

Aggregate consumption and debt accumulation: an empirical examination of US household behaviour

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The outbreak of the financial crisis in 2008 witnessed a significant contraction in US consumption spending, as households began deleveraging following a period marked by historically high levels of household borrowing. These events call into question the canonical life-cycle theory of consumption, with its benign view of debt as a neutral instrument of optimal intertemporal expenditure smoothing. This paper draws attention to an alternative, post-Keynesian account of consumption spending in which current income, household borrowing and household indebtedness all affect current consumption. Central to the analysis is an empirical investigation of US consumption spending since the 1950s. The results of this inquiry cast doubt on the life-cycle hypothesis, but are congruent with the alternative, post-Keynesian account of consumption.

Key words: Consumption, Household borrowing, Household debt, Life-cycle hypothesis, Relative income hypothesis

JEL classifications: E12, E21

1. Introduction

The Great Recession witnessed the first year-on-year declines in real household consumption spending in the USA since 1980. For some commentators, these events are closely linked, the Great Recession marking the culmination of an unsustainable, debt-financed, consumption-led growth regime (see, e.g., [Cynamon and Fazzari, 2013](#)). But none of this makes sense from the perspective of the canonical life-cycle model of household consumption spending. According to the life cycle hypothesis, debt is accumulated by far-sighted, utility-maximising households whose objective is to smooth consumption over a potentially infinite time horizon. From this perspective, consumption spending should not be the cause of deep recessions because it implodes owing to unsustainable patterns of household debt accumulation. Indeed, the life-cycle hypothesis suggests that consumption follows a random walk ([Hall, 1978](#)) and

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should not, therefore, be affected by borrowing, levels of indebtedness or any other financial or non-financial variable.¹ The point of this paper is to empirically investigate whether or not these claims are true, in light of an alternative post-Keynesian account of consumption spending which claims that current income, household borrowing and household indebtedness all affect current consumption.

The remainder of the paper is organised as follows. In the next section we briefly outline a post-Keynesian theory of aggregate consumption spending that draws on the relative income hypothesis (Duesenberry, 1949) and the contemporary insights of Cynamon and Fazzari (2008, 2013) regarding household debt accumulation and consumption spending.² Section 3 discusses the methodology and results of an empirical investigation of US consumption spending since the 1960s. Finally, Section 4 offers some conclusions. Chief amongst these is the claim that the data are not consistent with the canonical life-cycle hypothesis. In particular, debt accumulation by households does not function as an innocuous ‘smoothing’ instrument. It can instead have both positive effects on consumption (as borrowing relaxes the budget constraint imposed by income and wealth) and negative effects on consumption (as debt servicing burdens debtor households and reduces their capacity to spend on consumption goods). We cannot, of course, rule out the possibility that a modified life-cycle model would succeed in reconciling the life-cycle hypothesis with the data.³ We can, however, conclude that the data *are* consistent with the basic tenets of the post-Keynesian view of consumption spending outlined in this paper.

2. Debt and aggregate consumption spending: theory

According to the dominant life-cycle hypothesis, consumption is undertaken by far-sighted, rational households whose consumption spending is the outcome of a process of intertemporal optimisation designed to maximise lifetime utility.⁴ Consumer credit is little more than a neutral tool that facilitates the transfer of lifetime income and wealth across time in order to smooth consumption in the pursuit of utility maximisation. In the long run, then, household consumption is related to household income and wealth. But in the short run, smoothed by intertemporal optimisation in the manner described above, consumption follows a random walk (Hall, 1978).⁵

¹ In principle, the real interest rate may affect consumption in the life-cycle hypothesis, but empirical evidence suggests that it does not (Campbell and Mankiw, 1989).

² See, Kim *et al.* (2014) for a more formal Keynesian model of aggregate consumption. This theory emphasises the importance of the relative income hypothesis and debt finance for understanding household consumption behaviour. It shows that the treatment of debt servicing commitments as a substitute for savings by households creates the potential for sudden reductions in consumption spending and hence aggregate demand.

³ For example, Campbell and Mankiw (1989) argue that the pervasive influence of current income on current consumption—which is inconsistent with the canonical life-cycle hypothesis—can be explained by postulating that only *some* households plan their consumption in accordance with this hypothesis, while others follow a rule of thumb. Muellbauer and Lattimore (1995), meanwhile, provide the basis for incorporating credit channel effects into the life-cycle hypothesis and Engelhardt (1996) shows that the need to provide down payments can act as a financial constraint on consumption in a life-cycle framework. Nevertheless, the canonical life-cycle hypothesis continues to dominate macroeconomic research.

⁴ Usually, there is in fact only one household, as a result of the representative agent methodology employed by modern variants of the life-cycle hypothesis. For an introduction to the essential themes of the life-cycle hypothesis, see Deaton (1992) and Romer (2011, ch. 7).

⁵ Strictly speaking, this result requires equality of the interest rate and the subjective rate of time preference (under decision-making conditions of certainty equivalence). It is reasonable to suppose that such

According to post-Keynesian macroeconomic theory, deficient foresight associated with non-quantifiable uncertainty about the future renders dynamic optimisation impossible. Households therefore rely on rules of thumb—including spending a conventional fraction of their current income (and wealth)—to guide consumption behaviour, which will also be influenced by psychological factors such as their confidence in the economic outlook.⁶ Moreover, in keeping with the insights of the relative income hypothesis (Duesenberry, 1949), households will seek to maintain consumption relative to standards achieved in the past and contemporary standards established by others.⁷ These principles give rise to a situation in which households use credit and debt to consume in excess of what their current income and wealth allow, in the pursuit of consumption aspirations informed (in part) by the lifestyles of others but without full understanding of the future consequences of this behaviour. Cynamon and Fazzari (2008, 2013), for example, provide a detailed explanation of this behaviour based on the notion that consumer preferences endogenously evolve in a world of social cues. Drawing on the insights of the relative income hypothesis, they suggest that households learn consumption patterns from social reference groups and argue that the expansion of social reference groups (e.g. through advertising and the mass media) has been an important cause of US household debt accumulation since the 1980s. Cynamon and Fazzari also reflect on the contribution this has made to household financial fragility (which can interact negatively with consumption spending as debt servicing obligations increase and/or debtor households default) and hence the vulnerability of the economy to a Minsky crisis.

