Consumer Sentiment and Australian Consumer Spending*

Joanne Loundes and Rosanna Scutella
Melbourne Institute of Applied Economic and Social Research
The University of Melbourne

Abstract

There is a growing literature that seeks to analyse the relationship between consumer sentiment and economic variables, primarily because of the pervasive belief that consumers' opinions and expectations can influence the direction of—or signal changes in the direction of—the economy. There has been little previous empirical work on Australian consumer sentiment, either in determining its explanatory power, or examining the factors that influence consumer sentiment. This research aims to fill part of this gap by providing a clearer understanding of the relationship between consumer attitudes and 'real' economic variables. Specifically, the predictive power of the consumer sentiment index for consumption will be examined using the methods proposed in Carroll, Fuhrer and Wilcox (1994). Private consumption expenditure accounts for a large proportion of GDP; hence, early detection of possible shifts in consumer spending could assist policy makers in smoothing out the business cycle. Our results suggest that the causal relationship between consumption and sentiment in Australia is more complicated than what Carroll *et al* suggest, and that the behaviour of consumption in Australia looks more like the permanent income hypothesis than it does in the US.

1.   Introduction

There is a pervasive belief among economic analysts that consumer opinions and expectations can influence—or perhaps provide a forecast of changes in—economic growth. Private consumption expenditure accounts for a large proportion of GDP; hence, early detection of possible shifts in consumer spending could assist policy makers in smoothing the business cycle. Although the effect of consumer sentiment on economic activity is of interest to policymakers and economic forecasters, there is little consensus about the ability of indexes of consumer sentiment to provide information on consumer spending that is not already contained in other economic measures (Bram and Ludvigson, 1998, p. 59). The aim of this study is to determine whether consumer confidence—as measured by the consumer sentiment index (CSI)—contains any information on consumer spending that is not already captured by other economic indicators.

There has been little previous empirical work on Australian consumer sentiment, either in determining its explanatory power, or examining the factors that influence consumer sentiment.[1] This research aims to fill part of this gap by providing a clearer understanding of the relationship between consumer attitudes and 'real' economic variables using the Westpac-Melbourne Institute Consumer Sentiment Index, private consumption, labour income, the 90-day bank bill rate, the All Ordinaries index and the unemployment rate. The predictive power of the consumer sentiment index for consumption is examined using the methods proposed in Carroll *et al* (1994). The value of consumer sentiment indicators stems from the view that such measures lead cyclical economic movements. However, if sentiment indicators move coincidentally with cyclical changes, they may still contain some helpful information, as they are more readily available than economic data relating to the same point in time (Santero and Westerlund, 1996). Indeed, the Westpac-Melbourne Institute Consumer Sentiment Index is published seven days after the start of the survey period. In comparison, labour force estimates, retail sales, motor vehicle registrations and building approvals are available with (at least) a one-month lag, and analysts have to wait three months for the release of the National Accounts.

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[1] The exception is Boehm and McDonnell, 1993.

Although consumer confidence indicators are widely reported and discussed, their subjective nature has raised some questions as to their usefulness. Confidence indicators are not typically incorporated into standard theoretical models of household behaviour, except to the extent that they are "taken as a proxy for forward-looking expectations of economic agents about the key variables which enter behavioural equations" (Santero and Westerlund, 1996, p. 5). Santero and Westerlund found that the general usefulness of consumer sentiment indicators for predicting consumption expenditure varies among countries. Given this evidence, it would seem prudent to estimate appropriately the influence of Australian consumer sentiment on consumer spending, rather than rely on overseas evidence.

The following section describes the survey data utilised in this paper. Section three provides a preliminary analysis of the relationship between consumption expenditure and consumer sentiment in Australia by first looking at the incremental predictive ability of the consumer sentiment index, and then examining the lag structure. This lays the foundation for the estimation of the Campbell-Mankiw (1989) model of consumption, presented in Section four. In this model, Campbell and Mankiw (1989) investigate a modification of the pure life-cycle/permanent income hypothesis using aggregate data. They assume there is one type of consumer that spends all of their current income, with the remainder setting their spending behaviour according to the life-cycle/permanent income model. This model provides the basis of the analysis, and is supplemented by information on consumer sentiment. Section five concludes.

