DO DEFICITS CROWD OUT PRIVATE BORROWING?
EVIDENCE FROM FLOW OF FUNDS ACCOUNTS

John Heim
Rensselaer Polytechnic Institute
heimj@rpi.edu

Number 1102
June 2011
ABSTRACT: Heim (2010) found a strong negative relationship between deficits and private consumer and investment spending, controlling for other key variables. The study did not directly test the mechanism by which deficits were related to consumer and investment spending, only the result. Crowd out theory hypothesizes the mechanism is consumer and investment credit shortages induced by borrowing-financed government deficits. This paper examines that mechanism directly, testing to see if private borrowing is related to deficits. It uses Federal Reserve Flow of Funds accounts data on borrowing. The paper finds a strong negative relationship between deficits and private borrowing, with deficits reducing private borrowing dollar for dollar. The borrowing estimates are very similar to the Heim (2010) estimates of deficit effects on consumer and investment spending, suggesting crowd out effects work through the borrowing channel and fully offset the stimulus effects of deficits. Flow of Funds data on savings and investment, for accounting reasons, confirm the econometric findings of full crowd out, provided savings remain constant. JEL Codes: C50, C51, E12, E21, E22

Keywords: Consumption, Investment, Deficits, Savings, Borrowing, Stimulus

1.0. INTRODUCTION

By “crowd out” we mean the reduction in loanable funds (savings) available to consumers and businesses that occurs when government borrows from the savings pool to finance deficits caused by, i.e., increased government spending or decreased taxes. Private borrowing is consistently used to supplement the purchasing power of consumer and business incomes, for example, when consumers buy a house or businesses borrow to buy new machinery. Crowd out, by reducing the savings available for such purposes, “crowds out” private spending, and this spending reduction offsets some or all of the stimulus effect of the government deficits.

Heim (2010) used a 23 equation econometric model of the U.S. economy to evaluate crowd out problems and the extent to which government deficits reduced private consumer and investment spending. Data were from BEA. The results indicated that when a government deficit variable representing crowd out was added to well specified consumption and investment equations, it showed a negative relationship between the deficit and private consumer and investment spending, was statistically significant, and added substantially to explained variance. The study did not directly show the mechanism by which deficits were related to consumer and investment spending. Crowd out theory requires that reduced private borrowing, induced by deficits, be the mechanism causing the decline. Since other factors were controlled for, this was inferred to be the cause. This paper tests the crowd out mechanism hypothesis directly, testing to see if private borrowing is related to deficits. It uses Federal Reserve Flow of Funds accounts data on consumer, business and government borrowing.

Using the same models of consumption and investment used by Heim (2010), plus additional controls for borrowing, the paper examines whether testing reveals

- a negative relationship between deficits and private borrowing
- a positive relationship between private borrowing and spending
- if adding private borrowing to the Heim (2010) models increases their ability to explain consumer and investment spending.
- If crowd out is a factor in recessions, since demand for borrowed funds drops. The 1981-83 recession period is examined to test this hypothesis.
2.0 THEORY OF CROWD OUT

2.1. THE NO - CROWD OUT MODEL

A typical demand driven model of the economy does not allow for borrowing - related crowd out. In such models the impact of taxes and government spending are derived using the GDP identity:

\[ GDP = Y = C + I + G + (X-M) \]  \hspace{1cm} (1)

A simple consumption function might be given as a linear function of disposable income \((Y-T)\)

\[ C = \beta(Y-T) \]  \hspace{1cm} (2)

substituting \(C\) into (1) gives

\[ Y = \frac{1}{(1-\beta)} \cdot \left[ -\beta T + I + G + X-M \right] \]  \hspace{1cm} (3)

MULTIPLIER EFFECT OF \(\Delta T, \Delta G\):

\[ \begin{array}{cc}
\text{Tax Multiplier} & 1/
(1-\beta) \\
\text{Spending Multiplier} & 1/
(1-\beta)
\end{array} \]  \hspace{1cm} (4)

The clear expectation of standard model demand theory is that tax changes in are expected to be negatively related to the GDP, with a multiplier effect \(-\beta/(1-\beta)\). Changes in government spending and net exports are related to GDP in the positive direction, with a multiplier effect \(1/(1-\beta)\) and should when tested, have the same coefficients. In Section 2 below, we will test these expected relationships to see if actual econometric estimates yield the predicted results for variables.

2.2. THE CROWD OUT MODEL

However, to test the hypothesis that savings used to finance consumer credit is diverted to finance government deficits, the simplified consumption function must be modified to add the crowd out - causing factor \((T-G)\), where \((T-G) = \) taxes minus government spending:

\[ C = \beta (Y-T) + \lambda(T-G) \]  \hspace{1cm} (5)

where lambda \(\lambda\) represents the marginal effect of deficit spending on consumer demand. With this function, the Keynesian model becomes

\[ Y = \beta (Y-T) + \lambda(T-G) + G + I + (X-M) \]  \hspace{1cm} (6)

\[ Y = \left[1/(1-\beta)\right] \left[(\beta + \lambda)T + (1-\lambda)G + I + (X-M)\right] \]

From which we can easily see that the impact of a change in \(T\) or \(G\) on the GDP depends on \(\lambda\) as well as \(\beta\), and the spending multiplier \(1/(1-\beta)\). The tax multiplier, showing the marginal impact of a change in taxes is now \((-\beta + \lambda)/(1-\beta)\). The spending multiplier, showing the marginal impact of a change in government spending, is now \((1-\lambda)/(1-\beta)\). Both \(T\) and \(G\) marginal effects on the GDP will be smaller (in absolute terms) than they would have been without crowd out effects.

Notice in Graph 1 below that actual real consumption tends(billions of 1996 dollars) to be below its normal trend as a function of disposable income in the 1980's and 1990's, a period of crowd out, until 1998 - 2000 when budget deficits (crowd out) disappeared and budget surpluses occurred. (the late 80's were an exception due to the "dot-com" bubble in the economy.)
We can expand this model to include effects of crowd out on investment spending. Assume a simple investment model in which investment is determined by real interest rates (r) and access to credit, which varies with the government deficit (T-G).

\[ I = \gamma(T-G) - \theta r \]  

(7)

where gamma (\(\gamma\)) indicates the marginal effect of crowd out (the government deficit) on investment spending, and (\(\theta\)) represents the marginal effect of real interest rates (r).

