WHAT DO SENTIMENT SURVEYS MEASURE?

Ivan Roberts and John Simon

Research Discussion Paper
2001-09

November 2001

Economic Research
Reserve Bank of Australia

The authors would like to thank Gary Morgan of Roy Morgan Research for kindly providing some of the data for this project. Views expressed in this paper are those of the authors and not necessarily those of the Reserve Bank. Use of any results from this paper should clearly attribute the work to the authors and not to the Reserve Bank of Australia.

Abstract

Indices of business and consumer sentiment receive widespread media coverage and are closely watched by market economists despite their limited success as leading indicators. In this paper we ask what explains 'sentiment' and find that lagged economic indicators (such as changes in GDP, job vacancies and the cash rate) can explain a substantial proportion of the variation in a number of backward and forward-looking sentiment indices. This does not rule out the possibility that they may be useful for forecasting. We find, however, that when currently available economic information is appropriately 'filtered' from the sentiment indices, in most cases they fail even rudimentary Granger-causality tests of predictive ability. On a more positive note, we find that the Roy Morgan consumer confidence rating, NAB actual business conditions, NAB expected employment outlook over the next three months and the second question in the Roy Morgan and Westpac/MI consumer surveys all provide some, albeit small, contribution to forecasting employment growth. The second question of both consumer confidence surveys (which asks about anticipated personal financial conditions over the coming year) also appears to have some ability to predict recessions. Outside of these results there is little evidence that the surveys tell us anything we didn't already know. Thus, there is reason to suspect that surveyed respondents' forecasts offer little more information about the future path of the economy than a weighted average of lagged economic variables.

JEL Classification Numbers: E27, E37
Keywords: business, confidence, consumer, forecasting, predictive ability, sentiment, survey

Table of Contents

WHAT DO SENTIMENT SURVEYS MEASURE?

Ivan Roberts and John Simon

1. Preamble and Overview

Indices of business and consumer sentiment receive widespread media coverage and are closely watched by market economists.[1] A serious fall in any of the better-known indices is generally viewed with concern despite limited evidence of any predictive ability. Many people assume that business or consumer sentiment indicators actually measure the elusive quantity known as 'confidence' and, thus, offer insights over and above what we can glean from more commonplace indicators such as GDP and employment. If this were true, there would indeed be reason to think that they could help predict future changes in economic activity. However, the answers consumers and business executives give to questions about current and future economic conditions are clearly informed by news and personal experiences over the preceding months, some of which may in turn be reflected in data that were already available. This invites the question: do surveys tell us a great deal more than we already know?

In the first part of this paper we address this question directly. We look at whether various sentiment indicators can be explained on the basis of commonly available economic data. We find that much of the movement in sentiment indicators can be explained by variables such as GDP, interest rates and job vacancies. While this diminishes much of the significance attached to the surveys, it still leaves open the possibility that the remaining variation in the series is informative. The second section of this paper considers what sentiment indicators might reflect in more detail. We consider whether the surveys can be used to forecast any of the major economic indicators.

---

[1] *The Sydney Morning Herald* of 15 March 2001 had a particularly dire headline '$A reeling with huge plunge in consumer faith' after the release of the March 2001 Westpac-Melbourne Institute consumer confidence survey.

2. Previous Research

The extent to which sentiment indicators can forecast economic activity has been a recurrent topic in economic research ever since the Index of Consumer Sentiment (ICS) was introduced in 1952 by George Katona and his colleagues at the University of Michigan. In the United States research on consumer sentiment commenced only a decade after the Michigan index was introduced, and after flourishing briefly in the 1970s, re-emerged in the early 1990s due to renewed interest in surveys' power to predict recessions.

Surveys of business conditions have a longer history. The National Association of Purchasing Managers (NAPM) survey of manufacturers dates back to 1931; the German Ifo and French INSEE business surveys were initiated in 1949 and 1951. To date, however, business surveys have received comparatively little attention, despite some evidence (both academic and anecdotal) that they outperform consumer confidence surveys.

Consumer confidence surveys have generally been conducted with the intention of producing a leading indicator to forecast consumer expenditure. One early interpretation of survey-based indicators originates with Katona (1951, 1975). Katona argues that discretionary spending is postponable and, therefore, likely to be related to consumers' psychological 'willingness to buy' as well as their 'ability to buy'. While the latter is founded on tangible considerations (e.g., the state of household balance sheets), willingness to buy is better captured in this view by survey-based sentiment indicators than more conventional aggregate data. Many researchers, taking this view as their starting point, have focused on the ability of sentiment to predict household spending (especially on durables, which are considered especially 'discretionary' by virtue of the ability to postpone their purchase).

In one of the first attempts to assess the forecasting performance of the Michigan consumer confidence survey, Mueller (1963) found that lagged confidence variables were significant predictors of durable and non-durable household expenditures. Only slightly later, Friend and Adams (1964) found that the ICS was useful for forecasting motor vehicle expenditures; however, they also found that stock prices were a reliable substitute for the survey measure.

Hymans (1970) treated the ICS both as a dependent and an independent variable in his regressions. He found that lags of household disposable income, the consumption price deflator and the stock market predicted the ICS. He then used the ICS as a predictor in a forecasting equation for automobile spending, with significant results.[2] Later studies (Fair 1971; Juster and Wachtel 1972a, 1972b) supported Mueller's claim that sentiment could predict other durables as well.