Inequality also affects consumption from a post-Keynesian perspective, both because it creates different propensities to spend among households and because it gives rise to different proclivities to borrow to finance consumption based on the sort of emulation effects mentioned above. Indeed, widening income inequality in the presence of reference group-driven consumption aspirations can be seen as the principle driving force behind much of the household debt accumulation witnessed during recent decades (Barba and Pivetti, 2009; Foster and Magdoff, 2009; Setterfield, 2012, 2013; Wisman, 2013). It is this post-Keynesian thinking that advises the empirical inquiry that follows.

equality is likely to be a special case, with the result that current consumption will vary with the interest rate. But as noted earlier, empirical evidence does not support the hypothesis that aggregate consumption spending varies with the interest rate.

⁶ See, e.g., D'Orlando and Sanfilippo (2010) on the behavioural foundations of these principles. For an introduction to the essential themes of post-Keynesian consumption theory, see Harcourt *et al.* (1967, ch. 8).

⁷ The relative income hypothesis has attracted the attention of scholars other than post-Keynesian macroeconomists. Since Easterlin (1974), it has featured prominently in the 'macroeconomics of happiness' (see, e.g., Luttmer, 2005). Efforts have even been made to incorporate it into the life-cycle hypothesis. Alvarez-Cuadrado and Van Long (2011) treat the consumption of a reference group as an argument in the individual household's utility function. Dybvig (1995), meanwhile, postulates addiction effects in the process of utility maximisation, as a result of which consumption rises in response to an increase in income by more than it falls in response to a commensurate reduction in income. It should also be noted that the permanent income and life-cycle hypotheses have influenced the theoretical development of post-Keynesian consumption theory based on the relative income hypothesis (see, e.g., Palley, 2010).

3. Household debt and aggregate consumption: an empirical investigation

3.1 Empirical model and data

The estimating equation on which we base our empirical inquiry can be stated as follows:

$$C = \gamma_0 + \gamma_1 Y + \gamma_2 B + \gamma_3 W + \gamma_4 D + \gamma_5 S + \varepsilon \quad (1)$$

where C denotes the log level of real consumption, Y is the log of real disposable income, B is the log of real household borrowing, W is the log of real household wealth (measured as either households' total assets or households' financial assets), D is a measure of consumers' debt burden and S is an index of consumer sentiment (i.e. confidence). All data used are quarterly. A summary of these data and their sources, together with more precise definitions of the variables used throughout our analysis, can be found in the Appendix to this paper.

Note that the linear and therefore continuous form of equation (1) suggests that the debt burden D exerts an influence on consumption spending in any given period. But as demonstrated by Kim *et al.* (2014), the impact of D on consumption may be discontinuous if households seek to insulate current consumption spending from increased debt servicing commitments by treating the latter as a substitute for saving. The empirical performance of D will shed light on whether and how debt burdens affect the behaviour of US households.⁸

3.2 Unit root tests

Following the procedure suggested by Doldado *et al.* (1990), all variables are tested for unit roots using both the augmented Dickey–Fuller (ADF) test and the Phillips and Perron (P-P) test. Table 1 presents the results for the 1952–2011 period and Table 2 covers the 1980–2011 subperiod.⁹ From Table 1 we can see that both the ADF test and the P-P test indicate an integration of order 1 for all variables. In Table 2, both tests indicate an integration of order 1 for the log levels of disposable income, total assets, financial assets and consumer credit. For two of the series, a discrepancy is observed between the ADF test results and the P-P test results: the ADF test indicates that the log level of consumption is $I(2)$ and the consumer sentiment index is $I(1)$, whereas the P-P test suggests these series are $I(1)$ and $I(0)$, respectively. Since the ADF test is known for overestimating the existence of unit roots and the P-P test is generally considered a more advanced version of the ADF test, the results of the P-P test are accepted. The unit root test results therefore show that with the exception of the consumer sentiment index (which is stationary), all variables are integrated of order one.

⁸ It should also be noted that equation (1) does not include a measure of income inequality despite the suggestion, in Section 2, that the distribution of income affects aggregate consumption spending. This is because of data limitations: inclusion of a standard measure of income inequality would necessitate our use of annual data, as a result of which we would lose degrees of freedom that are valuable in light of the time-series estimating techniques utilised below. See, however, Bunting (1991, 1998, 2001) on the empirical importance of income distribution for aggregate consumption.

⁹ This subperiod is examined separately here and in what follows because our data measuring consumer sentiment are available only from 1980 onwards.

Table 1. Unit root test for all variables, 1952–2011

Variable	Test	Level/ difference	Type ^a	<i>p</i> -value ^b	Intercept	Trend	Integration
<i>C</i>	ADF	Level	With I&T	0.8585	0.1406	0.2057	I(1)
		Level	With I	0.3408	0.0121		
		1st	None	0.0004			
	P-P	Level	With I&T	0.9325	0.8304		
		Level	With I	0.2174	0.0000		
<i>Y</i>	ADF	1st	None	0.0000		0.8892	I(1)
		Level	With I&T	0.9748	0.4334		
		Level	With I	0.0512	0.0002		
	P-P	1st	None	0.0000			
		Level	With I&T	0.9618	0.4334		
<i>W_T</i>	ADF	Level	With I	0.0725	0.0002	0.6951	I(1)
		Level	With I	0.0725	0.0002		
		1st	None	0.0000			
	P-P	Level	With I&T	0.5136	0.0311		
		1st	None	0.0001			
<i>B</i>	ADF	Level	With I&T	0.3798	0.1187	0.0394	I(1)
		Level	With I	0.8077	0.2779		
		Level	None	1.0000			
	P-P	1st	None	0.0000			
		Level	With I&T	0.1362	0.0028		
<i>D₁₉₅₂</i>	ADF	Level	With I&T	0.0025		0.0061	I(1)
		Level	With I&T	0.0963	0.0056		
		1st	None	0.0000			
	P-P	Level	With I&T	0.0014			
		Level	With I	0.3968	0.0110		
<i>W_F</i>	ADF	Level	None	0.0000		0.0415	I(1)
		Level	None	0.9973			
		1st	None	0.0000			
	P-P	Level	With I&T	0.5855	0.0423		
		1st	None	0.0000			
	P-P	Level	With I&T	0.3913	0.0423	0.0487	I(1)
		1st	None	0.0000			

^aI&T denotes intercept and trend, I denotes intercept.^bThe null hypothesis is that the data series have a unit root.