How the crowd out problem may affect investment is given in the following graph, where the top two curves show the average relationship of investment to GDP 1960-2000, and how actual investment deviates from the average values each year. Note particularly that during the high deficit years in the mid and late eighties, investment fell well below long term averages, but in the 1996-98 surplus years, actual investment exceeded long term averages. The lowest curve on the graph merely indicates the real dollar amount, by which actual investment exceeded predictions (read using left scale).

If we replace investment in the GDP identity with its hypothesized determinants, we obtain a typical Keynesian IS equation:

\[ GDP = Y = \left[ \frac{1}{1-\beta} \right] \left[ (-\beta+\lambda+\gamma)T + (1-\lambda-\gamma)G - \theta r + (X-M) \right] \]  

(8)

In this IS equation, the normal stimulating impact of tax cuts on the GDP (-\(\beta\)) is offset in part by the effects of deficit – induced changes in credit available to consumers and investors (\(\lambda+\gamma\)). Tax stimulus effects may switch from negative to positive if the crowd out effects (\(\lambda+\gamma\)) are larger than the disposable income effect (-\(\beta\)). The effect of a change in government spending is also reduced per dollar of expenditure from (1) to (1- \(\lambda-\gamma\)), and stimulus effects are either reduced or become negative. Again, the net exports multiplier effect stays the same, now becoming an even stronger stimulus relative to government spending or tax cuts. Results are shown in Table 1.
Table 1
EFFECTS OF CONSUMER AND INVESTMENT CREDIT CROWD OUT ON THE EFFECTIVENESS OF TAXES AND GOVERNMENT SPENDING STIMULUS

<table>
<thead>
<tr>
<th></th>
<th>Without Crowd Out</th>
<th>With Crowd Out</th>
<th>Without Crowd Out</th>
<th>With Crowd Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax coefficient</td>
<td>(-β)</td>
<td>(-β+ λ+ γ)</td>
<td>1</td>
<td>(1- λ- γ)</td>
</tr>
<tr>
<td>Tax Multiplier</td>
<td>(1-β)</td>
<td>(-β+ λ+ γ)</td>
<td>(1- β)</td>
<td>(1-β)</td>
</tr>
<tr>
<td>Government Spending Coefficient</td>
<td></td>
<td></td>
<td>(1- λ- γ)</td>
<td>(1-β)</td>
</tr>
</tbody>
</table>

2.3. OTHER STUDIES

Considering that the efficacy of a major part stimulus theory hangs on whether or not borrowing financed deficits crowd out private borrowing, and therefore private spending, there has been no scientific work done testing the connection of borrowing to deficits, and little done even indirectly, by testing the relationship between actual private spending and deficits.

That said, the popular press is full of discussion of crowd out effects that are based on the assumption that crowd out does or does not work. For example:

1. Chan, S. (NY Times, 2/7/10, p.A16): reported the I.M.F. warned on Jan. 26 that rising sovereign debt "could crowd out private sector credit growth, gradually raising interest rates for private borrowers and putting a drag on the economic recovery."

3. Krugman (New York Times, 9/28/09) notes that in recessions, the accelerator effect is likely to dominate any crowd out effect, leaving a net stimulus effect of government spending increases or tax cuts.

In the professional literature, studies examining crowd out have been entirely, or principally, reports on other people’s science (or lack of it), i.e., literature reviews. For example, Spencer and Yohe, (1970), in reviewing the literature, found that the dominant view the past two hundred years from all types of studies has been that government deficits cause crowding out. Friedman’s work (1978) is largely theoretical, though it contains some references to his and others’ empirical work. He shows portfolio theory suggests the LM curve may shift in response to an IS shift due to a fiscal stimulus like a government deficit, and that elasticity of substitution between bonds and stocks when interest rates rise (due to deficit borrowing) is key: elasticities less than one lead to crowd out; greater than one: crowd in. Therefore crowd out effects are indeterminate theoretically. Friedman’s own empirical tests, based on money demand models, were more ambiguous.

Gale and Orszag’s work (2004) does include some empirical testing indicating crowd out matters. Consumer demand was hypothesized to be a function of current and one period lagged Net National Product (NNP), government purchases, taxes, transfer payments, interest payments and the size of the government debt. A negative relationship between taxes and GDP were taken as a sign that crowd out, if it existed, was not complete. That said, their tested hypothesis did not include the government deficit as an explanatory variable. This can result in stimulus effects of tax cuts being overstated (Heim 2010, and section 2.2 above). Other tests also indicated a positive relationship between interest rates and deficits, taken as an indicator of crowd out, but does not address the fact that the interest rates most systematically associated with the GDP are exogenously determined rates, the federal funds and prime interest rates, not supply and demand driven rates (Heim, 2008).

Using a VAR methodology, Montford and Uhlig (2008) found investment falls in response to both spending increases and tax increases (finding the same sign on both spending and tax effects is inconsistent with both Keynesian stimulus theory and crowd out theory) The VAR specified consumption or investment as being a function of six lagged values of each of ten variables: GDP, C, G, Taxes, real wages, private non-residential I, adjusted reserves, the PPI index and the GDP deflator. Interpreting VAR model findings can be difficult, since the tested hypotheses typically are somewhat-atheoretical. Also using a VAR model, Blanchard and Perrotti (2002) when testing taxes and government spending obtained the same result for investment, but more Keynesian results for total output, and non-Keynesian results for consumption.

Furceri and Sousa (2009) examine 145 countries using a VAR methodology to determine if government spending as a % of GDP was related to consumption and investment spending as a % of GDP. They conclude government spending is adversely related. Fundamentally the model tests consumption and investment spending against right - side variables fixed effects variables for the individual countries and the current and four lagged values of the government spending/ GDP variable. While many of the government spending variables had statistically significant adverse effects, the lack of controls for other structural variables makes it difficult to be sure the finding truly represent the government spending effect, and not perhaps occur because government spending can proxy for non-included variables.