Mishkin (1978) argued that the ICS could be interpreted as measuring consumers' subjective assessment of the probability of financial distress, and used a significant relationship between the ICS and household assets and liabilities to support this hypothesis. He argued that the ICS should be a significant predictor of consumer durables expenditure, since durables are illiquid and hence less likely to be purchased by consumers facing financial difficulties.[3] He found that this was the case when financial variables were not taken into account, but that when they were the sentiment variable became largely redundant.

Interest in consumer sentiment indices jumped again in the early 1990s after a large decline in consumer sentiment appeared to coincide with the onset of the 1990–1991 recession in the US.[4] As soon as policy-makers (including Alan Greenspan) announced that the recession was probably over, confidence appeared to have bounced back.[5] These events were widely interpreted as evidence that sentiment could play an independent role in driving recessions and subsequent recoveries. To assess this proposition's empirical relevance Carroll, Fuhrer and Wilcox (1991, 1994) first estimated simple forecasting equations and found that lags of the ICS contributed marginally to the prediction of household spending

---

[2] Hymans also estimated automobile expenditure by splitting the ICS into its predicted values and the residuals from the first regression. He found that there is little change in the coefficient estimates although the standard errors on the residual were much larger reducing its statistical significance.

[3] Mishkin maintains that Katona's approach is unconvincing when it comes to producing a rigorous definition of an item's postponability. In a comment on Hymans (1970), FT Juster argued that a durable item may be postponable but not discretionary, and thus may not be explained by sentiment.

[4] The decline in sentiment was widely attributed to Iraq's invasion of Kuwait and the Allied military response (e.g., Leeper (1992); Throop (1992)).

[5] Greenspan made the announcement in his statement before the Sub-committee on Domestic Monetary Policy of the Committee of Banking, Finance and Urban Affairs of the US House of Representatives, 16 July 1991 (Leeper 1992).

after controlling for other variables (including lags of the dependent variable and real labour income growth). They then estimated a consumption function in the style of Campbell and Mankiw (1989) and found that lags of the Michigan ICS were jointly significant when included in the estimation.

In contrast, Throop (1992) estimated a five-variable vector error-correction model (VECM) with the changes in the ICS, durables spending, non-durables and services spending, permanent income, and the 6-month commercial paper rate as endogenous variables. He found that changes in sentiment caused changes in durables spending (but not in non-durables and services); in contrast, durables spending did not cause changes in sentiment. When he replaced the ICS with economic variables that he found predicted sentiment (unemployment and inflation), forecast errors were usually lower than in regressions where the ICS (or its current financial conditions component)[6] were used. However, over the period of the Gulf War (and coincident recession) forecasts were more accurate if the ICS was used. Throop concluded that sentiment ordinarily has little complementary value in forecasting durables spending, but when an unusual event occurs the ICS is likely to improve forecasts.

Similarly, Leeper (1992) used a vector autoregression (VAR) framework to assess the relationship between consumer sentiment and activity. His results echoed Mishkin's. Sentiment innovations only improved the VAR's predictions of industrial production and unemployment when financial variables (again, stock prices and T-bill rates) were excluded from the analysis. Later work by Matsusaka and Sbordone (1995) also used a VAR framework, but found that consumer sentiment explained a large proportion of the innovation variance of GNP, after controlling for the Index of Leading Indicators and a measure of default risk.

Estrella and Mishkin (1998) used a simple probit analysis including financial variables to assess the usefulness of survey measures for predicting recessions. They found that the NAPM survey composite index by itself had some predictive power for US recessions (as dated by the National Bureau of Economic Research) up to four quarters ahead (although the fit was relatively poor), and that the Michigan ICS was rather less useful. When a successful financial indicator (a Treasury bond–bill spread) was included in the regressions, the NAPM index

---

6 That is, the index corresponding to Question 1 in the Michigan survey (see Section 3).

became practically redundant at horizons greater than one quarter, and the ICS became insignificant at all horizons.

There is little published econometric work on business confidence indices, but the work of Stock and Watson (1993) and Estrella and Mishkin (1998) suggests these may have some potential as leading indicators. Indeed, Santero and Westerlund (1996) found (using simple graphical methods, correlations and Granger causality tests) that in OECD countries business confidence measures displayed a much stronger relationship with activity than consumer confidence indices.

The American literature offers clear evidence of some kind of bivariate association between sentiment and economic activity (generally proxied by GDP or components of household expenditure). The extent of this association, the reasons for it and the direction of causality are less clear, however. There is a suggestion that sentiment variables become redundant when the researcher controls for financial variables, but this finding is by no means consistent across the board.[7] The likelihood of endogeneity between sentiment and activity has long been recognised, and in recent times typically addressed in a VAR/VECM framework, but the strength of the correlation appears to be sensitive to the choice of variables included. The early work of Hymans and Mishkin tends to favour the interpretation that sentiment indicators summarise prior (or contemporaneous) economic information, a finding echoed by Throop (1992) and Lovell and Tien (2000).[8] While the leading indicators literature reports significant results for some sentiment variables, other indicators are often preferred for forecasting purposes.

In Australia there has been little investigation of sentiment indicators outside of the Melbourne Institute of Applied Economic and Social Research (IAESR), which began conducting a consumer confidence survey (modelled on the Michigan survey) in 1973. Boehm and McDonnell (1993) of the IAESR, building on earlier work by Defris and McDonnell (1976), argued that the consumer sentiment index performed well as a leading indicator of retail trade, consumer durables and new

---

[7] Since the financial variables employed differ across studies, this is hardly surprising. Given the plurality of selected variables, estimation periods and econometric methods, no given result surveyed here can easily be compared to any other.