2.   The Westpac-Melbourne Institute Survey of Consumer Sentiment

The Melbourne Institute has conducted a regular survey of consumers' attitudes since March 1973. The Westpac-Melbourne Institute Consumer Sentiment Index (CSI) represents the balance of favourable and unfavourable responses to five questions on consumers' views about the broad economic environment and the household's financial position. The survey is conducted by telephone, and the questions are put to a sample of 1200 households each month.[2] The consumer sentiment index has been designed as a trendless variable indicating

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[2] The surveys were undertaken on a quarterly basis between 1974 and 1976. From 1976 to 1986 they were conducted every 6 weeks. Since then they have been undertaken monthly, with missing monthly values estimated by linear interpolation. The sample is stratified by sex and location and age is randomised. The Northern Territory is not included.

short-run changes in consumers' willingness to buy, and is calculated as the balance of opinion for five questions on the respondents' general economic outlook. The five questions include the respondents' assessment of their current family finances, family finances over the coming twelve months, economic conditions in Australia over the coming twelve months, economic conditions in Australia over the next five years, and whether it is a good or bad time to buy major household items. Each question is represented by an index, which is equal to the per cent of optimists minus the per cent of pessimists, plus 100. The consumer sentiment index is a simple average of the five component indexes. An Index of 100 indicates that, on balance, consumers do not feel any more or any less optimistic about the future than their perception of the present situation.

3. Preliminary analysis

3.1. Incremental predictive ability of the consumer sentiment index

In order to determine whether there is any additional predictive power in the consumer sentiment index for household consumption, Carroll *et al* (1994) first estimate variations of a simple model and examine the resultant adjusted R^2 from each of the regressions. The initial regression is of the form:

$$\Delta \log(C_t) = \alpha_0 + \sum_{i=1}^{N} \beta_i S_{t-i} + \varepsilon_t \qquad (1)$$

where C_t represents five different measures of consumption growth, and S represents four lags of the quarterly consumer sentiment index. The five measures of consumption are total private consumption expenditure, motor vehicles, goods excluding motor vehicles, discretionary consumption (total consumption excluding food, rent, health, education and electricity), and services. In order to determine whether the consumer sentiment index has predictive ability over and above that provided by other economic information, the equation is modified to produce

$$\Delta \log(C_t) = \alpha_0 + \sum_{i=1}^{N} \beta_i S_{t-i} + \gamma Z_{t-1} + \varepsilon_t \qquad (2)$$

where Z_t is a vector that includes four lags of the dependent variable and four lags of the growth in real labour income.

Table 1. Incremental predictive ability of the consumer sentiment index

Consumption category	USA		Australia	
	$\overline{R}^2$	Incremental $\overline{R}^2$	$\overline{R}^2$	Incremental $\overline{R}^2$
	1978:1 – 1992:3		1976:3 – 1999:2	
Total	0.05	-0.03	0.04	0.02
	(0.013)	(0.056)	(0.119)	(0.470)
Motor vehicles	-0.01	0.03	0.08	0.05
	(0.130)	(0.013)	(0.024)	(0.212)
Goods excluding motor vehicles	0.20	0.03	0.02	-0.01
	(0.000)	(0.001)	(0.203)	(0.051)
Discretionary consumption	.	.	0.07	-0.02
	.	.	(0.040)	(0.155)
Services	0.02	-0.07	0.04	0.04
	(0.030)	(0.969)	(0.094)	(0.513)

Source of USA data: Carroll *et al*, 1994, p. 1400. Although Carroll *et al* (1994) also estimate the equation using a longer data set (1955:1 to 1992:3), the shorter sample period is used here for comparative purposes. The quarterly consumer sentiment index for both models is defined as the average of the monthly observations. Values in parentheses are the p-values of an F-test for the joint significance of the lags of sentiment.