3.3 Short-run regressions

Since a unit root exists in all but one data series, regression using simple OLS will produce spurious results. [Granger and Newbold \(1974\)](#) suggest that first-differencing will considerably improve the interpretability of the regression coefficients and make estimation more efficient. For the data series covering the entire 1952–2011 period, since all variables are integrated of order one, first-differencing will render all variables stationary. The differenced variables are then regressed using OLS. For the 1980–2011 subperiod, all variables except the consumer sentiment index are differenced and then regressed with the consumer sentiment index in level form. The estimating equations for the two data periods appear in equations (2A) and (2B). Since most variables in the equations are differenced, regression results reflect short-run relationships among the independent and dependent variables:

Table 2. *Unit root test for all variables, 1980–2011*

Variable	Test	Level/ difference	Type ^a	<i>p</i> -value ^b	Intercept	Trend	Integration
<i>C</i>	ADF	Level	With I&T	0.7488	0.0877	0.1251	I(2)
		Level	With I	0.5564	0.1121		
		Level	None	0.9973			
	P-P	1st	None	0.0807		0.3421	I(1)
		2nd	None	0.0000			
		Level	With I&T	0.9762	0.5032		
<i>Y</i>	ADF	Level	With I	0.6371	0.0213	0.4306	I(1)
		Level	None	0.0000			
		1st	None	0.9510	0.3486		
	P-P	Level	With I&T	0.6081	0.1080	0.4306	I(1)
		Level	With I	0.0001			
		Level	None	0.9415	0.3486		
<i>B</i>	ADF	Level	With I&T	0.5887	0.1080	0.0107	I(1)
		Level	None	1.0000			
		1st	None	0.0000			
	P-P	Level	With I&T	0.0000	0.0047	0.8201	I(1)
		1st	None	0.1750			
		Level	With I&T	0.0268	0.9622		
<i>W_T</i>	ADF	Level	With I	0.7555	0.2312	0.3617	I(1)
		Level	None	0.9977			
		1st	None	0.0000			
	P-P	Level	With I&T	0.9158	0.2479	0.0531	I(1)
		Level	With I	0.6477	0.1963		
		Level	None	0.9995			
<i>D₁₉₈₀</i>	ADF	1st	None	0.0000		0.8236	I(1)
		Level	With I&T	0.9509	0.2902		
		Level	With I	0.3944	0.0798		
	P-P	Level	None	0.6495		0.0531	I(1)
		1st	None	0.0000			
		Level	With I&T	0.9430	0.4578		
<i>S</i>	ADF	Level	With I	0.5232	0.4390	0.1433	I(1)
		Level	None	0.6257			
		1st	None	0.0000			
	P-P	Level	With I	0.7120	0.2343	0.2811	I(0)
		Level	None	0.9995			
		1st	None	0.0000			
<i>W_F</i>	ADF	Level	With I&T	0.2189	0.0030	0.2061	I(1)
		Level	With I	0.0690	0.0068		
		1st	None	0.0000			
	P-P	Level	With I&T	0.1013	0.0006	0.1359	I(1)
		Level	With I	0.0208	0.0010		
		Level	With I&T	0.8296	0.1359		
<i>W_F</i>	ADF	Level	With I	0.6965	0.2343	0.2061	I(1)
		Level	None	0.9999			
		1st	None	0.0000			
	P-P	Level	With I&T	0.6036	0.1359	0.2343	I(1)
		Level	With I	0.7120	0.2343		
		Level	None	0.9995			
<i>W_F</i>	ADF	1st	None	0.0000		0.2343	I(1)
		Level	With I&T	0.6036	0.1359		
		Level	With I	0.7120	0.2343		
	P-P	Level	None	0.9995		0.2343	I(1)
		Level	With I&T	0.6036	0.1359		
		Level	With I	0.7120	0.2343		

^aI&T denotes intercept and trend, I denotes intercept.

^bThe null hypothesis is that the data series have a unit root.

$$\Delta C = \gamma_0 + \gamma_1 \Delta Y + \gamma_2 \Delta B + \gamma_3 \Delta W + \gamma_4 \Delta D + \varepsilon_1 \quad (2A)$$

$$\Delta C = \gamma_0 + \gamma_1 \Delta Y + \gamma_2 \Delta B + \gamma_3 \Delta W + \gamma_4 \Delta D + \gamma_5 S + \varepsilon_2 \quad (2B)$$

Table 3 summarises the regression results. There are, in total, eight estimating equations, four of which use total assets (W_T) to measure the wealth effect, while the other four use financial assets (W_F). Total household liabilities as a proportion of disposable household income (D_{1952}) is used to represent the debt burden for the 1952–2011 period, while the household debt service-to-income ratio (D_{1980}) is selected to measure the debt burden for the 1980–2011 subperiod.¹⁰ In addition, two dummy variables ($Crisis_1$ and $Crisis_2$) are used to capture two major macroeconomic crises since the 1950s: $Crisis_1$ covers the oil crisis from the last quarter of 1973 to the first quarter of 1975 and $Crisis_2$ covers the financial crisis from the first quarter of 2008 to the second quarter of 2009.

Before analysing our results, we first check whether or not first-differencing performs well in eliminating spurious regressions due to the presence of unit roots. Since spurious regressions are characterised by very high adjusted R^2 values and very low Durbin–Watson (D-W) statistics, we start by analysing the test statistics at the bottom of **Table 3**. We can see that the adjusted R^2 values for all eight regressions, ranging from 0.3334 (R1) to 0.4025 (R8), are not very high. Moreover, the lowest D-W statistic observed is 1.9806 (R5). The upper bound value for this regression is 1.720. Since none of the regressions have extremely high adjusted R^2 or extremely low D-W statistics, the regression results do not appear spurious.

R1 and R2 are regressions covering the 1952–2011 period, excluding the two dummies. It can be seen that results for these two regressions are very similar: the coefficients of all variables possess the same signs and their values do not deviate much from each other. The three test statistics (the adjusted R^2 , the F -statistic and the D-W statistic) also have similar values. These observations can be explained by the extremely high correlation between the changes in financial assets and the changes in total assets in the USA during this period: the correlation coefficient between the two data series is 0.9976.

Four out of five independent variables in R1 and R2 are significant. ΔY is significant and has relatively large coefficients in both regressions. In R3 and R4, where the two dummies are included, the coefficient of ΔY becomes smaller but the variable remains significant at the 5% level. Since all of these regressions capture short-run relationships, the significance of ΔY is incompatible with the canonical life-cycle hypothesis. [Campbell and Mankiw's \(1989\)](#) argument about the existence of a subpopulation of ‘rule-of-thumb’ consumers can explain the observed significance of ΔY , however. In fact, their estimated fraction of the population whose consumption behaviour is influenced by current income (approximately 0.5) is not far from the estimated coefficients on ΔY in R1 and R2 (0.4461 and 0.4243, respectively).