2.4. REAL GOVERNMENT DEFICITS

Table 2 below shows combined real federal, state and local government budget surpluses and deficits. It shows a period generally characterized as one of government surpluses up until 1970, sizable deficits from 1970 until 1992, major reductions in the deficit 1992-97 and surpluses 1998-2000.
TABLE 2
GOVERNMENT SURPLUS/DEFICITS 1960-2000 (BILLIONS OF 1996 DOLLARS)

<table>
<thead>
<tr>
<th>Year</th>
<th>Surplus/Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>$41.20</td>
</tr>
<tr>
<td>1960</td>
<td>65.74</td>
</tr>
<tr>
<td>1961</td>
<td>38.26</td>
</tr>
<tr>
<td>1962</td>
<td>42.29</td>
</tr>
<tr>
<td>1963</td>
<td>59.27</td>
</tr>
<tr>
<td>1964</td>
<td>38.10</td>
</tr>
<tr>
<td>1965</td>
<td>49.97</td>
</tr>
<tr>
<td>1966</td>
<td>51.98</td>
</tr>
<tr>
<td>1967</td>
<td>-6.18</td>
</tr>
<tr>
<td>1968</td>
<td>27.44</td>
</tr>
<tr>
<td>1969</td>
<td>74.70</td>
</tr>
<tr>
<td>1970</td>
<td>$-28.69</td>
</tr>
<tr>
<td>1971</td>
<td>-74.34</td>
</tr>
<tr>
<td>1972</td>
<td>-23.4</td>
</tr>
<tr>
<td>1973</td>
<td>14.209</td>
</tr>
<tr>
<td>1974</td>
<td>-13.21</td>
</tr>
<tr>
<td>1975</td>
<td>-174.8</td>
</tr>
<tr>
<td>1976</td>
<td>-112.2</td>
</tr>
<tr>
<td>1977</td>
<td>-73.48</td>
</tr>
<tr>
<td>1978</td>
<td>-17.9</td>
</tr>
<tr>
<td>1979</td>
<td>3.1822</td>
</tr>
<tr>
<td>1980</td>
<td>$-80.466</td>
</tr>
<tr>
<td>1981</td>
<td>-75.204</td>
</tr>
<tr>
<td>1982</td>
<td>-206.02</td>
</tr>
<tr>
<td>1983</td>
<td>-248.24</td>
</tr>
<tr>
<td>1984</td>
<td>-201.51</td>
</tr>
<tr>
<td>1985</td>
<td>-209.95</td>
</tr>
<tr>
<td>1986</td>
<td>-228.29</td>
</tr>
<tr>
<td>1987</td>
<td>-175.75</td>
</tr>
<tr>
<td>1988</td>
<td>-153.59</td>
</tr>
<tr>
<td>1989</td>
<td>-135.18</td>
</tr>
<tr>
<td>1990</td>
<td>$-200</td>
</tr>
<tr>
<td>1991</td>
<td>-253.4</td>
</tr>
<tr>
<td>1992</td>
<td>-335.7</td>
</tr>
<tr>
<td>1993</td>
<td>-294.9</td>
</tr>
<tr>
<td>1994</td>
<td>-214.8</td>
</tr>
<tr>
<td>1995</td>
<td>-181</td>
</tr>
<tr>
<td>1996</td>
<td>-115.4</td>
</tr>
<tr>
<td>1997</td>
<td>-21.91</td>
</tr>
<tr>
<td>1998</td>
<td>81.469</td>
</tr>
<tr>
<td>1999</td>
<td>151.34</td>
</tr>
<tr>
<td>2000</td>
<td>227.08</td>
</tr>
</tbody>
</table>


3.0 CONSUMPTION AND INVESTMENT DEMAND AS A FUNCTION PURCHASING POWER

To the extent borrowing-financed deficits utilize savings previously available for private borrowing, a problem only arises if consumer or business demand is driven by total consumer purchasing power, not just income purchasing power. We define total purchasing power manifested in the market place as a function not only of income, but borrowing. Let

\[(C_{BOR}) = \text{Net annual consumer borrowing} = \text{change in consumer indebtedness (}\Delta C_{DEBT}\text{) that period.}\]

Consumer indebtedness data are taken from the Federal Reserve’s Flow of Funds data. Changes in the level of consumer borrowing are given as: \(\Delta(C_{BOR})\).

\[(I_{BOR}) = \text{Net annual business borrowing} = \text{business indebtedness (}\Delta I_{DEBT}\text{) that occurs in that period.}\]

Business indebtedness data are taken from the Federal Reserve’s Flow of Funds data. Increases / decreases in the level of business borrowing are given as: \(\Delta(I_{BOR})\).

The basic theory is that both consumer and business money demand for goods and services is a function of consumer and business purchasing power, not just income, where purchasing power is defined as income, borrowing ability and any other factors (such as depreciation allowances) that influence how much is available to spend.

Clearly, for crowd out to matter, private spending must be driven by access to borrowing as well as income. Hence, we also have to show that private demand is better explained by purchasing power than by income alone, controlling for other relevant variables. The hypotheses to be tested (in first differences) are

\[\Delta(\text{consumption spending}) = f(\Delta\text{ Determinants of consumption, including the } \Delta \text{ in borrowing})\]

\[\Delta(\text{investment spending}) = f(\Delta\text{ Determinants of investment, including the } \Delta \text{ in borrowing})\]

4.0. METHODOLOGY
1960 - 2000 data on the determinants of consumption and investment spending from the *Economic Report of the President* and the *Flow of Funds Accounts* of the Federal Reserve were used to estimate the effects of a wide range of variables, including borrowing on consumption and investment spending. The specific variables are identified in later sections.

Two-stage least squares regression was used since both consumption and investment are driven in part by income related variables (disposable income or the accelerator), and therefore 2SLS was needed to avoid issues of simultaneity. Data was tested in first differences instead of levels to address nonstationarity, serial correlation and multicollinearity issues commonly found in time series data. Newey West corrections to standard errors were used to avoid heteroskedasticity problems.

### 5.0. FINDINGS: RELATIONSHIP OF CONSUMER BORROWING TO CONSUMER SPENDING

If we examine the effect of deficits on consumption, *holding consumer borrowing constant*, we should expect to see the deficit having a lesser, or no, crowd out effect on consumption. The observed effect may not drop to zero, since crowd out not only negatively affects consumption, but also investment. Declining investment may have secondary effects on consumption because its decline reduces income and taxes, increasing the deficit, causing secondary declines in consumption. Therefore, controlling for the level of consumer borrowing may not fully eliminate the observed effect of the deficit on consumption, but should at least reduce it from the levels found in Heim (2010) where borrowing was not controlled for.