A similar process was carried out on Australian data, with the main exception being the use of discretionary consumption as a dependent variable. The results of both studies are presented in Table 1. The difference in the size and significance of the explanatory power of the consumer sentiment index between the two countries is considerable. Lagged values of the consumer sentiment index explain about 5 per cent of the variation in growth of total private consumption expenditure for the USA, and 4 per cent for Australia. The results for the USA are jointly significant at higher than the 5 per cent level, but those for Australia are not significant at any meaningful level of significance (although it is approaching significance at the 10 per cent level). Furthermore, despite apparently adding explanatory power once extra variables are added to the Australian equation, there is a deterioration in the significance level.

Re-estimating the equation using motor vehicles as the dependent variable does not yield particularly promising results either. Lags of sentiment on their own explain 8 per cent of the variation in motor vehicle consumption growth, a result that is significant at higher than the 5 per cent level. However, once lagged income growth and lagged values of the dependent variable are included, sentiment accounts for an extra 5 per cent of the variation in motor vehicle growth, but the result is no longer significant at any meaningful level. In the USA, sentiment on its own is a poor explanator of motor vehicle growth, but performs somewhat better once the other variables are added to the equation.

Perhaps the greatest disparity in results can be seen from the equation that utilises goods excluding motor vehicles as the dependent variable. In the USA, the consumer sentiment index explains 20 per cent of the variation in the growth of this consumption item and an extra 3 per cent when other variables are controlled for. A joint significance test indicates that these results are significant at greater than the one per cent level. For Australia, the outcome is decidedly different. Only 2 per cent of the variation is accounted for by sentiment, although this is not significant at any meaningful level. Adding labour income and lags of the dependent variable improves the joint significance of the sentiment variables, but actually *detracts* from the explanatory power.

The relationship between consumption and consumer attitudes would usually be expected to be strongest for discretionary consumption. However, the preliminary estimates suggest that this is not the case (this exercise was not carried out on USA data). On their own, lags of the consumer sentiment index explain 7 per cent of variation in the growth of consumption excluding necessities, and are significant at better than the 5 per cent level. However, once the other lagged variables are accounted for, the consumer sentiment index detracts from the explanatory power, although this result is not significant at any meaningful level.

Services are poorly explained by the consumer sentiment index for both countries. In Australia, 4 per cent of the variation in the growth of service consumption is explained by the consumer sentiment index; this is significant at the 10 per cent level. Once lagged labour income and 4 lags of the dependent variable are added, the consumer sentiment index accounts for a further 4 per cent. However, the joint significance of the 4 lags of the consumer sentiment index deteriorates to the extent that it is no longer significant at any meaningful level.

3.2. *Lag structure*

Given that these preliminary estimates are quite different, there is a distinct possibility that the time frame in which Australian sentiment has an impact on consumption may also be different from its US counterpart. To examine this issue, several tests were undertaken to determine the lag length required for the consumer sentiment index to have an impact on consumption in Australia, using the procedure outlined in Gourieroux and Monfort (1997, Sections 10.2.4 and 10.2.5). The method uses the variance of the residuals from the series of

regressions outlined in equations (3) to (9) to calculate instantaneous causation, causation of consumption on sentiment and causation of sentiment on consumption.

The method proceeds by estimating the following regressions (where C is consumption and S is sentiment):

Consumption on its own past

$$C_t = \sum_{j=1}^{+\infty} A_j^1 C_{t-j} + a^1 + u_t^1, \tag{3}$$

Sentiment on its own past

$$S_t = \sum_{j=1}^{+\infty} A_j^2 S_{t-j} + a^2 + u_t^2, \tag{4}$$

Consumption on the past of consumption and sentiment

$$C_t = \sum_{j=1}^{+\infty} A_j^3 C_{t-j} + \sum_{j=1}^{+\infty} A_j^4 S_{t-j} + a^3 + u_t^3, \tag{5}$$

Sentiment on the past of consumption and sentiment

$$S_t = \sum_{j=1}^{+\infty} A_j^5 C_{t-j} + \sum_{j=1}^{+\infty} A_j^6 S_{t-j} + a^4 + u_t^4, \tag{6}$$

Consumption on the past of consumption and on current and past sentiment

$$C_t = \sum_{j=1}^{+\infty} A_j^7 C_{t-j} + \sum_{j=0}^{+\infty} A_j^8 S_{t-j} + a^5 + u_t^5, \tag{7}$$