[8] Lovell and Tien find that the change in the unemployment rate, the stock market and real GDP explain much of the variation in the Michigan ICS.

passenger vehicle registrations. They found that including variables generated from an application of principal components analysis to the ICS improved the fit of regression equations modelling consumption.[9] Loundes and Scutella (2000) applied the method of Carroll *et al* (1994) to Australia and found that including lagged values of the ICS in simple forecasting equations and Campbell-Mankiw equations in some cases improved both models' explanations of consumption. They also report a bivariate causality decomposition, suggesting that consumption has a major effect on sentiment with a lag of five quarters, while the ICS takes twice as long to have any appreciable effect on consumption. The apparent endogeneity of sentiment is correctly taken to indicate a relatively 'complex' causal relationship. We believe this relationship deserves further study, and in later sections offer an approach that we hope will shed some light on the issue.

A characteristic of much of the literature on consumer confidence indicators is that it takes for granted that 'confidence' is actually captured and quantified by a specific index, which is itself a somewhat arbitrary construction. While we address this issue below, it is worth noting here that the five component indices that are averaged to obtain the Michigan ICS (and its descendants, such as the Melbourne Institute ICS) have rarely been subjected to the precision of analysis that the aggregate index routinely receives. Attempts have been made to 're-weight' sentiment indices (for example, using principal components), but there is little evidence that the revised indices perform a great deal better than existing (unweighted) indices. While Throop (1992) and Bram and Ludvigson (1998) find that specific components of the Michigan and Conference Board indices improve forecasts of aggregate consumption and durables spending, we have yet to see a similar exercise conducted using Australian data.

---

[9] An earlier example of the application of principal components analysis to sentiment indicators is Adams (1964). The technique offers an alternative to using unweighted averages of component indices (e.g., based on net balance responses to specific questions) and involves constructing mutually orthogonal linear combinations (weighted averages) of component variables that account for the maximum possible variance in the original (standardised) components.

3. What Explains Sentiment?

It is clear from the previous section that while the existing literature recognises that sentiment may be endogenously determined, it places most emphasis on using sentiment variables to predict or forecast consumption and other activity measures. However we begin our study with a different focus. This section takes up the basic, but fundamental, question of whether sentiment responds consistently to prior economic information. This section also provides the foundation for later investigations of the predictive ability of sentiment indices.

3.1 What is Sentiment?

While the results of sentiment surveys may be well known, their methods of construction are more obscure. This section presents some details on the construction of each index we use. The construction of all the survey indices is similar. Respondents are asked a number of questions about economic conditions, their responses are categorised as: i) up/positive, ii) no change/don't know or iii) down/negative. An index for each question is constructed as the 'net balance' where the proportion of negative responses is subtracted from the proportion of positive responses. The overall indices are constructed as an average of the net balance for a number of questions. This method of construction ignores a number of features of the data and there may be alternative methods that would yield more informative indices. For example, abstracting from adding up constraints, the proportion of people holding a 'no change' opinion has no effect on the final index yet could, arguably, contain information on people's expectations. We consider the effect of alternative construction methods a little later.

We now turn to the specific measures of confidence we use. To investigate business sentiment, we focus on the 'Business Confidence' and 'Business Conditions' indicators from the NAB Quarterly Business Survey. The Business Confidence index is a net balance of responses to the question: 'Excluding normal seasonal changes, how do you expect business conditions facing your industry to change in the next three months?' The Business Conditions index is an unweighted average of three net balance indices expressing respondents' expectations about changes in their firms' trading performance, profitability and number of employees over the past quarter. Neither index is seasonally adjusted as the questions are

couched in seasonally adjusted terms. Each series extends from 1989:Q3, when the NAB survey started, to 2001:Q1.

To analyse consumer sentiment, we use the Westpac-Melbourne Institute Index of Consumer Sentiment and the Roy Morgan Consumer Confidence Rating. Until 1990 there was only one such measure, drawn from a single survey conducted jointly by the Melbourne Institute and Roy Morgan. A falling out since then has led to the production of two indices, although the Westpac-Melbourne Institute index receives much broader media attention. Both indices are unweighted simple averages of five component indices, each of which is calculated by adding 100 to a net balance of positive minus negative responses to a specific question. The five questions cover respondents' evaluations of: (1) personal financial conditions over the past year; (2) anticipated personal financial conditions over the coming year; (3) anticipated economic conditions over the coming year; (4) anticipated economic conditions over the next five years and (5) whether now is a good or a bad time to buy major household items.[10] The Westpac-Melbourne Institute index is drawn from a telephone survey and is seasonally adjusted. The Roy Morgan index is based on face-to-face interviews and is not seasonally adjusted. The data we use extend from 1974:Q3 to 2001:Q1 although the two series are very similar up until 1990 (the only difference being the seasonal adjustment). Both surveys are conducted monthly, generally at the beginning of the month. As most of our data are available quarterly we reduce the frequency of the sentiment surveys by taking the observation closest to the end of the quarter; i.e. we use the April survey as our March quarter reading.[11]

3.2 Method

Our objective in this section is to gauge whether any variables systematically predict the various sentiment measures. An obvious candidate, for example, might be GDP – it seems likely that people would base their expectations of general

[10] These questions were initially devised by Katona as 'ice breaker' questions for the Survey of Income and Wealth in the US (Lovell and Tien 2000). As such they are quite vague and were not specifically designed to give clear answers. This makes the interpretation of this series particularly difficult.