Heim's (no borrowing control) consumption function for domestically produced consumer goods was

\[
\Delta C_{D} = 39\Delta(Y-T) + .18\Delta(T-G) - 2.67\Delta PR + .42\Delta DJ_{2} - 0.25\Delta XR_{AV} - 418.90\Delta POP_{16} + 0.01\Delta POP + 23\Delta ICC_{1} + 37.75\Delta M2_{AV}
\]

Where

- \(C_{D}\) = real domestically produced consumer goods and services
- \((Y-T)\) = real disposable income
- \((T-G)\) = real government deficit
- \(PR\) = real prime interest rate
- \(DJ_{2}\) = a measure of wealth (Dow Jones Composite Index), lagged two years
- \(XR_{AV}\) = exchange rate average for current and past three years
- \(POP_{16}\) = ratio of young to old in population
- \(POP\) = population size
- \(ICC_{1}\) = Index of Consumer Confidence (Conference Board), lagged one year
- \(M2_{AV}\) = real M2 money supply, average of past three years

If we add an additional variable to control for consumer borrowing (\(C_{BOR}\)), the reestimated regression results become

\[
\Delta C_{D} = .39\Delta(Y-T) + .18\Delta(T-G) + 2.67\Delta PR + .42\Delta DJ_{2} - 0.25\Delta XR_{AV} - 418.90\Delta POP_{16} + 0.01\Delta POP + 0.05\Delta ICC_{1} + 24\Delta M2_{AV} + .20\Delta C_{BOR}
\]

where \(R^2 = 88.0\%\) and \(D.W. = 1.8\).

Our results indicate every dollar borrowed by consumers results in and additional $0.20 cents spending on domestically produced consumer goods. The remainder would be spent on housing (investment) and imported consumer goods.

Crowd out theory is based on the premise that the major determinant of consumer demand is not disposable income, but purchasing power, i.e. disposable income plus consumer borrowing. If we consolidate the two into one variable, we should improve our results. The equation below provides the resulting econometric estimates:
\[ \Delta C = 25\Delta \left[ (Y-T_G) + C_{BOR} \right] + 17\Delta(T-G) - 2.26\Delta PR + 0.47\Delta DJ_2 - 0.59\Delta XR_{AV} - 430.66\Delta POP_{AV} + 0.02\Delta POP_{AV} + 0.01\Delta ICC_1 + 35.69\Delta M_{AV} \]

\text{(11)}

Notice the effect is to strengthen substantially the statistical significance of the original “income” variable, by converting it to a “purchasing power” variable, without significantly changing the estimated effects of any of the other variables, and in most cases, increasing their statistical significance as well. This is an indicator that the purchasing power formulation of how income affects consumption is the more scientifically accurate. Another indicator of purchasing power’s appropriateness is to examine its contribution to explaining variation in consumer spending. Dropping the “purchasing power” composite variable from the full model reduces explained variance from 88% to 68%. By comparison, dropping only the income reduces explained variance only from 88% to 80%.

The results (two equations above) for the model with borrowing as a separate variable indicate that every additional dollar of consumer borrowing results in a $0.20 dollar increase in consumer spending on domestically produced consumer goods, \textit{ceteris paribus}. Alternatively, we could test demand except for that based on borrowing \((\Delta C - 0.20 \Delta C_{BOR})\).

\[ \Delta(C - 0.20C_{BOR}) = 0.29\Delta(Y-T_G) + 18\Delta(T-G) - 2.67\Delta PR + 0.42\Delta DJ_2 - 0.25\Delta XR_{AV} - 418.90\Delta POP_{AV} + 0.01\Delta POP_{AV} + 0.5\Delta ICC_1 \]

\text{(12)}

This results in precisely the same regression coefficients. The difference in these coefficients and the Heim (2010) coefficients reflects the full effect these variables have on consumer spending when the full value of consumer money demand (income & borrowing) is considered. Clearly, the level of consumer borrowing is systematically related to the level of consumer spending.

The negative impact of deficits on consumer spending is \textit{markedly less} when borrowing is held constant, corroborating the earlier Heim (2010) results. In the equations above, the marginal effect of an increase in the deficit not controlling for borrowing effects is $0.27 per dollar of deficit. Controlling for the level of borrowing it is $0.18.

The regression below shows the effect of borrowed funds on total consumer spending \((C_t)\) on both imports and domestically produced goods. The original Heim equation without borrowing controlled for, was

\[ \Delta C_t = 50\Delta(Y-T_G) + 54\Delta(T-G) - 10.28\Delta PR + 0.59\Delta DJ_2 = 4.32\Delta XR_{AV} - 360.95\Delta POP_{AV} + 0.01\Delta POP_{AV} + 0.55\Delta ICC_1 \]

\text{(13)}

And the equation with borrowing is

\[ \Delta C_t = 45\Delta(Y-T_G) + 49\Delta(T-G) - 9.12\Delta PR + 0.70\Delta DJ_2 + 3.33\Delta XR_{AV} + \Delta C_{BOR} = -388.94\Delta POP_{AV} + 0.01\Delta POP_{AV} + 0.44\Delta ICC_1 \]

\text{(14)}

Here again, at about the 9% level of confidence, we can show a positive relationship between consumer borrowing and total consumption spending, and a drop in the impact of a given sized deficit on consumer demand when borrowing effects are controlled for. Every additional dollar of borrowing is associated with $0.13 of additional consumption.

\textbf{6.0. FINDINGS: RELATIONSHIP OF BORROWING TO INVESTMENT SPENDING}
When examining the effects of deficits on investment, we should expect to see the deficit having a lesser, or no, effect on investment when we control for the level of consumer borrowing as well as the other variables mentioned in Heim (2010). The observed effect may not drop to zero, since crowd out not only negatively affects investment, but also consumption, which may cause secondary effects on investment. Reducing the accelerator, further reducing investment, and reducing taxes, increasing the deficit, which also further reduces investment. Therefore, controlling for the level of business borrowing may not fully eliminate the observed effect of the deficit on investment, but should at least reduce it from the levels found in Heim (2010) where borrowing was not controlled for.