Sentiment on its own past and on current and past consumption

$$C_t = \sum_{j=0}^{+\infty} A_j^9 C_{t-j} + \sum_{j=1}^{+\infty} A_j^{10} S_{t-j} + a^6 + u_t^6, \tag{8}$$

with $\mathrm{var}(u_t^k) = \Omega_k$

Consumption and sentiment on the past of consumption and sentiment (that is, a VAR of consumption and sentiment)

$$\begin{pmatrix} C_t \\ S_t \end{pmatrix} = \sum_{j=1}^{+\infty} \mathbf{A_t} \begin{pmatrix} C_{t-j} \\ S_{t-j} \end{pmatrix} + \mathbf{a} + \mathbf{u_t}, \qquad \mathrm{var}(\mathbf{u_t}) = \mathbf{\Omega}, \tag{9}$$

After these regressions are run the causality measures are calculated:

$$\gamma_{C \to S} = \ln \frac{\det \Omega_2}{\det \Omega_4} \tag{10}$$

$$\gamma_{S \to C} = \ln \frac{\det \Omega_1}{\det \Omega_3} \tag{11}$$

$$\gamma_{C \leftrightarrow S} = \ln \frac{\det \Omega_3}{\det \Omega_5} = \ln \frac{\det \Omega_4}{\det \Omega_6} = \ln \frac{\det \Omega_1 \det \Omega_2}{\det \Omega} \tag{12}$$

where $\gamma_{C \to S}$ is the causality from consumption to sentiment and $\gamma_{S \to C}$ is the causality from sentiment to consumption.

This technique allows causality to be decomposed in the time domain as in Gourieroux and Monfort (1997). Specifically:

$$\gamma_{C \to S} = \sum_{j=1}^{+\infty} \gamma_{C \to S}^{(j)} ,$$

where $\gamma_{C \to S}^{(j)}$ is the causality from consumption to sentiment at lag j. The total measure of causality, or linear dependence, between C and S is given by:

$$\gamma_{C,S} = \gamma_{C \leftrightarrow S} + \sum_{j=1}^{+\infty} \gamma_{C \to S}^{(j)} + \sum_{j=1}^{+\infty} \gamma_{S \to C}^{(j)} \tag{13}$$

These measures can be transformed into the following ratios,

$$\frac{\gamma_{C \to S}^{(j)}}{\gamma_{C,S}} , \qquad \frac{\gamma_{S \to C}^{(j)}}{\gamma_{C,S}} , \qquad \frac{\gamma_{C \leftrightarrow S}}{\gamma_{C,S}} , \tag{14}$$

which allow an examination of the contribution of various lags to the overall causality measure. Results (in percentage terms) for 12 lags of sentiment and consumption are presented in Table 2. Various measures of consumption and sentiment were used to derive the measures of causality. Levels of sentiment were used with yearly and quarterly growth in consumption in the first and second panels, respectively. The final panel illustrates the results obtained when yearly growth in both consumption and sentiment is used.

Table 2. Causality decomposition

(a) Yearly growth in consumption, level of sentiment

Lags (quarters)	Instantaneous causality	Causality: consumption → sentiment	Cumulative	Causality: sentiment → consumption	Cumulative	
0	0.39					
1		5.39	5.39	2.22	2.22	
2		0.08	5.47	0.00	2.22	
3		3.60	9.07	7.61	9.83	
4		3.95	13.02	0.70	10.53	
5		**12.90**	25.92	6.09	16.62	
6		2.63	28.55	0.38	17.00	
7		0.00	28.55	**13.88**	30.88	
8		3.34	31.89	9.02	39.90	
9		0.09	31.98	**10.61**	50.51	
10		0.97	32.95	4.33	54.84	
11		4.97	37.92	2.71	57.55	
12		3.06	40.98	1.07	58.62	
Total	0.39	40.98		58.62		100