In addition, both ΔW_F and ΔW_T are significant at the 5% level if we compare the results from R1 and R2. However, once the crisis dummies are added, both variables become insignificant in R3 and R4. This suggests that changes in wealth only significantly affect short-run consumption during times of crisis. If the two major crisis

¹⁰ These choices again reflect the availability of data.

Table 3. *Short-run OLS regression results*

	1952–2011			1980–2011				
	R1	R2	R3	R4	R5	R6	R7	R8
c_0	0.0035** (5.6640)	0.0035** (5.6815)	0.0045** (6.6304)	0.0045** (6.5294)	-0.0121** (-2.6490)	-0.0108** (-2.3007)	-0.0090* (-1.979)	-0.0085* (-1.8440)
ΔY	0.4461** (7.5395)	0.4243** (7.0107)	0.3907** (6.4728)	0.3818** (6.2384)	0.1425* (1.7362)	0.1425* (1.7582)	0.1118 (1.3952)	0.1128 (1.4178)
ΔB	0.0310 (1.3623)	0.0342 (1.5039)	0.0358 (1.5990)	0.0371* (1.6574)	0.0552** (2.0642)	0.0555** (2.0940)	0.0582** (2.2480)	0.0583** (2.2573)
ΔW_F	0.0390** (1.9733)		0.0161 (1.0839)		0.0271* (1.7045)		0.0131 (0.8158)	
ΔW_T		0.0546** (2.5051)		0.0306 (1.3468)		0.0596** (2.1238)		0.0244 (0.9983)
ΔD_{1952}	0.1453** (2.6092)	0.1254** (2.2040)	0.0995* (1.7726)	0.0913 (1.6033)				
ΔD_{1980}					-0.0002 (-0.0410)	-0.0002 (-0.0439)	-0.0021 (-0.4119)	-0.0020 (-0.4067)
S					0.0003** (3.5838)	0.0002** (3.1951)	0.0002** (3.1425)	0.0002** (2.9589)
$Crisis_1$			-0.0040 (-1.5585)	-0.0039 (-1.5094)				
$Crisis_2$			-0.0086** (-3.2600)	-0.0081** (-2.9971)			-0.0072** (-2.9868)	-0.0069** (-2.7606)
Adjusted R^2	0.3334	0.3401	0.3607	0.3624	0.3609	0.3692	0.4008	0.4025
F -statistic	30.5089	31.4026	23.1890	23.3590	15.0058	15.5168	14.8241	14.9203
D-W	2.1723	2.1883	2.1678	2.1721	1.9806	2.0010	2.0348	2.0362

Notes: Significance levels: *10% and **5%,
t-statistics in brackets.

periods are removed from the regression, then neither changes in financial assets nor changes in total assets cause changes in consumption. In other words, increasing wealth may not lead to higher consumption during an economic boom, but sudden and precipitous declines in wealth cause reductions in consumer expenditure during a crisis. A similar argument has also been made by [Case *et al.* \(2001\)](#).

ΔB is not significant in any of the first three regressions and in R4 it is significant only at the 10% level. It seems that during the 1952–2011 period as a whole, there is little evidence to show that consumer expenditure in the USA varied with borrowing in the short run. Obviously, the development of mortgage-backed and other credit-financed consumption expenditures has been observed only since the 1980s, but clearly, any effects of credit-financed consumption since the 1980s have not been powerful enough to render the variable ΔB significant throughout the entire post-1952 period.

Unlike ΔY and ΔB , which perform consistently throughout the first four regressions, the performance of ΔD_{1952} is more variable: it has the wrong sign throughout but is significant at the 5% level only in the first two regressions. This suggests that the short-run significance of the debt burden variable in the consumption function is eliminated when crisis dummies are added. It seems, then, that the positive coefficients on ΔD_{1952} in R1 and R2 are spurious and that the debt burden's impact on consumption is negative but discontinuous, in keeping with the predictions of the post-Keynesian consumption function developed in [Kim *et al.* \(2014\)](#).

R5–R8 summarise results for the 1980–2011 subperiod. The influence of current income on consumption appears to have been drastically reduced over the last three decades relative to the 1950s and 1960s. ΔY is significant only at the 10% level in R5 and R6 and, once the dummy for the financial crisis is included in R7 and R8, ΔY becomes insignificant. In the language of Campbell and Mankiw, the ratio of ‘rule-of-thumb’ consumers appears to have decreased substantially since the 1980s. However, our results are also consistent with the claims of post-Keynesian authors such as [Palley \(2002\)](#), [Cynamon and Fazzari \(2008\)](#) and [Setterfield \(2013\)](#), who claim that real-wage stagnation and worsening income distribution have created a disconnect between real income growth and consumer expenditure in the USA.

If current income has ceased to be a driver of short-run consumption expenditures since the 1980s, then what, if anything, has taken its place? Results from the four columns on the right-hand side of [Table 3](#) all point to increasingly extensive credit-financing of consumer spending. ΔB is significant at the 5% level in all four regressions for the 1980–2011 subperiod. The significance of consumer credit in the short-run consumption function post-1980 suggests a change in Americans' attitude towards debt-financed consumption. From a microeconomic perspective, the household budget constraint is now framed less in terms of current income and more on the basis of the ability to borrow.

The significance of ΔB cannot be explained by the canonical life-cycle hypothesis. Consumers in the life-cycle model should behave rationally and only treat borrowing as an instrument to smooth consumption against fluctuating income, so that consumer credit should not exert an independent effect on consumer expenditure. The significance of ΔB post-1980 is, however, consistent with the post-Keynesian vision of consumption spending outlined earlier, associated with [Cynamon and Fazzari \(2008, 2013\)](#).

Results for the wealth variables in the last four columns of [Table 3](#) are similar to those in the first four columns of the table. ΔW_F is significant at the 10% level in R5,

but is rendered insignificant when the dummy for the financial crisis is added in R7. Similarly, ΔW_T is significant at the 5% level in R6 but is again insignificant in R8. If, however, we compare the adjusted R^2 of the regressions that include consumer sentiment with those that do not, it appears that the increase in explanatory power is insubstantial. These results are consistent with the findings of Ludvigson (2004), who suggests that even though the most popular measures of consumer confidence (including the University of Michigan's consumer sentiment index) do contain *some* information about consumer expenditure, much of that information is already captured in other economic indicators.