Heim’s (no borrowing control) investment function was

**Domestically Produced Investment Goods**

\[ \Delta(I) = 0.23\Delta\text{ACC} + 0.51 \Delta(T-G) + 0.16\Delta\text{DEP} - 0.37\Delta\text{CAP} + 8.22\Delta r - 0.28 \Delta DJ + 0.44 \Delta\text{PROF} + 5.59\Delta\text{XR}_{AV} + 0.008\Delta\text{POP} \]  
\((t =) \quad (9.0) \quad (7.6) \quad (0.5) \quad (-0.3) \quad (-6.6) \quad (-1.3) \quad (4.1) \quad (5.6) \quad (3.6) \)  
\( R^2 = 0.90 \quad D.W. = 2.3 \)  

Where

- \( I_0 \): real domestically produced investment goods
- \( I_T \): total real domestically produced and imported investment goods
- \( \text{ACC} \): a Samuelson accelerator variable measuring the economy’s growth rate (\( \Delta \) Real GDP)
- \( \text{DEP} \): real business depreciation allowances
- \( \text{CAP} \): industrial capacity utilization, lagged one period
- \( \text{PROF} \): real corporate profits, lagged two periods
- \( r \): real Prime interest rate, lagged two periods

Other variables in the model are as defined in the consumption function model. If we add an additional variable to control for business borrowing (\( B_{BOR} \)), defined as the net increase in consumer debt, our regression results become

\[ \Delta(I) = 0.22\Delta\text{ACC} + 0.46 \Delta(T-G) + 0.02\Delta\text{DEP} - 0.31\Delta\text{CAP} - 6.87\Delta r - 0.17 \Delta DJ + 0.39 \Delta\text{PROF} + 4.36\Delta\text{XR}_{AV} + 0.008\Delta\text{POP} + 10 \Delta B_{BOR} \]  
\((t =) \quad (9.0) \quad (6.6) \quad (0.1) \quad (-0.3) \quad (-4.0) \quad (-0.7) \quad (3.2) \quad (2.7) \quad (3.0) \quad (1.1) \)  
\( R^2 = 0.91 \quad D.W. = 2.2 \)  

The results indicate that every additional dollar of business borrowing results in a $0.10 dollar increase in business spending on domestically produced investment goods, *ceteris paribus*. However, the result is statistically insignificant.

Alternatively, we could test investment demand except for that based on borrowing (\( \Delta I_0 - 0.10 \Delta I_{BOR} \)). Doing so results in precisely the same regression coefficients as shown in the equation immediately above for all right hand side variables (except \( \Delta B_{BOR} \), which is now part of the left side). The difference in these coefficients and the Heim (2010) coefficients reflects the full effect these variables have on investment spending on domestically produced goods when the full value of business purchasing power (income, borrowing) is considered.

The negative impact of deficits on investment spending is less when deficits are not allowed to affect business borrowing, corroborating the earlier Heim (2010) results. That said, not much less; $0.51 versus $0.46 cents per dollar of deficit. This appears to be because the main use of borrowed funds by businesses is to spend on imported investment goods. The regression below shows the effect of borrowed funds on total investment spending (\( I_0 \)), where total investment spending is spending on domestically produced goods and imported goods. The original Heim equation without borrowing controlled for, was

**Total Investment**

\[ \Delta(I) = 0.27\Delta\text{ACC} + 0.60 \Delta(T-G) + 0.29\Delta\text{DEP} + 0.72\Delta\text{CAP} + 6.79\Delta r + 0.08 \Delta DJ + 0.32 \Delta\text{PROF} + 5.16\Delta\text{XR}_{AV20123} + 0.01\Delta\text{POP} \]  
\((t =) \quad (8.2) \quad (6.4) \quad (0.8) \quad (0.6) \quad (-4.0) \quad (0.3) \quad (1.9) \quad (6.3) \quad (4.0) \)  
\( R^2 = 0.91 \quad D.W. = 2.5 \)  

Adding a variable to control for borrowing availability:
Here again we see that controlling for its effects on borrowing, the effect of the deficit on investment drops more noticeably from $0.60 to $0.52 cents per dollar of deficit, and that $0.16 of every dollar of business borrowing is used to increase purchases of investment goods (other portions may represent cash flow borrowing, special operational needs, etc.). The coefficients in the regression function for imported investment goods are exactly the same as can be calculated by subtracting the domestically produced investment goods equation coefficients from the total investment equation coefficients.

Crowd out theory implies business investment may be best described as a function of purchasing power (income and access to borrowing), rather than income alone. The model below combines these two variables into a "purchasing power" variable, and re-estimates it:

\[
\Delta(I_T) = \beta_0 + \beta_1 \Delta(DJ) + \beta_2 \Delta(Real\text{-}Consumer\text{-}Borrowing) + \beta_3 \Delta(Disposable\text{-}Income) + \epsilon
\]

Notice the "purchasing power" variable is substantially more statistically significant than the income (profits) variable alone. Adding depreciation allowances to the "purchasing power" variable strengthens the relationship further, as shown below:

\[
\Delta(I_T) = \beta_0 + \beta_1 \Delta(DJ) + \beta_2 \Delta(Real\text{-}Consumer\text{-}Borrowing) + \beta_3 \Delta(Disposable\text{-}Income) + \beta_4 \Delta(Depreciation) + \epsilon
\]

We conclude that for investment as was the case for consumption, investment spending is systematically related to business borrowing; increases/decreases in borrowing are associated with increases/decreases. Business income and borrowing systematically explains more variation in investment than business income alone (92.0% versus 90.7%).

**7.0. FINDINGS: THE EFFECT OF DEFICITS ON CONSUMER BORROWING**

A simple model of the relationship of deficits to consumer borrowing, controlling for a measure of the state of the economy (disposable income), indicates deficits are negatively related to consumer borrowing. The findings were significant at the 1% level. The model estimated year to year changes in consumer borrowing as a function of year to year changes in disposable income and the deficit. The results were:

\[
\Delta(Real\text{-}Consumer\text{-}Borrowing) = \Delta(Disposable\text{-}Income) + 0.34 \Delta(T-G) \quad R^2 = 0.23
\]

Controlling for other possible determinants of borrowing, as is done further below, also shows the same relationship, but not quite as strongly statistically significant.

Graph 3 below shows the estimated ("fitted") relationship of consumer borrowing and disposable income growth over the 1959-2000 period.

Where the fitted value was found to be

\[
(Real\text{-}Consumer\text{-}Borrowing) = -56.72 + 0.045 \text{ (Disposable Income)} \quad R^2 = 0.53
\]
**trend in periods of significant deficit growth.** This provides some visual confirmation of the statistically significant negative econometric relationship between deficits and borrowing shown earlier. Borrowing data are from the Federal Reserve Flow of Funds Account; other data are from the 2002 Annual Report of the President.