(b) Quarterly growth in consumption, level of sentiment

Lags (quarters)	Instantaneous causality	Causality: consumption → sentiment	Cumulative	Causality: sentiment → consumption	Cumulative	
0	0.66					
1		**8.62**	8.62	0.42	0.42	
2		0.62	9.24	3.49	3.91	
3		4.31	13.55	4.71	8.62	
4		5.54	19.09	1.56	10.18	
5		**8.90**	27.99	2.42	12.60	
6		1.40	29.39	0.20	12.80	
7		0.29	29.68	**16.98**	29.78	
8		0.02	29.70	8.53	38.31	
9		1.19	30.89	**19.55**	57.86	
10		0.15	31.04	2.94	60.80	
11		1.38	32.42	1.04	61.84	
12		2.84	35.26	2.24	64.08	
Total	0.66	35.26		64.08		100

(c) Yearly growth in consumption, yearly change in sentiment

Lags (quarters)	Instantaneous causality	Causality: consumption → sentiment	Cumulative	Causality: sentiment → consumption	Cumulative	
0	1.46					
1		4.98	4.98	0.11	0.11	
2		0.00	4.98	0.01	0.12	
3		3.60	8.58	3.51	3.63	
4		**9.84**	18.42	0.73	4.36	
5		**16.21**	34.63	2.52	6.88	
6		5.41	40.04	0.09	6.97	
7		0.90	40.94	6.00	12.97	
8		2.47	43.41	6.09	19.06	
9		0.00	43.41	**23.48**	42.54	
10		0.18	43.59	7.68	50.22	
11		3.29	46.88	0.55	50.77	
12		0.02	46.90	0.87	51.64	
Total	1.46	46.90		51.64		100

Consumption has its major impact on sentiment with a lag of 5 quarters, and sentiment affects consumption with a lag of 9 quarters, regardless of the definition used for sentiment or

consumption (quarterly or yearly growth). However, there is still some interaction between sentiment and consumption before this time. Looking at the top panel, 63 per cent of the total effect of the yearly change in consumption on sentiment has occurred by the 5th quarter. The impact is faster for quarterly growth in consumption on sentiment, with 79 per cent of the effect occurring by the 5th lag. The effect of yearly growth in consumption on yearly growth in sentiment (the bottom panel) is somewhere in the middle, accounting for nearly three-quarters of the total impact by the 5th quarter.

The lag time is longer for the impact of sentiment on consumption. After 18 months, only 29 per cent of the effect of the level of sentiment on the annual change in consumption has occurred. However the next 3 quarters increase the estimates by a further 57 per cent. The results are similar for the two lower panels. The effect of sentiment on quarterly growth in consumption is 90 per cent complete by the 9th lag, although again the majority of the impact occurs between the 7th and 9th lag. In the last panel, most of the action occurs in the 9th quarter itself, accounting for 45 per cent of the total. Only 37 per cent of the total occurs prior to this time.

Given this impact, it would seem prudent to adopt a method that incorporates at least 9 lags. Having determined the preferred lag structure, the next section examines the Campbell-Mankiw model, which is used to help determine whether there is any useful information contained in the consumer sentiment index.

4. The Campbell – Mankiw Model

Campbell and Mankiw (1989, 1990, 1991) investigate a modification of the pure life-cycle/permanent income hypothesis using aggregate data. In this analysis they assume there are two types of consumer: one (representing a fraction, λ, of the population) spending all of their current income, with the remaining share of the population (1-λ) setting their spending behaviour according to the life-cycle/permanent income model. Thus the consumption decision of the latter group follows a random walk while the other type of consumer (which Carroll *et al* (1994) refer to as 'rule-of-thumb' consumers) set the change in their consumption equal to the change in their current income. Aggregate consumption is thus:

$$\Delta C_t = \lambda \Delta Y_t + \varepsilon_t \tag{15}$$

Instrumental variables techniques are then used to estimate the above equation as ΔY_t is correlated with ε_t.