[11] We investigated other alternatives, such as averaging the monthly results, and found that there were no appreciable differences in the regressions. To the extent that there were differences we were generally able to explain the end-quarter observations better.

economic conditions upon the most recently reported GDP growth numbers. There are many other variables that might conceivably have some influence on sentiment but it is difficult to cover them all. Nonetheless, we approach this section as agnostically as possible. Instead of trying to test some specific model we engage in general-to-specific modelling. That is, we start with a long list of variables that might have some effect on confidence indicators and eliminate those that make no statistical contribution to forecasting. The initial list of candidates is long (see Appendix A for the complete list) and we cannot possibly include all variables and their lags in the one regression.

Since there are a number of alternatives for particular variables (e.g., the 'interest rate', which can be proxied by the cash rate, bank bills rates, capital market rates, and so on *ad infinitum*), we use only one alternative in any given regression. We approach the estimation by starting with four lags of all variables, and gradually reduce the number of lags for each (testing both the significance of individual lags, and groups of lags, in each variable and in sets of variables). If all the lags of one of several alternative measures of a particular variable (e.g., the interest rate or job vacancies) prove jointly insignificant controlling for other variables, we replace it with a different alternative and repeat the process.

We also take care not to include variables on the right-hand side that are only known after the surveys are conducted. This ensures there are no simultaneity issues to deal with and also that we do not capture potentially leading information contained in the surveys.[12] The business confidence surveys are released quarterly with the survey generally conducted in the middle of the quarter. This means that only the second lag of GDP is known when the survey is taken so the first lag cannot be included in the regressions. On the other hand, as the consumer sentiment surveys are conducted just after the end of the quarter it is possible to include contemporaneously dated financial variables, such as interest rates and exchange rates, without creating simultaneity problems.

[12] As might be the case if the survey proved to be a good indicator of current quarter growth and the official release was not made until much later.

3.3 Aggregate Results

When undertaking initial OLS estimation of these equations the errors were found to have significant autocorrelation. To account for this we switched to estimating regression equations allowing the residuals to follow an AR(1) process (using iterative maximum likelihood and grid search methods). Further testing of the residuals did not show any significant higher order autocorrelation. Furthermore, all variables were tested using augmented Dickey-Fuller tests to confirm their stationarity – all the variables included were found to be stationary.

Results for the aggregate indices are presented in Table 1 and Figures 1–4. In this table GDP is gross domestic product, JV is job vacancies (ANZ measure), HW is hours worked, AO is the real All Ordinaries stock index, ER is the A$/US$ exchange rate, and CASH is the official cash rate. The 'relevant R^2' statistic also needs some explanation. As we are estimating AR(1) models the standard R^2 reported by our econometrics package includes the variation explained by the autoregressive component of the errors. However, for the purposes of this exercise we are more interested in the proportion of variation explained by the regressors alone, that is, excluding the unexplained errors even though we have a model for the autoregressive nature of these errors. For this reason we calculate a different R^2 statistic, which we call the 'relevant R^2', by dividing the sum of squares for the fitted series by the standard total sum of squares.[13] The following four figures show the actual and fitted values for these series. In the case of the fitted values we remove the autoregressive error term so that the influence of the underlying variables is clear.

---

[13] We use the de-meaned sentiment series y_t as our regressand in each case (i.e., $\bar{y} = 0$). Assuming the residuals u_t are autocorrelated ($u_t = \rho u_{t-1} + \varepsilon_t$), the ordinary R^2 will be: $R^2 = \frac{\sum \hat{y}_t^2}{\sum y_t^2}$ where $\hat{y}_t = \mathbf{X}\hat{\boldsymbol{\beta}} + \hat{\rho} u_{t-1}$. To obtain the 'relevant R^2', we simply replace $\hat{y}_t$ with $\hat{y}_t' = \mathbf{X}\hat{\boldsymbol{\beta}}$, thereby removing the effect of the autoregressive coefficient $\hat{\rho}$.

Table 1: Four Aggregate Indices

Regressor	Westpac-MI ICS	Roy Morgan CCR	NAB Business Confidence	NAB Business Conditions
ΔGDP_{t-2}	–	–	–	2.55 (1.30)*
ΔGDP_{t-3}	–	–	–	4.15 (1.48)***
ΔGDP_{t-4}	–	–	–	4.02 (1.43)***
ΔJV_{t-1}	0.28 (0.14)**	–	0.29 (0.16)*	–
ΔJV_{t-2}	0.47 (0.13)***	–	–	–
ΔJV_{t-3}	–	–	–0.39 (0.18)**	–
ΔJV_{t-4}	–0.26 (0.14)*	–	–0.62 (0.17)***	–
ΔHW_{t-1}	–	–	–	7.81 (1.92)***
ΔHW_{t-2}	–	2.86 (1.62)*	–	3.85 (2.25)*
ΔAO_{t-1}	0.15 (0.09)*	0.21 (0.09)**	–	–
ΔAO_{t-2}	–	0.21 (0.10)**	–	0.39 (0.15)**
ΔAO_{t-3}	–	0.27 (0.09)***	0.22 (0.11)*	0.32 (0.15)**
ΔER_t	–	0.29 (0.15)*	–	–
ΔER_{t-3}	–	–0.39 (0.16)**	–	–
ΔER_{t-4}	–	–	–	0.61 (0.24)**
$CASH_t$	–1.04 (0.40)**	–1.07 (0.48)**	–	–
$CASH_{t-1}$	–	–	–	–1.20 (0.44)***
$CASH_{t-3}$	–	–1.32 (0.48)***	–2.77 (0.74)***	–
Rho	0.64 (0.09)***	0.62 (0.09)***	0.82 (0.10)***	0.59 (0.18)***
Constant	10.22 (4.50)**	21.94 (4.85)***	21.40 (7.18)***	–4.87 (4.97)
Observations	86	87	47	47
R^2	0.72	0.79	0.88	0.91
Relevant R^2	0.39	0.69	0.67	0.72
Q (1–8) p-value	0.13	0.15	0.16	0.11

Note: *, **, *** denote significance at the 10%, 5% and 1% levels.