In testing a more complete model of consumer borrowing, the 1960 - 2000 data indicate a statistically significant negative relationship between deficits and consumer borrowing, *ceteris paribus*. The finding, significant at the 8% level (t = 1.8), was obtained while controlling for changes in all the other variables theorized to be determinants of demand for consumer goods and services in Heim (2010). They were used as controls on the theory that since consumer borrowing is done to finance consumer demand, determinants of consumer demand, or some of them, should be determinants of consumer borrowing. The controls allow us to examine the relationship of deficits to borrowing holding these other factors constant. The regression results were as follows:

\[
\Delta C_{BKR} = .39 \Delta (Y-T_0) + .42 \Delta (T - G) - 9.28 \Delta PR - .91 \Delta DJ - 7.89 \Delta XR + 223.05 \Delta POP + .02 \Delta POP + .88 \Delta ICC. \\
(t =) (4.5) (1.8) (-1.9) (2.8) (4.3) (0.5) (-3.1) (1.1) \\
\]

\[
+ 11.55 \Delta M_{2AV} \quad R^2 = 63.2% \\
(0.4) \quad D.W. = 1.7 
\]

There was evidence in preliminary testing that borrowing, while a function of the variables listed above, grew at a slightly slower rate than the linear growth rates allowed for in this equation. For example, if the disposable income variable is reformulated as \( \Delta (Y-T_0)^{0.5} \), the income variable becomes statistically significant and explained variance increases, as shown below:

\[
\Delta C_{BKR} = 56.13(Y-T_0)^{0.5} + .42 \Delta (T - G) - 9.36 \Delta PR - .56 \Delta DJ - 7.72 \Delta XR + 147.50 \Delta POP - .02 \Delta POP + .90 \Delta ICC. \\
(t =) (4.7) (1.8) (-1.9) (1.7) (4.3) (-0.3) (3.5) (1.1) \\
\]

\[
+ 1.99 \Delta M_{2AV} \quad R^2 = 64.4% \\
(0.7) \quad D.W. = 1.8 
\]

The reduction in consumer **borrowing** per dollar of deficit incurred ($0.42) is very close to the earlier finding (Section 5) that consumer **spending** declined by $0.49 cents, per dollar of deficit. Hence, the linkage between deficits, consumer borrowing and consumer spending required for crow out theory appears to be confirmed by these tests. *The linkage suggests declining borrowing associated with deficits is the main, and perhaps only, reason for the declining spending associated with deficits.*

Alternatively, adding a constant term to the original equation leaves the results varying a bit, but essentially unchanged. Results are shown immediately below:

\[
\Delta C_{BKR} = -107.90 + .36 \Delta (Y-T_0) + .45 \Delta (T - G) - 9.98 \Delta PR - 1.12 \Delta DJ + 8.81 \Delta XR + 333.63 \Delta POP + .03 \Delta POP + 1.09 \Delta ICC. \\
(t =) (-1.7) (3.8) (1.8) (-1.8) (-2.7) (3.9) (0.7) (1.0) (1.4) \\
\]

\[
+ 24.94 \Delta M_{2AV} \quad R^2 = 64.6% \\
(0.9) \quad D.W. = 1.8 
\]

Whichever formulation is used shows a statistically significant negative relationship between consumer borrowing and government deficits at the 8% level. The results also show most other variables affecting consumer spending also affect (the same people’s) demand for consumer loans, and in the same direction.

This model provides information on which variables are important determinants of consumers’ desire to borrow. As Table 3 below shows, the deficit explains 7.2% of the total variance, exceeded only by the income measure (12.2%) and exchange rate measure (12.5%), using the “1st out” stepwise regression method. Using “1st in” stepwise regression, the deficit explains (17.2%) of the total variance, more than any other variables except disposable income and the exchange rate measure

Either way the deficit’s contribution to explaining variance in consumer borrowing is calculated, it is substantial. Generally, 1st out estimates are considered underestimates; 1st in as overestimates.
TABLE 3: CONTRIBUTIONS TO EXPLAINED VARIANCE

<table>
<thead>
<tr>
<th>Determinant of Consumer Borrowing</th>
<th>Variance in Borrowing Explained By 1st Out Method</th>
<th>1st In Method*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange Rate_{AV}</td>
<td>12.5%</td>
<td>20.1%</td>
</tr>
<tr>
<td>Disposable Income</td>
<td>12.2</td>
<td>33.6</td>
</tr>
<tr>
<td>DJ Composite Av._2</td>
<td>8.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Deficits</td>
<td>7.2</td>
<td>17.2</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>4.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Population Size</td>
<td>4.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Consumer Confidence,.1</td>
<td>2.7</td>
<td>12.9</td>
</tr>
<tr>
<td>M2_{AV}</td>
<td>0.4</td>
<td>3.7</td>
</tr>
<tr>
<td>Pop. Ratio(16-24)/65+</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*Constant term included

8.0. FINDINGS: THE EFFECT OF DEFICITS ON BUSINESS BORROWING

The 1960 - 2000 data indicate a statistically significant negative relationship between deficits and business borrowing, *ceteris paribus*. The finding, significant at the 1.5% level, was obtained while controlling for changes in all the other variables commonly theorized to be determinants of business demand for investment goods. They were used as controls on the theory that since business borrowing is done to finance investment demand, determinants of business investment, or some of them, should be determinants of business borrowing. The model also allows for portfolio balancing considerations: financing must come from internal sources (profits), or externally from borrowing or equities. The controls allow us to examine the relationship of deficits to borrowing holding these other factors constant.

Beside crowd out, other variables found significantly negatively related to business borrowing include interest rates and the stock market level (higher stock prices make financing investments by issuing stock more attractive than borrowing). The exchange rate was found positively related to borrowing (higher rates reduce the cost of imported investment goods; increasing demand for them, and to the extent they are financed by borrowing, demand for borrowing may rise).

\[ \Delta(\text{Real Business Borrowing}) = 0.09 \Delta(\text{Accelerator}) + 1.43 \Delta(\text{Depreciation}) - 0.59 \Delta(\text{Capacity Util.}_{-1}) \]
\[ (t-,\text{Statistic}) \quad (0.7) \quad (1.1) \quad (-0.2) \]
\[ - 13.64 \Delta(\text{Real Prime Interest Rate}) + 0.56 \Delta(\text{Real Profits}_{AV}) \]
\[ (-2.7) \quad (1.4) \]
\[ - 1.10 \Delta(\text{Tobin's } q_{\text{proxy}}) - 0.01 \Delta(\text{Population Size}) \]
\[ (-1.9) \quad (-0.5) \]
\[ + 12.39 \Delta(\text{Exchange Rate}_{AV}) + 0.48 \Delta(\text{T-G}) \]
\[ R^2 = 0.56 \quad (26) \]
\[ D.W. = 1.9 \]