If consumption decisions are made continuously (but the data are measured as time aggregates) the observed series on consumption spending follows an IMA (1,1). This occurs even if consumer behaviour conforms exactly to the life-cycle model and the consumption good is completely non-durable. Therefore, a slight adjustment is made to equation (15) in Carroll *et al* (1994), and aggregate consumption is given by:

$$\Delta C_t = \lambda \Delta Y_t + v_t - \theta v_{t-1} \tag{16}$$

The Campbell–Mankiw model does not prohibit lagged sentiment from being used as an instrument to predict current growth of income. However, it is required that lagged sentiment does not directly affect current growth in consumption apart from its effect as an instrument for income. The alternative hypothesis is that lagged sentiment directly affects the current growth of spending. That is,

$$\Delta C_t = \lambda \Delta Y_t + \sum_{i=1}^{N} \beta_i S_{t-i} + v_t - \theta v_{t-1} \tag{17}$$

Non-linear instrumental variables techniques are used to estimate the above equation and a joint significance test of the coefficients on lagged sentiment is performed to test the restrictions implicit in the Campbell-Mankiw model.[3] The results of the causality analysis presented in Section 3.2 suggest that it is not sufficient to use four lags of sentiment as was used in the analysis by Carroll *et al*. Thus in this analysis ten lags of the Consumer Sentiment Index are used.

Four different estimations are performed on each of five different consumption categories. The first two use an instrument list consisting of four lags of the dependent variable and four lags of the growth in real labour income (instrument list 1), and are estimated with and without consumer sentiment.[4] The second two use an instrument list that includes the All

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[3] A RATS program downloaded from Christopher Carroll's website was used to estimate the equation, see http://www.econ.jhu.edu/People/CCarroll/carroll.html.

[4] Ten lags of all variables is the preferred estimation method; the estimation presented has been restricted to four lags due to a lack of degrees of freedom.

Ordinaries Index, the 90-day bank bill rate and the unemployment rate (instrument list 2), and are again estimated with and without consumer sentiment. The All Ordinaries index is used as a proxy for the 'wealth effect' in that—*ceteris paribus*—an increase in stock prices will raise household wealth and therefore lead to higher income and higher consumption (Ludvigson and Steindel, 1999, p. 29). An interest rate variable (the 90-day bank bill rate) is included in the estimation to account for interest rate effects on income from savings, or falls in income from increased costs of debt. The aggregate unemployment rate is included to represent the observation that when unemployment increases (there is an economic downturn) aggregate income decreases. Consumer sentiment is measured as the end-quarter value of the consumer sentiment index, and the various consumption measures are denominated in quarterly growth terms.

The results are presented in Table 3 with the standard errors in parentheses. The first three columns present the results where sentiment plays no role (in either explaining growth in consumption or growth in income). In the case of total private consumption expenditure, λ is significant at the 5 per cent level when using the second instrument set with a value of 0.253. This suggests that there are a significant number of consumers that do indeed set consumption equal to current income. However as the coefficient is also significantly less than one it suggests that many individuals make consumption expenditure decisions based on the random walk hypothesis, that is, consumption decisions made this quarter are based on what they did in the previous quarter, with a random disturbance term. The moving average term is not significantly different from zero for either instrument set. Services are the exception, but are still only significant when using the second instrument set. The third column in the table presents the results of a chi-squared test of whether the instruments used are leading to over-identification. There is no evidence that either specification is over-identified.

The various components of private consumption expenditure give noticeably different results. According to these estimates, Australian consumers only behave according to the rule of thumb approach (setting consumption equal to current income) when purchasing goods excluding motor vehicles or discretionary consumption, as λ is only significantly different from zero for these groups of goods when using the second instrument set. The value of the coefficients in these cases are 0.368 and 0.343 respectively and—as in the aggregate case— are also significantly less than one. This suggests that the majority of consumers of goods

excluding motor vehicles and of discretionary consumption set their expenditure according to the permanent income hypothesis. The results also indicate that consumption decisions regarding motor vehicles and services are set according to a random walk. The moving average term is insignificant for all components apart from when using the second instrument set for services. In no case are the over-identifying restrictions rejected.