Last but not least, it is clear that ΔD_{1980} takes the correct sign but is insignificant in each of the last four regressions reported in Table 3. At first sight this may seem puzzling, since it is the period since 1980 that is most closely associated with the growth of debt-financed consumption spending by households. It is possible that our result is explained by the fact that different data are used to measure the debt burden for the 1980–2011 subperiod. If we calculate the correlation coefficient of the two data series, however, the result is 0.8229. This suggests a relatively strong positive correlation between our two measures of the debt burden. Moreover, if regression R5 is re-estimated using data from the ΔD_{1952} series, the results again suggest that the debt burden variable is insignificant. Hence there is little evidence to suggest that measurement issues alone render the debt burden variable insignificant in the four regressions covering the 1980–2011 subperiod.

Why, then, is the debt burden variable insignificant after 1980? One possible explanation is that the insignificance of ΔD_{1980} provides further evidence of households behaving in accordance with the consumption function developed in Kim *et al.* (2014) during the period of debt-financed consumption spending since 1980: the debt burden effect is negative but *discontinuous*, manifesting only in times of acute macroeconomic distress. A second explanation is that the insignificance of ΔD_{1980} coupled with the significant but *positive* impact on consumption of ΔD_{1952} in R1 and R2, suggest that the debt-to-income ratio (however measured) captures more than just a debt burden that, *ceteris paribus*, can be expected to negatively affect consumption spending. Hence prior to the boom in credit-financed consumerism, household debt was largely mortgage debt and mortgages were used exclusively to acquire and improve property. Indeed, even since the onset of credit-financed consumer spending, mortgage debt has continued to dominate household debt accumulation, although it is now much less certain that mortgage debt is used to acquire or improve property (Cynamon and Fazzari, 2008). It can be argued, then, that at least for the period 1952–80 (and possibly thereafter), total household liabilities as a proportion of disposable household income proxies the steady accumulation of *housing wealth* in the USA. According to Case *et al.* (2001), and contrary to the effects of financial assets that are concentrated in the hands of the very rich, housing wealth affects most American households. It is therefore possible that the empirical performance of our debt burden variables is affected by the fact that they reflect, in part, a positive housing wealth effect on consumption (which is not completely captured by our other wealth variables) as well as a negative debt burden effect—with the latter only evident after 1980, since when the growing use of credit cards and cash-out mortgage refinancing has fundamentally altered the relationship between the debt-to-income ratio and housing wealth. The upshot of all this is that after 1980, what our 'debt burden' variables measure begins to change, from a serviceable proxy for housing wealth to a genuine measure of the

debt burden. On this interpretation, it could be argued that *after* 1980 the negative effect of the debt burden began to offset the positive impact of debt-financed housing wealth accumulation, explaining the statistical insignificance of ΔD_{1980} , whereas prior to the 1980s our debt burden variables essentially proxy *only* the accumulation of housing wealth, and this drives the positive and significant effects of ΔD_{1952} in R1 and R2.

In order for this second explanation to make sense, there must have been a change in the behaviour of American consumers at the beginning of the 1980s. Results of a series of Chow tests indicate that if any date between the third quarter of 1980 and the first quarter of 1985 is selected as the break point, the null hypothesis of no structural break is rejected at the 5% level. There is, then, some evidence to suggest that the second account of the performance of our debt burden variables is plausible.

According to the regression results in Table 3, consumer behaviour in the USA does not correspond to the strictures of the canonical life-cycle model. Since all regressions conducted are short run, neither income nor our balance sheet variables should have any significant effect on consumer expenditure. In fact, following Hall (1978), consumption in the short run should follow a random walk. Instead, our regression results indicate that US consumption spending was significantly influenced by current income prior to the 1980s. While this relationship waned thereafter, our results suggest that this was because beginning in the early 1980s, US consumers spent according to the amount of credit (rather than current income) available to them. In summary, in the short run, US households appear to behave more in accordance with the post-Keynesian theory of consumption outlined in Section 2, which is a derivative of the relative income hypothesis.

3.4 Consumption spending in the long run: a vector error-correction model

A vector error-correction (VEC) model of the sort developed by Johansen (1988) and Johansen and Juselius (1992) is used to examine the long-run relationships between consumption, income and our balance sheet variables. In order to determine whether or not the consumption function in equation (1) involves a long-run cointegrating relationship, the Johansen cointegration test is used. The first step of the Johansen test involves determining the optimal lag length. The most common procedure used to choose the optimal lag length involves estimating a vector autoregressive (VAR) model including all variables in levels. The principle of majority rule among our information criteria suggests that lag lengths of 6 and 5 are optimal for the 1952–2011 and 1980–2011 periods, respectively.¹¹

The next step is to decide whether an intercept and trend should be included in either the short-run or the long-run model, or both. Since it is generally accepted that autonomous consumption is an important part of total consumer expenditure, it seems appropriate to include an intercept term in both the long-run cointegrating equation and the short-run VAR matrix. It is difficult, however, to think of any sound explanation for a permanently increasing level of consumer expenditure over time, *ceteris paribus*. Adding a time trend into the long-run cointegrating equation does not, therefore, make economic sense.

¹¹ Due to space limitations, we omit the results of lag length tests. The results are available upon request.

Bearing in mind the choices made above, we now proceed to analyse the Johansen test results reported in Tables 4–7. In Table 4, the trace statistic shows at most two cointegrating equations, while the maximum eigenvalue statistic indicates only one. In Table 5, the trace statistic shows two cointegrating equations, but the maximum eigenvalue statistic indicates none. In Tables 6 and 7, which present test results for the 1980–2011 subperiod, the Johansen test fails. This last result is unexpected; however, it should be noted that the statistical robustness of the VEC model depends not only on the number of degrees of freedom, but also on the length of the test period. Hence it is possible that the cointegrating relationship is still there, but the limited length of the test period renders the relationship statistically insignificant.