However, this model does not quite as explicitly control for the state of the economy when estimating the effect of the deficit on business borrowing. A slightly simpler model that holds the state of the economy (variations in the GDP) constant when testing for factors influencing borrowing is as follows:

\[ \Delta(\text{Real Business Borrowing}) = 0.13 \Delta(\text{Real GDP}) + 0.49 \Delta(\text{T-G}) - 7.05 \Delta(\text{Real Prime Interest Rate}) \]
\[ (t-,\text{Statistic}) \quad (2.7) \quad (2.9) \quad (-3.4) \]
\[ - 0.90 \Delta(\text{Tobin's } q_{\text{proxy}}) + 10.30 \Delta(\text{Exchange Rate}_{AV}) \]
\[ R^2 = 0.50 \quad (27) \]
\[ D.W. = 1.7 \]
The reduction in business borrowing per dollar of deficit incurred ($0.49) is very close to the earlier finding that consumer spending declined by $0.52 cents, per dollar of deficit, and the earlier Heim (2010) finding of a $0.60 cents reduction. Hence, the linkage between deficits, business borrowing and consumer spending required for crowd out theory appears confirmed by these tests.

This model provides essentially the same conclusions as to which variables are important determinants of business desire to borrow while controlling more explicitly for the effects of the business cycle. Here again, one of the most significant determinants of business borrowing is crowd out, i.e., the government deficit, significant at the 1% level. The deficit explains a 10% of the total variance, exceeded only by the exchange rate (14%) using the “1st out” stepwise regression method. Using “1st in” stepwise regression, it explains 25% of the total variance, more than any other variable.

**TABLE 4: CONTRIBUTIONS TO EXPLAINED VARIANCE**

<table>
<thead>
<tr>
<th>Determinant of Business Borrowing</th>
<th>Variance in Borrowing Explained By 1st Out Method</th>
<th>1st In Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficits</td>
<td>10%</td>
<td>25%</td>
</tr>
<tr>
<td>GDP</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Exchange Rate</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>DJ Composite Av. (Tobin’s q Proxy)</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Graph 4 below shows the trend in borrowing growth associated with growth in the GDP. The trend line is given by the formula
\[ \Delta \text{Business Borrowing} = -\$51.76 \text{ Billion} + .36 \Delta (\text{Real GDP}) \quad R^2 = .29 \]
\[ \text{(t-Statistic)} \quad (-1.9) \quad \text{D.W. } 1.3 \]

Actual borrowing tended to equal or exceed the predicted trend in periods of budget surplus or declining deficits (1964-70, most of the 1990’s), and fall below the trend in periods of significant deficit growth (1975, 1985-94). Though there are exceptions, (late 1990’s, when real interest rates had risen to their highest levels since the mid-1980’s, reducing borrowing), the general trend is visible.

**GRAPH 4**

DEVIATIONS IN BUSINESS BORROWING FROM TREND
(BILLIONS OF 1996 DOLLARS)

---

**9.0. CROWD OUT EFFECTS IN RECESSIONS: THE 1981 - 83 RECESSION AS A CASE STUDY**

Theoretically, even in recessions, when demand for loans declines, government deficits financed by borrowing could cause crowd out if the recession causes savings to decline as much or more than loan demand. In this situation any new deficit will crowd out private borrowing, with two exceptions:

1. if private borrowers can borrow from abroad to compensate for the decline in domestic savings available because used to finance the deficit.

2. if government borrowing to finance the deficit is from foreign sources, such as China or Saudi Arabia, rather than from domestic savings.

For example, in the 1981-83 recession period covered by this study, Table 5 shows both total gross domestic savings and total gross investment dropped $30.5 billion (correcting for the statistical discrepancy between the two accounts). During the same period, foreign borrowing increased $38.4 billion. Had this not occurred, investment would have had to drop more, since total savings (foreign and domestic) must equal total investment (business and government). How much more investment would have dropped depends on how interest rates rose in response to the savings supply/investment demand imbalance. Any increase would likely cause domestic savings to rise and domestic business borrowing to fall. The exact result is an empirical question; it cannot be deduced *a priori* from flow of funds data on
what actually occurred. Nonetheless, it is clear that investment would have fallen even further than it did ($30.5 billion) if business and government had not been able to access foreign saving.

Alternatively, with foreign borrowing at $38.4 billion, but borrowing to finance government investment been $16 billion less (reducing the deficit a similar amount), $16 billion in savings would have been freed up for private use. Business investment may not have declined at all, and may have grown (again, an empirical question, since we don’t know the effect on interest rates). Hence, interpreting the effect of the actual decline in savings on private investment crowd out is difficult to do simply by inspecting the available Flow of Funds data. Better information is probably provided by the behavioral econometric models of earlier sections, which do indicate crowd out is a problem.

Clearly though, even without a deficit, without foreign borrowing to compensate for the decline in domestic saving, there would have been draconian cutbacks in private borrowing. To finance a government deficit as well out of domestic savings, private borrowing cutbacks would have had to be even greater. Even with foreign borrowing available, since business and government investment must equal domestic and foreign savings, greater borrowing - financed government investment, given the level of savings, must mean less private investment if the identity is to be maintained. In this sense, abstracting from behavioral effects, the flow of funds clearly implies crowd out must always result when deficits occur.

**TABLE 5**

1981-83 SAVINGS AND INVESTMENT
(BILLIONS OF CURRENT DOLLARS)

| Year | Total Gross Personal Business Gov't. Depreciation |
|------|-----------------|-----------------|----------------|-----------------|-----------------|
|      | Saving          | Savings         | Savings        | Savings         | Allowance Savings |
| 1981 | $646.1          | $236.7          | $65.2          | $49.2           | $393.3          |
| 1983 | 602.4           | 226.9           | 95.7           | -171.4          | 451.1           |
| Chge.| -$43.7          | -$9.8           | $+30.5         | -$122.2         | $+57.8          |

| Year | Total Gross Private Gov't. Net Capital Net Foreign, Statistical Discrepancy |
|------|----------------|----------------|----------------|----------------|-----------------|
|      | Investment     | Domestic I     | Investment    | Acct. Trans. | Lending/Bor. | (Investment-Savings) |
| 1981 | $682.6         | $572.4         | $106.9        | $0.1          | $3.2           | $36.6           |
| 1983 | 652.1          | 564.3          | 122.9         | 0.1           | -35.2         | 49.7            |
| Chge.| $-30.5         | $-8.1          | $+16.0        | $0.0          | $-38.4        | $+13.1          |

Source: Flow of Funds Data cited in *Economic Report of the President, 2010, Table B-32*)