Table 3. Results, with and without sentiment

| | | Without sentiment | | | With sentiment (10 lags) | | | |
| | | | | p-value on | | | p-value on: | |
	Instrument list	λ	θ	Overidentifying restrictions	λ	θ	Overidentifying restrictions	Joint significance of coefficients on CSI
Total	1	0.046 (0.204)	0.048 (0.132)	0.819	0.120 (0.114)	-0.113 (0.097)	0.366	0.077
	2	0.253 (0.092)**	0.086 (0.089)	0.918	0.183 (0.096)**	-0.095 (0.092)	0.659	0.097
Motor vehicles	1	1.924 (1.397)	-0.116 (0.099)	0.430	1.390 (1.159)	-0.163 (0.106)	0.687	0.058
	2	0.930 (0.865)	-0.089 (0.105)	0.313	0.738 (0.951)	-0.153 (0.109)	0.871	0.046
Goods excluding motor vehicles	1	0.026 (0.220)	-0.065 (0.105)	0.999	0.042 (0.177)	-0.254 (0.119)**	0.911	0.356
	2	0.368 (0.106)**	-0.064 (0.077)	0.850	0.196 (0.169)	-0.199 (0.115)*	0.262	0.487
Services	1	0.269 (0.239)	0.169 (0.112)	0.688	-0.003 (0.110)	-0.119 (0.109)	0.844	0.124
	2	0.155 (0.103)	0.320 (0.119)**	0.970	0.104 (0.085)	-0.093 (0.099)	0.876	0.154
Discretionary consumption	1	-0.000 (0.218)	-0.043 (0.125)	0.848	0.253 (0.156)	-0.077 (0.088)	0.337	0.020
	2	0.343 (0.125)**	0.053 (0.085)	0.783	0.299 (0.128)**	-0.069 (0.084)	0.741	0.021

**Denotes significance at 5%, * denotes significance at 10%.

Notes:

a. Instrument list 1: constant, ΔC_t and ΔY_t $(i = 1,...,4)$

Instrument list 2: constant, ΔC_t, ΔY_t, ΔU_t, ΔR_t and ΔQ_t $(i = 1,...,3)$

where C is real consumption, Y is real labour income, U is the unemployment rate, R is the 3-month bill rate and Q is the All Ordinaries Index.

b. Discretionary consumption is total consumption excluding food, rent, electricity, health and education.

The last four columns of Table 3 present the results of the original focus of the paper; estimating the alternative hypothesis in equation (17) with ten lags of consumer sentiment as regressors and as instruments. The last column shows the combined significance of lags of consumer sentiment as a predictor of consumption and indicates that sentiment does provide additional information in determining total consumption growth at the 10 per cent level of significance. However, when sentiment is included the estimate of λ (using the second instrument set) falls from 0.253 to 0.183, indicating that fewer consumers are actually setting their consumption expenditure equal to current income.

For motor vehicles, sentiment provides additional explanatory power at the 10 per cent level of significance when using the first instrument set, and 5 per cent using the second. However, adding sentiment does not improve the significance of λ for motor vehicles, such that none of the variables included do a particularly good job of explaining motor vehicle consumption growth.

Sentiment provides additional explanatory power for discretionary consumption at the 5 per cent level of significance for both instrument sets. Similarly to total consumption however, the coefficient on λ (using the second instrument set) declines from 0.343 without sentiment to 0.299 with sentiment, and both are significant at the 5 per cent level.

There is a large difference in the results for goods excluding motor vehicles when consumer sentiment is included. The joint significance of the coefficients on the consumer sentiment index is not significant at any meaningful level. As a consequence, including sentiment in the estimation results in λ no longer being significant. The moving average term θ now becomes significant. Again, there is no evidence to suggest that the specifications are over-identified for any of the consumption categories.

The behaviour of consumption in Australia looks more like the permanent income hypothesis than it does in the US, as $\lambda=0$ most of the time. In particular, including sentiment adds explanatory power and lowers λ in all of the preferred equations (that is, those using the second instrument set). The observation that lagged values of the consumer sentiment index are usually insignificant in Table 2 is also consistent with this interpretation, that is, consumer sentiment is predominantly useful as an instrument for current income. Another possible interpretation is that the consumer sentiment index is accounting for consumer uncertainty, thereby generating an outcome that more closely resembles a "consumption under certainty" model.