Chow tests conducted on the consumer confidence equations provided some suggestion of parameter instability (3 to 4 of 26 potential breakpoints tested returned significant *p*-values, albeit *p*-values unadjusted for the sequential nature of our tests). Conversely, CUSUM tests gave no indication of parameter instability. We did not conduct breakpoint tests for the NAB survey measures in view of the short run of data, but CUSUM tests for both measures revealed no evidence of structural instability. We take these results as a broad indication that there are no serious parameter instability problems.

Figure 1: Westpac-Melbourne Institute ICS

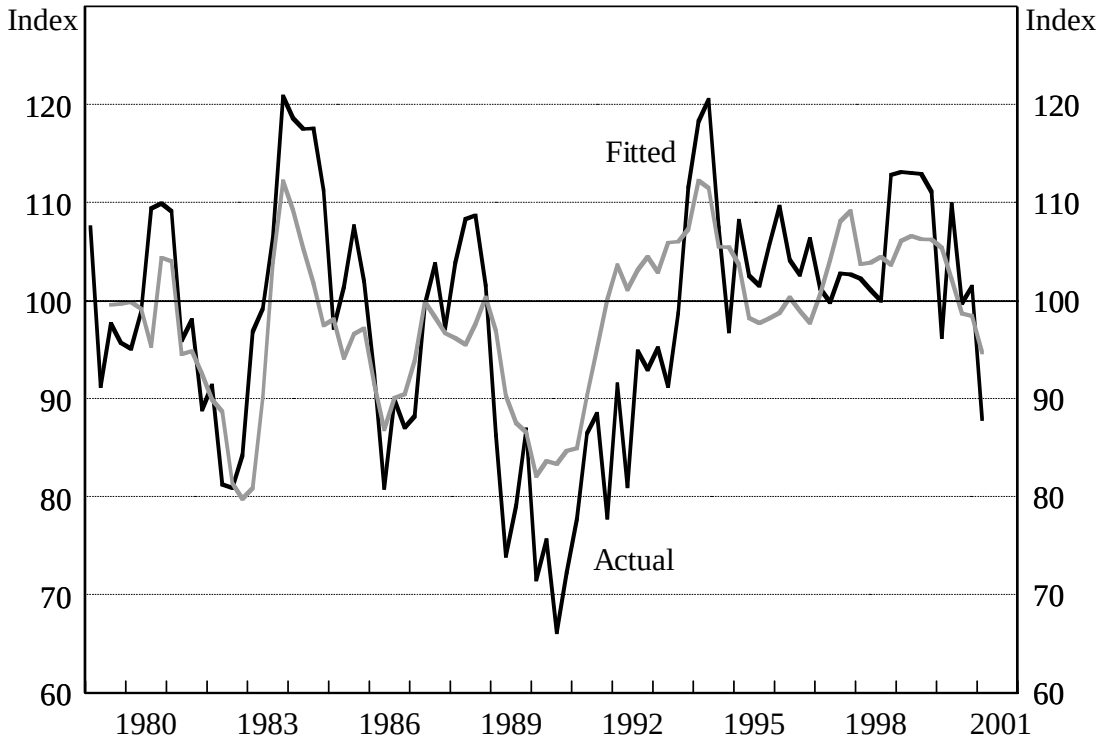


Figure 2: Roy Morgan CCR

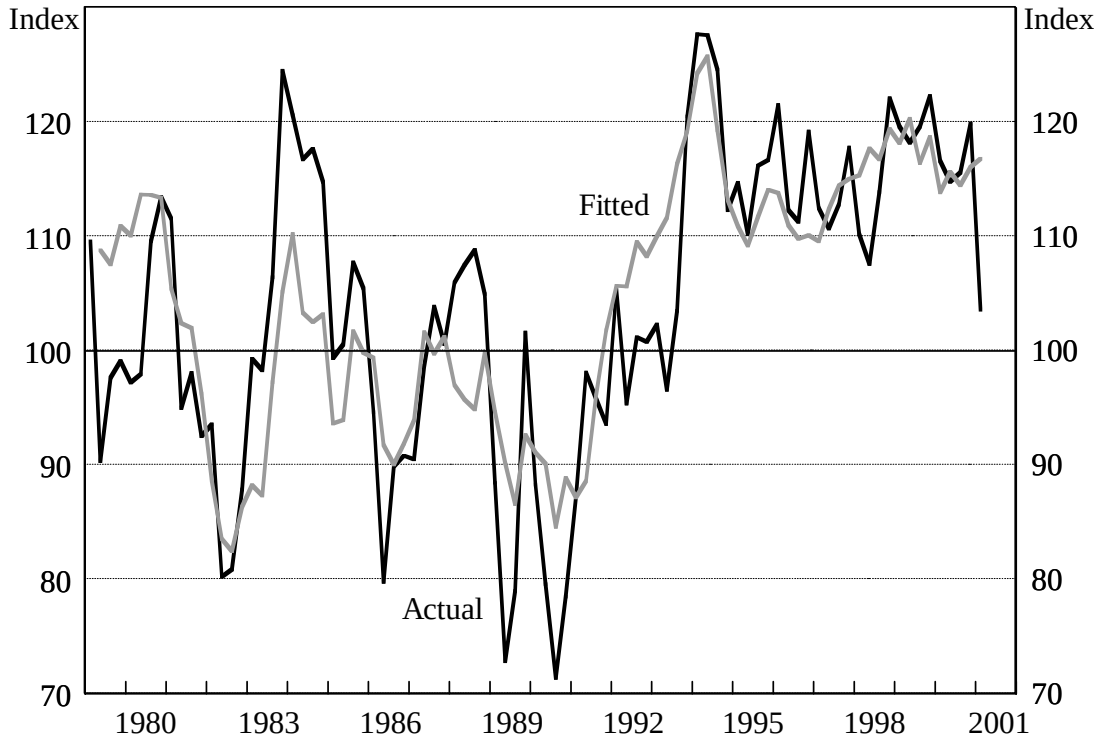


Figure 3: NAB Actual Business Conditions

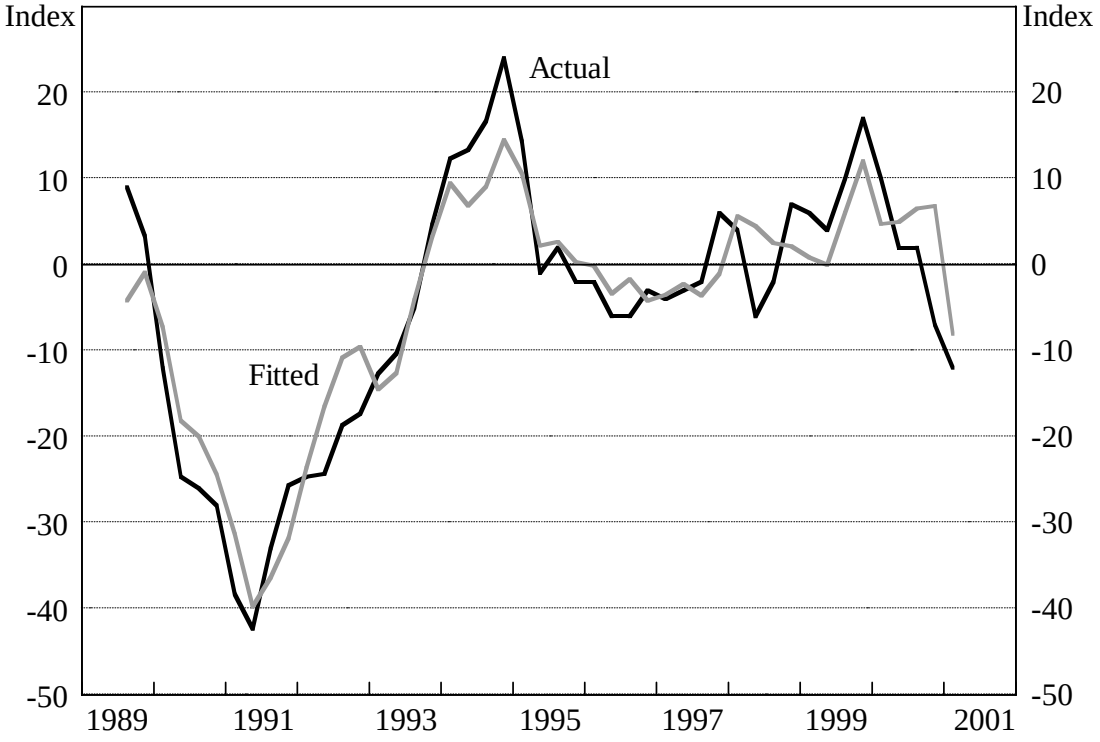
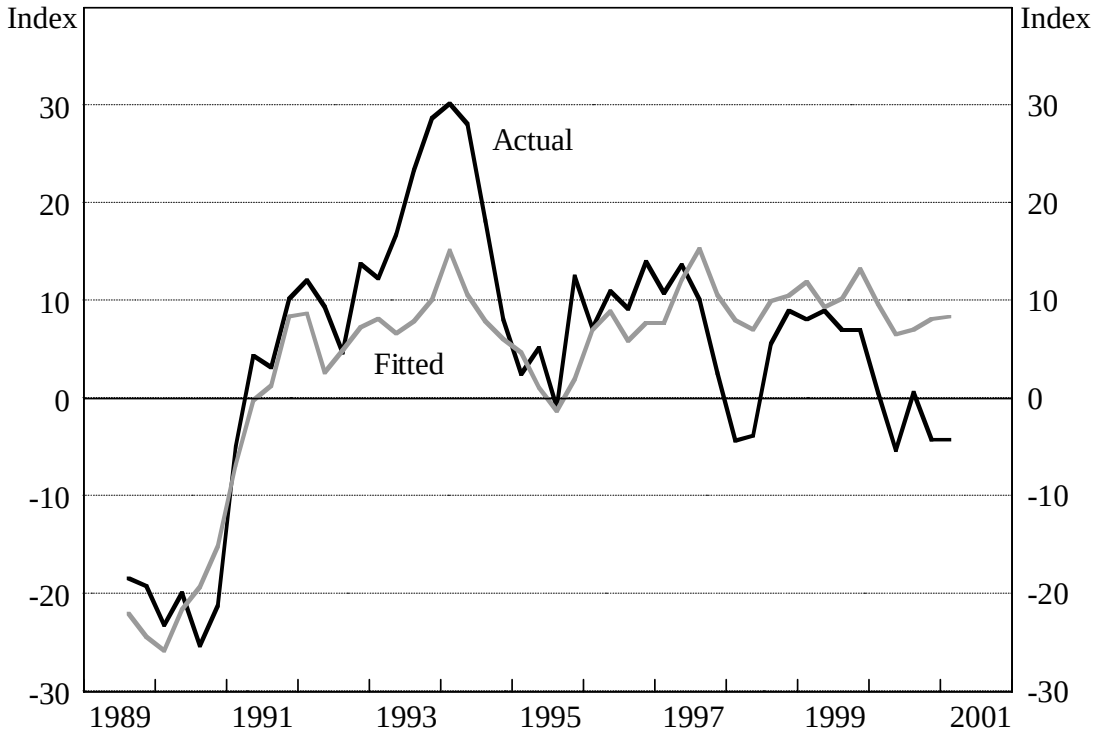