Since the Johansen test shows that there is no cointegrating relationship for the shorter 1980–2011 subperiod, the VEC model is only constructed for the entire 1952–2011 period. We have already determined the optimal lag length and the exact model to be used. The only parameter left to determine is how many cointegrating relationships should be included in the VEC model. As neither of the two different types of test reported in Tables 4 and 5 gives an unambiguous answer, detailed analysis of the possible cointegrating equations is needed. Table 8 provides detailed estimates of the cointegrating equations identified in Table 4. Since the trace test indicates two cointegrating equations whereas the maximum eigenvalue test shows one, we need to examine which choice would yield more economically and statistically meaningful estimates. If there is only one cointegrating equation, the error-correction term is significant and

Table 4. *P-value for the Johansen cointegration test using W_F , 1952–2011*

No. of CEs	Model 2		Model 3		Model 4	
	Trace	Max. eigenvalue	Trace	Max. eigenvalue	Trace	Max. eigenvalue
0	0.0000	0.0005	0.0014	0.0480	0.0005	0.1283
At most 1	0.0125	0.0802	0.0177	0.0625	0.0028	0.0359
At most 2	0.0771	0.3485	0.1422	0.2713	0.0432	0.2119
At most 3	0.0974	0.1356	0.2577	0.3886	0.1102	0.1802

Note: Variables included: C , Y , B , W_F and D_{1952} . CE denotes cointegrating equation.

Table 5. *P-value for the Johansen cointegration test using W_T , 1952–2011*

No. of CEs	Model 2		Model 3		Model 4	
	Trace	Max. eigenvalue	Trace	Max. eigenvalue	Trace	Max. eigenvalue
0	0.0001	0.0026	0.0057	0.1338	0.0009	0.0395
At most 1	0.0210	0.1182	0.0291	0.1053	0.0157	0.0902
At most 2	0.0930	0.3482	0.1495	0.2678	0.1048	0.3294
At most 3	0.2473	0.1914	0.1088	0.4358	0.1847	0.2938

Note: Variables included: C , Y , B , W_T and D_{1952} . CE denotes cointegrating equation.

Table 6. *P-value for the Johansen cointegration test using W_F , 1980–2011*

No. of CEs	Model 2		Model 3		Model 4	
	Trace	Max. eigenvalue	Trace	Max. eigenvalue	Trace	Max. eigenvalue
0	0.0003	0.0006	0.0831	0.1916	0.0236	0.2289
At most 1	0.0856	0.3713	0.2832	0.3583	0.0817	0.2014
At most 2	0.1377	0.1974	0.5157	0.6179	0.2618	0.3461
At most 3	0.3503	0.6489	0.5326	0.4752	0.4778	0.5254

Note: Variables included: C , Y , B , W_F and D_{1980} . CE denotes cointegrating equation.

Table 7. *P-value for the Johansen cointegration test using W_T , 1980–2011*

No. of CEs	Model 2		Model 3		Model 4	
	Trace	Max. eigenvalue	Trace	Max. eigenvalue	Trace	Max. eigenvalue
0	0.0002	0.0007	0.0668	0.2145	0.0244	0.1463
At most 1	0.0560	0.3586	0.2146	0.4112	0.1211	0.3512
At most 2	0.0887	0.1961	0.3464	0.4288	0.2454	0.3098
At most 3	0.2188	0.5876	0.4736	0.4135	0.4879	0.5078

Note: Variables included: C , Y , B , W_T and D_{1980} . CE denotes cointegrating equation.

Table 8. *Cointegrating equation and adjustment coefficient, following Table 4*

No. of CEs	Adjustment coefficient	Normalised cointegrating equation				
		C	Y	B	W_F	D_{1952}
1	−0.0928** (0.0349)	1.0000	−0.7334** (0.0441)	−0.1360** (0.0415)	−0.1227** (0.0293)	0.0853** (0.0383)
	−0.1864** (0.0555)	1.0000	0.0000	−0.8801** (0.0939)	−0.0663 (0.1279)	0.5271** (0.1432)
2	0.1620** (0.0504)	0.0000	1.0000	−1.0146** (0.1052)	0.0769 (0.1432)	0.6023** (0.1604)

Notes: Significance level: **5%.

Standard errors in parentheses. CE denotes cointegrating equation.

has a negative coefficient. However, if there are two cointegrating equations, one of the two error-correction terms will have a positive coefficient. According to the theoretical foundation of the error-correction model, if there is a cointegrating relationship among the variables, the error-correction term must be negative and significant. Therefore, it seems that the VEC model covering the 1952–2011 period with W_F used to measure household wealth should only have one cointegrating equation.

Table 9 contains detailed estimates of the cointegrating equations identified in Table 5. We can see that if there is one cointegrating equation, the error-correction term, although negative and less than one, is not significant at the 5% level. On the other hand, if there are two cointegrating equations, one of the two error-correction terms has a positive coefficient. As neither choice produces statistically meaningful estimates, the result of no cointegrating relationship suggested by the maximum eigen-value test is accepted.

Because the estimates in Table 9 identify no cointegrating equation, a VEC model cannot be constructed using the variable W_T . The only possible model left is one covering the entire 1952–2011 period using W_F . Estimates of this model are presented in Table 10. The first part of the table is a normalised cointegrating equation that describes the long-run relationship among the variables. We can see that all of the independent variables in the long-run cointegrating equation are significant at the 5% level. In equation form, the cointegrating equation can be written as:

$$C = -5.2556 + 0.7334Y + 0.1360B + 0.1227W_F - 0.0853D_{1952} \tag{3}$$

The marginal propensity to consume indicated by the VEC model is 0.7334, a value that is within the expected range (between zero and one). The positive coefficient on B means that in the long run, consumer expenditure is positively related to borrowing by consumers. The positive but less than unit coefficient on W_F confirms the existence of a financial wealth effect in the long run. Last, but not least, the negative coefficient on D is evidence of a long-run negative relationship between consumption and the household debt burden.¹²

Table 9. *Cointegrating equation and adjustment coefficient, following Table 5*

No. of CEs	Adjustment coefficient	Normalised cointegrating equation				
		C	Y	B	W_T	D_{1952}
1	−0.0295 (0.0232)	1.0000	−0.5360** (0.0848)	−0.2979** (0.0632)	−0.1345 (0.0634)	0.1483** (0.0689)
	−0.1401** (0.0529)	1.0000	0.0000	−0.8803** (0.1202)	−0.0506 (0.1527)	0.4750** (0.1367)
2	0.1104** (0.0426)	0.0000	1.0000	−1.0867** (0.1509)	0.1566 (0.1917)	0.6096** (0.1716)

Notes: Significance level: **5%.
Standard errors in parentheses. CE denotes cointegrating equation.