Technical Note: Total investment should equal total domestic and foreign savings. It does not in the Flow of Funds data. the statistical discrepancy shows total investment exceeding total saving. This may result from either over counting investment or under counting saving. Subtracting the discrepancy from 1981 and 1983 Investment leaves the changes in investment and saving equal at -$43.7 billion; adding the discrepancy to savings in those years leaves investment equal to saving at -$30.5 billion. That is what we have done. Basically, the change in investment and saving relevant to the crowd out issue is

\[-8.1 \Delta (\text{Bus Inv.}) + 16.0 \Delta (\text{Gov't. Inv.}) = +38.4 \Delta (\text{Increased For. Borrowing}) - 30.5 \Delta (\text{Domestic Saving})\]

Or

\[+7.9 \text{ net investment} = +7.9 \text{ net increase in available savings}\]  \hspace{0.5cm} (29)

\[-8.1 (\Delta \text{Business Investment}) = 7.9 (\text{Net increase in available saving}) - 16.0 (\text{Increase Gov't.})\]
As an accounting identity, the flow of funds data say that for a given level of available saving, if government investment goes up, private investment must go down. However, there are behavioral relationships involved. If increased government (or private) investment demand is financed by increased savings availability (through interest rate changes or some other mechanism), no reduction in the other type of investment need occur. Econometric analysis of these behavioral relationships is needed. The econometrics analysis shown earlier in this paper shows a systematic negative relationship between deficits and private borrowing over the 1960-2000 period, and that the decline in private borrowing is virtually equal to the decline in private total consumption and investment spending that occurs, i.e., the crowd out effect of borrowing-financed deficits is total; the stimulus effects of the deficit are completely offset by decreased private spending. Access to Foreign borrowing may increase total savings available for investment, but whatever total is available, must be divided between private and government investment; if one goes up, the other must go down, as the flow of funds accounts indicate. We conclude the flow of funds data and the behavioral data are in full agreement.

10.0. SUMMARY AND CONCLUSIONS

1. Adding a variable for consumer borrowing to a well specified consumption function estimating the demand for domestically produced consumer goods, adds two percent to explained variance and is statistically significant at the 2% level. Combining it with disposable income to form a “total purchasing power” form of the income variable raises the t statistic even more; from 4.0 on the income variable alone, and 2.3 on the borrowing variable alone, to 7.7 on the joint variable. Also, controlling for its effect on borrowing, reduces the effect of the deficit on consumer spending by a third. Secondary effects of deficits, through their effect on investment crowd out, which subsequently adversely affects consumption, were not controlled for, may explain the remaining statistical significance of crowd out effects. (Section 5.0)

2. Adding a variable for investment borrowing to a well specified investment function estimating the demand for domestically produced investment goods adds only one percent to explained variance and is statistically insignificant. This appears to be the case because crowd out mainly affects purchases of imported investment goods. Running the same test on total investment spending (domestic and imports) adds two percent to explained variance and is statistically significant at close to the 1% level. Combining it with business income to form a “total purchasing power” form of the income variable raises the t statistic even more; from 1.2 on the income variable alone, and 2.6 on the borrowing variable alone, to 3.5 on the joint variable. Also, controlling for its effect on borrowing reduces the effect of the deficit on investment spending by a 13 percent. Secondary effects of deficits, through their effect on consumption crowd out, which subsequently adversely affects investment, were not controlled for in the investment equation. These effects can still be seen in the investment function as remaining crowd out effects. (Section 6.0)

3. Most of the same factors found to explain consumer demand also explained consumer borrowing, as expected. Consumer borrowing was inversely related to deficits at high levels of statistical significance (0.017% - 0.003% levels of confidence). Estimates indicated consumer borrowing declined by 0.54 cents per dollar of deficit incurred (Eq. 26), and consumer spending by 0.49 (Eq. 14), matching closely the earlier 0.54 Heim study finding of the effect of deficits on total consumer demand. This of course corroborates the finding of that study suggesting a strong crowd out effect. Using Stepwise regression methods, deficits explained more variance in consumer borrowing than any other variables except consumer wealth and the ratio of young to old in the population (1st out method), and more than any other variables except consumer wealth and disposable income (1st in method). (Section 7.0)

4. Most of the same factors found to explain investment demand also explained business borrowing, as was expected. Business borrowing was inversely related to deficits at high levels of statistical significance (0.017% - 0.007% levels of confidence). Estimates indicated that business
borrowing declined by 0.48 cents per dollar of deficit incurred (Eq. 26), and spending declined by 0.52 cents per dollar of deficit incurred (Eq. 18). Coupled with the estimated consumption effect, it appears deficits may result in complete crowd out of private borrowing (Section 8.0). These estimates approximate the findings of the earlier Heim study (0.60 decline in investment per dollar of deficit), supports the assertion in that study that crowd out was the channel through which deficits affected the level of investment.

5. The 1981-83 flow of funds data clearly show that total available saving (foreign and domestic), equaled total business and government investment. This is an accounting identity that must always hold, and implies that for any given level of saving, increased government investment must always come at the expense of equal amounts of private investment. This is essentially the same result shown by the behavioral responses to government deficits, where the equations showed that roughly half of every dollar increase in government deficits reduces consumer borrowing (and spending) by an equivalent amount; the other half reduces business borrowing (and spending) an equivalent amount. These behavioral results, given in equations 13 and 17, and 14 and 18, also meet the theoretical conditions required for tax and government spending coefficients to result in full crowd out established in section 2.2.

BIBLIOGRAPHY

Barley, R. “The Hidden Risks Governments Create by Delaying Cuts”. Wall Street Journal, p.C14, 2/24/10:


Chan, S. “Group of 7’s Finance Ministers Stand By Stimulus Programs” NY Times, p.A16, 2/7/10.


**ABOUT THE AUTHOR**

John J. Heim has an MPA from Harvard University and a Ph.D. in Political Economy from SUNY Albany. He is Clinical Professor of Economics at Rensselaer Polytechnic Institute, Troy, NY, and has taught there for 14 years. He has published 19 articles attempting to strengthen the science underlying macroeconomics in the last four years. Prior to joining R.P.I. he worked as an economist consultant and econometrician, a finance analyst for NY State governor Wilson, Director of Fiscal and Budget Research for the minority party in the NY State Senate, and Commissioner of Administration and Finance for the city of Buffalo, NY. He was also President of Heim Industries, Inc., a statistical software firm, and Assistant Executive Director of the Facilities Development Corporation, a not-for-profit firm providing construction management services.