In comparison to the Australian results, Carroll *et al* (1994) find that consumption patterns in the United States more closely fit the Campbell-Mankiw model, which also results in a stronger relationship between consumption and sentiment. Their analysis has a longer sample period (January 1955 to March 1992) with quarterly observations of sentiment and consumption. The instruments used in their analysis are the same variables as here, although for the first instrument set four lags of each variable are used, and in the second instrument

set three lags of each variable are used. Carroll *et al* find that using the Campell-Mankiw framework on US data without sentiment results in estimates of λ all statistically greater than zero at least at the 10 per cent level. Motor vehicles, the most durable consumption good, have the highest values of λ, statistically equal to one. Non-durable services exhibit the lowest values of λ although it is still positive. When sentiment is included (four lags if using the first instrument set, three lags if using the second), λ remains significantly greater than zero for all components of consumption apart from motor vehicles. In addition, the authors find that sentiment does provide additional explanatory power for all components of consumption, except when the second instrument set is used for services.

Carroll *et al* suggest that a model with both precautionary saving and habit formation may explain their results. The evidence for Australia indicates that this view may be correct, as the two categories where sentiment has the biggest effect are motor vehicles and discretionary consumption. That is, it appears that motor vehicles and discretionary consumption are more affected by uncertainty and habit formation than the other three categories of consumption.

In summary, it seems that the Westpac-Melbourne Institute Consumer Sentiment Index is a useful instrument of current income—but not in its own right—for motor vehicles, goods excluding motor vehicles and services, as seen by four columns of Table 3. However, consumer sentiment also provides extra information for discretionary consumption and total consumption (although the latter is probably driven by the former). The relationship between consumer sentiment and consumption appears more complex than the results from the USA particularly given the time it takes for consumer sentiment to have the bulk of its impact on consumption.

5. Conclusion

The results presented here indicate that consumer sentiment is a useful indicator of total consumption, predominantly through its ability to explain discretionary consumption. However, the causal relationship between consumption and sentiment appears more complicated (at least for Australia) than Carroll *et al.* It also appears that the behaviour of consumption in Australia looks more like the permanent income hypothesis than it does in the US. Unlike the estimates available from the USA, it seems that Australian consumer sentiment requires a much longer time frame to have an impact on consumption, as the

causality estimates indicate that it takes more than 2 years for the majority of the effect to work its way through the system. Although the term 'long and variable lags' is typically associated with the effect of monetary policy, it also looks to have some relevance to the impact of consumer sentiment.

The observation that the over-identifying restrictions implied by the Campbell-Mankiw model are not rejected suggests that the model is an acceptable description of Australian spending behaviour. However, the use of this model raises a number of issues. The principle difficulty is that the Cambell-Mankiw model assumes a representative agent, whereas the purpose of a survey is to capture the fact that consumers are in fact heterogenous. The history of the consumer sentiment index shows that young people (18-24 years old) tend to be more optimistic than those aged over 45, men are more optimistic than women, households with high incomes are more optimistic than poorer households and managers and professionals are more optimistic than other occupation groups. Such evidence suggests that a more fruitful area of research would be to investigate how the spending habits of different demographic groups change with changes in economic outcomes.

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Appendix: Description of variables used

Table 1: Incremental predictive ability of Consumer Sentiment

Total household final consumption expenditure	Quarterly log change
Motor vehicles	Quarterly log change
Goods excluding motor vehicles	Quarterly log change
Consumption excluding food, electricity, rent, health & education	Quarterly log change
Services	Quarterly log change
Real labour income: gross income minus social contributions for workers compensation and net non-life insurance premiums	Quarterly log change
Consumer sentiment index	Average quarter, level

Table 3: Campbell-Mankiw model

Total household final consumption expenditure	Change
Motor vehicles	Change
Goods excluding motor vehicles	Change
Consumption excluding food, electricity, rent, health & education	Change
Services	Change
Real labour income: gross income minus social contributions for workers compensation and net non-life insurance premiums	Change
Consumer sentiment index	End quarter, level
Unemployment rate	End quarter, change
90 day bank bill rate	End quarter, change
All Ordinaries index	End quarter, percentage change