¹² The second half of Table 10 presents short-run estimates of the error-correction model. Since the main purpose of the VEC model is to find the long-run relationship between consumption and the other variables in Table 10, the regression results for the short run are of less importance. The most important result reported in the second half of Table 10 is the value and significance of the error-correction term. This term is significant at the 5% level and implies a speed of adjustment of −0.0928, suggesting that for every unit of short-run deviation from long-run equilibrium in a given period, 9.28% of the deviation will be corrected in the following period.

Table 10. VEC model estimates using W_{F3} 1952–2011

Variable	Coefficient (<i>t</i> -statistic)	Variable	Coefficient (<i>t</i> -statistic)	Variable	Coefficient (<i>t</i> -statistic)
Cointegrating equation					
C	1.0000	Constant	5.2559	W_F	-0.1227** (-4.1941)
Y	-0.7334** (-16.6479)	B	-0.1360** (-3.2798)	D_{1952}	0.0853** (2.2295)
Error correction					
Correction term	-0.0928** (-2.6633)	Constant	0.0059** (4.5394)		
ΔC_{-1}	0.0539 (0.6258)	ΔC_{-3}	0.2386** (2.8427)	ΔC_{-5}	-0.0549 (-0.6425)
ΔC_{-2}	0.1090 (1.2680)	ΔC_{-4}	-0.0887 (-1.0664)	ΔC_{-6}	0.0449 (0.5871)
ΔY_{-1}	0.3216** (3.6706)	ΔY_{-3}	-0.0184 (-0.2064)	ΔY_{-5}	-0.1621* (-1.8331)
ΔY_{-2}	-0.0307 (-0.3439)	ΔY_{-4}	-0.2307** (-2.6618)	ΔY_{-6}	-0.0010 (-0.0115)
ΔW_{F-1}	0.0382** (2.4076)	ΔW_{F-3}	0.0051 (0.3084)	ΔW_{F-5}	0.0033 (0.2054)
ΔW_{F-2}	0.0386 (2.3801)	ΔW_{F-4}	0.0273 (1.6482)	ΔW_{F-6}	0.0089 (0.5532)
ΔB_{-1}	-0.0703 (-1.5411)	ΔB_{-3}	-0.0082 (-0.2696)	ΔB_{-5}	0.0241 (0.5458)
ΔB_{-2}	-0.0221 (-0.5345)	ΔB_{-4}	0.0725** (2.3933)	ΔB_{-6}	-0.0204 (-0.4957)
ΔD_{1952-1}	0.2825** (3.6244)	ΔD_{1952-3}	0.0564 (0.6729)	ΔD_{1952-5}	-0.1577* (-1.8970)
ΔD_{1952-2}	0.0710 (0.8638)	ΔD_{1952-4}	-0.2056** (-2.4703)	ΔD_{1952-6}	-0.0268 (-0.3096)
Adjusted R^2 :		0.3248	F -statistic:		4.5690

Note: Significance levels: **5% and *10%.

To what extent are the results reported in equation (3) consistent with the post-Keynesian vision of consumption discussed in Section 2? Note first that both the income and wealth variables in equation (3) are significant and have positive coefficients. These findings are consistent with the post-Keynesian account of consumption spending discussed in the previous section, but so too are they consistent with the canonical life-cycle hypothesis, according to which (lifetime) income and wealth are the basic drivers of consumption spending.

The life-cycle framework, however, is not well suited to explaining the significance of household borrowing and the debt burden in the long-run consumption function estimated in equation (3). Consumers in the canonical life-cycle model are perfectly rational and plan their consumption based on their permanent income and wealth. Borrowing is merely an instrument to smooth consumption over time and should not have a positive and significant impact on consumption in the long run. Similarly, the debt burden should not afflict intertemporally optimising consumers who have borrowed only to smooth consumption as part of a rational dynamic plan: it should not have a significant negative effect on consumption in the long run, as in equation (3).

Note, however, that the positive and significant coefficient on borrowing and negative and significant coefficient on the debt burden *are* consistent with the post-Keynesian account of consumption discussed in Section 2. This theory suggests that consumers have come to depend on debt accumulation to finance consumption at or near to levels to which they aspire, but which they cannot afford to fund from current income. It also suggests that given their deficient foresight, households will be prone to accumulating debt in a manner that results in increasing financial fragility (and hence eventual financial distress and possibly default). This is consistent with the negative long-run relationship between consumption and the debt burden in equation (3).

3.5 Consumption spending in the long run: a dynamic ordinary least squares model

Besides the commonly used VEC method, the dynamic ordinary least squares (DOLS) method also provides an effective way of estimating long-run cointegrating relationships. Tables 11 and 12, respectively, report estimates of long-run cointegrating equations using W_F and W_T to measure the wealth effect on consumption. Three statistical criteria, namely the Akaike information criterion (AIC), the Schwarz criterion (SC) and the Hannan–Quinn information criterion (HQC), can be used to determine the optimal leads and lags in a DOLS model. Unfortunately, the 1980–2011 subperiod is not long enough to permit such calculation, so only regressions for the 1952–2011 period are conducted. Table 11 shows that the three criteria indicate different leads and lags: the AIC suggests 14 leads and 11 lags; the SC indicates no leads and four lags; and the HQC suggests no leads and five lags. Some variables, such as Y and W_F , are significant regardless of which criterion is used. B , on the other hand, is insignificant in all three columns. The only variable that behaves inconsistently is D_{1952} : it is negative and significant if the regression is based on AIC, but becomes insignificant when SC or HQC is adopted. Similarly, in Table 12, the two columns of estimates using SC and

Table 11. DOLS estimates using W_F , 1952–2011

Criteria	AIC	SC	HQC
No. of leads	14	0	0
No. of lags	11	4	5
Constant	−5.8494** (−5.169)	−2.3750** (−5.9107)	−2.5501** (−6.2806)
Y	0.7764** (13.9613)	0.9088** (43.7376)	0.8988** (42.1828)
B	0.03848 (0.6636)	−0.0265 (−1.3554)	−0.0178 (−0.8785)
W_F	0.2215** (6.5123)	0.1238** (8.3569)	0.1246** (8.5300)
D_{1952}	−0.1781** (−2.6998)	0.0009 (0.6297)	0.0020 (0.1075)
Adjusted R^2	0.9998	0.9998	0.9998
D-W statistic	0.5761	0.4360	0.4295

Notes: Significance level: **5%.
 t -statistics in brackets.