Figure 4: NAB Business Confidence (Outlook)



3.3.1 Discussion

The above regressions show that broadly speaking between 40 and 70 per cent of the variation in the sentiment indices we examine can be explained by information that is already available. This argues for a significant backward-looking component to the indices. In all of the regressions the cash rate has a significant influence on the indices and in most of the regressions the last few quarters of hours worked or job vacancies are significant. GDP growth, exchange rate changes and stock market changes also make an appearance in at least one regression. Furthermore, the variable coefficients generally have signs in line with expectations. For example, rises in the cash rate reduce sentiment, falls in the stock market reduce sentiment, and increases in GDP growth improve sentiment.

3.4 Extensions

As foreshadowed above, there are many things one could do differently when analysing sentiment indices. In this section we consider some in an effort to learn more about the information contained in sentiment indices.

3.4.1 Can we improve on the net balance?

The first possibility is that the use of a net balance measure obscures valuable information contained in the distribution of responses.[14] To examine this we looked at the pattern for positive, negative and no change responses for each index separately. On the whole there was little difference between the component series and the net balance series. The proportion of 'no change' responses was relatively constant throughout the samples with only minor variation in good or bad times. Regressions using the proportion of positive or negative responses yielded very similar results to those using the net balance on the left hand side. This leads us to the conclusion that there is little to be gained by pursuing this aspect of the data so we confine ourselves to looking at net balance measures throughout the rest of the paper.

3.4.2 Results for individual questions

There is considerable variation in the responses to questions underlying the aggregate indices. Some questions are explicitly backward-looking while others ask about the future. It seems reasonable to assume that the forward-looking questions may provide more information about the future and be less influenced by already available information. To test this and look more closely at the individual components of the surveys we conduct the same exercise for the individual questions as we conducted for the aggregate series. Due to the space taken by the results we report them in Tables B1 to B5 in Appendix B.

In common with regressions for the aggregate indices, serial correlation was present in the residuals. Thus, we again estimated AR(1) models for each equation. Both Chow and CUSUM tests suggest that the first and fifth component indices obtained from the Westpac-Melbourne Institute and Roy Morgan surveys suffer from parameter instability (although the instability seems more pervasive in the case of the fifth). The substitution of alternative specifications did not resolve this problem. Thus, results presented for Indices 1 and 5 should be interpreted with particular caution, and the results for Index 5 might at worst be regarded as

[14] While this possibility has received scant attention in the literature, at least one research effort has used the proportion of 'no answer' and 'don't know' responses to a business survey as a predictor in forecasting regressions, apparently with significant results (Dunkelberg and Dennis 1988).

uninformative. CUSUM tests for two of the equations for Business Conditions (namely, 12-month Outlook – Expected Profitability and Employment) revealed evidence of structural instability.

3.4.3 Discussion

As far as the two consumer confidence indices are concerned, there seems to be little correlation between the time horizon of the question and the proportion of variation that can be explained by already available economic indicators. The same is true if we compare the components of Actual and Expected Business Conditions (3-month Outlook). This is not really surprising, as the two series show negligible independent variation. The model specifications for the two sets of indices are also very similar. However the Expected Business Conditions (12-month Outlook) regressions display a much poorer average fit to the data than those corresponding to shorter horizon indices. In the next section we address the possibility that the unexplained variation in more forward-looking indices is itself 'forward looking' and, for this reason, not readily explained by lagged economic variables.

There is little to be learnt from looking at the set of significant right-hand side variables across equations. The NAB survey indicators and their components are both well explained by a small pool of regressors (comprising both financial and activity variables), which remain relatively constant across horizons, and do not seem specific to the questions asked.[15] Comparing the Roy Morgan and Westpac-Melbourne Institute component index specifications is also uninformative, as the two sets of equations do not closely resemble each other. Perhaps the most striking result is that 61 per cent of the variation in Index 4 of the Roy Morgan survey (economic conditions over the next five years) can be explained solely by lags of the cash rate.

4. What Does Sentiment Measure?

While Section 3 has demonstrated that a significant proportion of the variation in the sentiment indices can be explained by lagged information this does not directly

[15] The exception is that GDP growth does not predict Business Conditions 12 months ahead, but it is hard to make much of this result.

address the question of whether sentiment actually measures anything useful, forward looking or otherwise. We take up this question in this section.

The fact that much of the movement in sentiment measures can be explained by other variables does not necessarily mean that respondents are simply backward-looking. Respondents may be forming the best expectations of the future they can and using lagged GDP as a significant input to these expectations. However, if there is no more information in the sentiment surveys than is contained in lagged economic variables then there is little point in poring over the latest release. To assess whether there is any information in the surveys, after allowance is made for the lagged economic variables, we look at regressions of a variety of major economic indicators on our regression residuals.

