.0)	1.29 (1.4)	**-2.76 (-2.4)**	-5.19 (-2.9)	-3.22 (-2.2)
$AV_{0\text{-}1\text{-}2\text{-}3\text{-}4\text{-}5\text{-}6}$	- .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 4 also presents two sets of findings for total investment. 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, not just those found earlier to be statistically significant determinants of total investment. Both total investment models indicate the (-1-2) year ICE average significantly related to total investment, and with the right sign. However, both of these findings are considered problematic. Neither represent the same three year average lag found significant for the housing and inventory components of total investment (0,-1,-2), and neither have any of their component parts at the same lag level significantly related to the ICE.

One could argue as well that the two components found significant (housing and inventories) did not have a finding of significance for total investment for the same lag. However, these two components include only about 1/3 of total investment in an average year, and have offsetting effects. The component typically accounting for two thirds was found unrelated to ICE at this lag level. Hence, our conclusion for total investment's relationship to the ICE should be one of statistical insignificance, except for this seemingly spurious result. In addition, the findings for the two year total investment average were barely significant.

Conclusions Regarding the Relationship Of ICE to Investment

Based on the Table 4 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. However, no relationship with plant and equipment investment or total investment was found, with one exception, considered spurious. Revised baseline models for housing and inventory, incorporating these results, are shown below:

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

$$\Delta I_{RES(t)} = f\ [\beta_1\ \Delta Y\text{-}T_{G(t)},\ \beta_{2T\text{-}2G}\ \Delta \text{Crowd Out Variable(s)}_t,\ \beta_3\ \Delta Acc_t,\ \beta_4\ \Delta r_{t\text{-}2or3} {*} Y_{t\text{-}4or5},\ \beta_5\ \Delta DJ_{-2},\ \beta_6\ \Delta P_{HOUSE(t)},\ \beta_7\ \Delta POP_{16\text{-}24(t)},\ B_8\ \Delta XR_{AVt\ to\ (t\text{-}3)}]$$

R^2/Adj.R^2 (DW) B (t-stat.**)	$\Delta P_{HOUSE(t)}$ β_{1T}(t)	$\Delta T_{G(t)}$ β_{2T} (t)	ΔG_{tt} β_{2G}(t)	$\Delta r_{MORT} Y_{-4}$ β_3(t)	ΔACC_t β_4(t)	$\Delta(Y\text{-}T_G)$ β_5(t)	$\Delta DJ_{t\text{-}2}$ β_6(t)	$\Delta POP_{16\text{-}24}$ β_7(t)	$\Delta XR_{AVt\text{-}(t\text{-}3)}$ β_8(t)	$\Delta ICE_{AV0\text{-}1\text{-}2}$ β_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 $ICE_{AV0\text{-}1\text{-}2}$ 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.**)	ΔACC_0 β_{1T}(t)	$\Delta T_{G(0)}$ β_{2T} (t)	ΔG_0 β_{2G}(t)	$\Delta r_{PR\text{-}2} Y_{-4}$ β_3(t)	ΔC_0 β_4(t)	ΔDEP_0 β_5(t)	$\Delta ICE_{AV0\text{-}1\text{-}2\text{-}3}$ β_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 $ICE_{AV0\text{-}1\text{-}2\text{-}3}$ and reestimated.

Estimated Impact of Ice Decline in 2008 on 2009 GDP

Our best evidence of the impact of ICE on total investment is 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 3.2 when estimating the impact of the ICC on total consumption.

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)* ($\Delta ICE_{AV0\text{-}1\text{-}2}$) = (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 3.2 and 4.1) was that the ICE did not significantly affect consumption. However, the effect of the ICC on consumption was significant. The drop in the ICC in 2008 was associated with an estimated 2009 GDP loss of $ 263.8. Adding the estimated net negative effects of the ICE through the investment channel resulting from declining housing investment almost offsetting inventory accumulation increases this loss by $5.76 billion (though felt over three years: 2008, 2009 and 2010 in $1.92 billion amounts each year.

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 $ -267.64 billion, with a lagged additional effect in 2010 of $1.92 billion.

ESTABLISHING DIRECTION OF CAUSATION: ADDITIONAL TESTS

Comparing Ability to Explain Variance: *C= f(ICC)* ***vs.*** *ICC= f(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 might better be explained as lagging indicators , i.e., changes resulting from earlier changes in consumption or investment. One test would be to compare the regressions

Consumption = *f* (Lagged Consumer Confidence)

With Consumer Confidence = *f* (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. Table 5 below shows results of such a test. R^2 values for the zero lag of one regressed on the zero lag of the other are the same, regardless of which is on the right side, as might be expected.

However, last year's ICC does a much better job of explaining current year consumption than vice versa. Hence, our direction of causation seems established as running from ICC to consumption. This is consistent with our Table 3 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. Lags greater than four explained virtually none of the variance in either variable. Investment results are the same.

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 6 below:

TABLE 5
VARIANCE IN CONSUMPTION EXPLAINED BY ICC (AND VICE VERSA)

Function Tested	R^2	Function Tested	R^2
Consumption:		Investment:	
$C_0 = f(c, ICC_0)$	.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

TABLE 6
PAIRWISE GRANGER CAUSALITY TESTS

Null Hypothesis :	Test Results: Reject/Don't Reject @ 5% Level; (F-Stat.)			
	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. Granger results are not consistent with our previous R^2 tests in Table 5 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 5 results were 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. Granger tests also employ a VAR - like methodology different from the structural model methods used elsewhere in this paper. A brief treatment of the differences in such models was given earlier in the introductory section.

REFERENCES

Abel, A., Bernanke, B and Croushore, D. (2008) *Macroeconomics. 6ed.* New York: Pearson Addison Wesley. 2008

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.

Consumer Confidence Survey 1967-2009. The Conference Board. Data Available at The Conference Board.Org.

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. Journal of *Applied Econometrics and International Development*. Vol. 9(2).

Heim, John, J. (2009D) U.S. Demand For different Types of Imported and Domestic Investment Goods. *Journal of Applied Econometrics and International Development* Vol. 10(1) (In Press)

Heim, John J. (2009E) Does Consumer Confidence, Measured by University of Michigan Indices, 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. 903*. August 2009.

Hill, R., Griffiths, W. and Judge, G. *Undergraduate Econometrics, 2ed*. New York: John Wiley & Sons. 2001

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.

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.