Table 12. DOLS estimates using W_T 1952–2011

Criteria	AIC	SC	HQC
No. of leads	14	0	0
No. of lags	11	4	1
Constant	−8.5064** (−4.8753)	−3.9124** (−6.7567)	−3.7120** (−6.5800)
Y	0.5920** (8.0793)	0.8237** (30.9579)	0.8406** (33.0259)
B	0.1567** (2.5646)	0.0100 (0.5190)	−0.0095 (−0.5268)
W_T	0.2496** (4.6778)	0.1629** (7.5707)	0.1688** (7.8979)
D_{1952}	−0.1653* (−1.8927)	−0.0051 (−0.2376)	−0.0013 (−0.0619)
Adjusted R^2	0.9998	0.9998	0.9998
D-W statistic	0.4785	0.4128	0.4532

Notes: Significance levels: **5% and *10%.
t-statistics in brackets.

HQC resemble one another to a large extent. In both columns, Y and W_T are positive and significant while the other two variables are insignificant. Variables in the column using AIC, on the other hand, are all statistically significant.

In both tables, a dichotomy is observed between the AIC, on one hand, and the SC and HQC, on the other. DOLS estimates from equations based on the SC and HQC favour the life-cycle hypothesis: income and wealth are significant in the long-run consumption function and have expected signs, while borrowing and the debt burden are insignificant. The estimates produced using the AIC, however, tell a completely different story. Although B is insignificant in the second column of Table 11, in Table 12, all independent variables are significant and have signs consistent with the post-Keynesian view of consumption. In fact, the regression results in the second column of Table 12 are broadly similar to those in Table 10 (based on the VEC model).

There is no basis for establishing which criterion performs best in selecting the most appropriate DOLS model. However, through analysing how these criteria are calculated, we may be able to prioritise them under certain circumstances. Hence the AIC is constructed in such a way that the model with the best fit is given more credit. The SC and the HQC, on the other hand, emphasise the succinctness of the estimating model and punish additional independent variables. The SC is often selected to be the determining criterion because of the simplicity of the resulting regression. In DOLS estimation, however, the criteria are only used to determine the optimal number of leads and lags: no matter which criterion is selected, the variables in the cointegrating equation will not change. Sacrificing the accuracy of the estimates when the number of independent variables remains unchanged regardless seems imprudent. We therefore consider the AIC the most appropriate indicator of optimal leads and lags in our DOLS regressions. On this basis, we conclude that the results in Tables 11 and 12 are consistent with those reported in

Table 10 and corroborate the post-Keynesian account of aggregate consumption outlined in Section 2.

4. Conclusion

This paper analyses consumption spending by US households since the 1950s. Its initial focus is consumer behaviour in the short run. Comparing short-run regression results covering two different periods, we notice a structural change in consumer behaviour. During the 1952–2011 period as a whole, current income is significant in the consumption function whereas consumer borrowing is insignificant. During the 1980–2011 subperiod, however, current income is substantially less important while consumer borrowing is highly significant. Results of a Chow test confirm the existence of a structural break in the early 1980s. In neither period can our regression results be well explained by the canonical life-cycle hypothesis. In particular, the importance of household borrowing after the structural break is incompatible with the life-cycle hypothesis, in which rational consumers only use credit as a tool to smooth consumption in the face of fluctuating income. It is, however, compatible with the post-Keynesian theory of consumption outlined in this paper, which posits that households accumulate debt in order to finance consumption they cannot fund from current income subject to deficient foresight regarding the long-term consequences of this behaviour.

Additionally, we use two different models, the VEC model and the DOLS model, to estimate the cointegrating relationship between consumption and various other variables, and in so doing to examine consumer behaviour in the long run. A cointegrating equation is produced by the VEC model and the regression results indicate that both household borrowing and the debt burden are statistically significant and of the correct sign. Again, this is compatible with the post-Keynesian theory of consumption outlined in this paper, but not with the canonical life-cycle hypothesis in which borrowing and debt accumulation are merely tools that assist the intertemporal reallocation of consumption spending. A regression produced by the DOLS model produces results that are again compatible with the alternative theory of consumption advanced in this paper. We are only left to conclude that the post-Keynesian account of consumption furnishes a more plausible account of post-war US consumption spending than the canonical life-cycle hypothesis.

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Appendix: Data definitions and sources**Table A1.** Data definitions and sources

Time-series data	Definition	Source
Consumer expenditure	<i>Real personal consumption expenditures (chained 2005 dollars)</i>	Bureau of Economic Analysis www.bea.gov
Disposable income (real)	<i>Real disposable personal income (chained 2005 dollars)</i>	Bureau of Economic Analysis www.bea.gov
Disposable income (nominal)	<i>Disposable personal income</i>	Bureau of Economic Analysis www.bea.gov
Consumer credit	<i>Consumer credit–liabilities–balance sheet of households and non-profit organisations</i>	Federal Reserve Board Flow of Fund www.federalreserve.gov/releases/z1/Current/
Household total assets	<i>Total assets–balance sheet of households and non-profit organisations</i>	Federal Reserve Board Flow of Fund www.federalreserve.gov/releases/z1/Current/
Household financial assets	<i>Total financial assets–assets–balance sheet of households and non-profit organisations</i>	Federal Reserve Board Flow of Fund www.federalreserve.gov/releases/z1/Current/
Household liabilities	<i>Total liabilities–balance sheet of households and non-profit organisations</i>	Federal Reserve Board Flow of Fund www.federalreserve.gov/releases/z1/Current/
Debt service-to-income ratio	<i>Household debt service payments as a percentage of disposable personal income</i>	Federal Reserve Board Flow of Fund www.federalreserve.gov/releases/z1/Current/
GDP deflator	<i>Gross domestic product: implicit price deflator</i>	Bureau of Economic Analysis www.bea.gov
Consumer sentiment index	<i>University of Michigan: consumer sentiment</i>	Thompson Reuters/University of Michigan Survey of Consumers www.sca.isr.umich.edu

The variables that appear in the text are then calculated as follows:

$C = \ln(\text{consumer expenditure})$

$Y = \ln(\text{disposable income})$

$$B = \ln \left(\frac{\text{Consumer Credit}}{\text{GDP Deflator}} \right)$$

$$W_T = \ln \left(\frac{\text{Households' Total Assets}}{\text{GDP Deflator}} \right)$$

$$W_F = \ln \left(\frac{\text{Households' Financial Assets}}{\text{GDP Deflator}} \right)$$

$$D_{1952} = \frac{\text{Households' Liabilities}}{\text{Nominal Disposable Income}}$$

D_{1980} = debt service-to-income ratio

S = consumer sentiment index