4.1 Method

Unfortunately, it is difficult to form any expectations about which sentiment series might explain which economic series. While some questions in the sentiment surveys are quite specific, many are vague. For example, the consumer confidence survey asks about 'general economic conditions' but it is unlikely that this can be considered to be the same as the quarterly percentage growth rate of real GDP (A). What is more likely is that respondents weight together many economic indicators in forming their response. For this reason we search across all combinations of sentiment and economic variables rather than confining our search on the basis of *a priori* beliefs.

We choose to focus on GDP, employment, corporate gross operating surplus (GOS), household spending, and retail trade.[16] Initially we conduct simple bivariate regressions (Granger causality tests) of economic variables on sentiment, followed by regressions of economic variables on our residuals. In each regression, an economic variable is regressed on four lags of itself and four lags of a sentiment or residual series. We then compare the predictive power of the residuals to the predictive power of the original sentiment indices, to see if our 'filtering' of readily available information from those indices leaves any significant information

[16] We also generated results for job vacancies and hours worked, but as these did not differ appreciably from those for employment we do not report them here. For the same reason we do not report results for individual components of household spending (such as spending on food or vehicles).

behind.[17] Results are reported in Tables B6, B7 and B8 (business conditions), and Tables B11 and B12 (consumer confidence) in Appendix B.

In a similar vein, we investigate the extent to which consumer sentiment indicators can be used to predict recessions.[18] We conduct an elementary probit analysis of the average index, its components and the residuals from our earlier regressions, in each case treating the probability of recession as the dependent variable, and a lag of a particular length of a given index or residual series as the independent variable.[19] Results are reported for the first eight lags of each indicator (see Tables B9 and B10 in Appendix B).

Finally, net balance results from business and consumer confidence surveys have an advantage over traditional statistical releases as they are easy to calculate and, as such, are available much sooner than similarly dated economic variables (such as GDP). The Granger causality tests reported above do not directly address the question of whether sentiment indices may be useful as 'coincident' indicators, i.e. that they provide an early reading on GDP due to the delays in official statistical releases. To test this we also conducted 'Granger-causality tests' where we tested for any significance of contemporaneously dated sentiment variables for contemporaneously dated economic variables.[20] In addition we included contemporaneously dated sentiment in each probit regression. The results did not change as a result of these re-specifications, so we do not report them here. In sum, we find no support for the proposition that sentiment surveys are good coincident indicators.

---

[17] As the residuals are generated regressors, OLS may not yield correct standard errors (the estimates are, however, consistent). Nonetheless, the analysis of Pagan (1984) suggests that the OLS standard errors are either correct (if no lags are included) or too small (in other cases). As our results suggest that the residuals are generally insignificant, computing corrected standard errors would not change our findings.

[18] Since the business confidence series is quite short (and thus offers only one recession reading) we focus instead on the longer consumer confidence series.

[19] We do not control for other variables. These regressions are conducted in the spirit of obtaining basic descriptive statistics, rather than precise estimates.

[20] We did this by including contemporaneously dated sentiment in the Granger-causality tests in addition to the standard lagged values.

4.2 Results

An inspection of Tables B5 to B12 suggests that, in general, the residuals from our earlier regressions perform considerably worse than the sentiment indices themselves as predictors for various activity measures and the probability of a recession. This confirms that in most cases the economic information we filtered from the indices explains their predictive success. Nonetheless, the Roy Morgan and Melbourne Institute indices, the NAB Actual Business Conditions index, and some of their components, do continue to predict employment growth after they have been filtered.

To see if the residuals predicted employment growth, controlling for other variables, we added four lags of each residual series to a baseline error-correction model of full-time equivalent employment. We then tested their joint significance; results are reported in Tables B13 and B14.[21] It appears that the filtered Roy Morgan Average Index and Indices 1 and 2 have some predictive power, as does Index 1 from the Westpac-Melbourne Institute survey. This suggests that questions about personal financial conditions may elicit information about the path of employment not provided by ordinary economic indicators. The filtered Actual Business Conditions index is marginally significant, and the Expected Employment indices (3- and 12-month Outlook) also have some predictive power for employment growth. Nonetheless, the economic significance of the indices (as opposed to their statistical significance) is small. Typical results are that a 2 standard deviation change in the sentiment residual (a very large change) leads to a 0.2 per cent change in employment (a relatively small change).

One might have expected that the residuals corresponding to more forward-looking indices would predict the economic variables better than the backward-looking residuals. As noted above, there is evidence that the most forward-looking

---

[21] On their own, the baseline models used for employment explain between 70 and 80 per cent of the variation in the dependent variable (the range coming from different sample periods used for the business and consumer sentiment indices). The baseline equation is:

$$\Delta E_t = \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 C_{t-1} + \alpha_3 Y_{t-1} + \sum_{i=1}^{4} \beta_i \Delta E_{t-i} + \sum_{i=1}^{5} \gamma_{i-1} \Delta C_{t-i+1} + \sum_{i=1}^{5} \delta_{i-1} \Delta Y_{t-i+1} + \varepsilon_t$$

where E is full-time equivalent employment, C is real unit labour costs and Y is real non-farm GDP. All variables are in natural logarithms and insignificant differenced variables are not included in the final specification.

responses to the NAB survey are less well explained by lagged data than the backward-looking ones. The bivariate regressions suggest, however, that while the three residual series corresponding to the Actual Business Conditions index have some explanatory power, the residuals from the forward-looking indices are without exception redundant. The Expected Employment residuals fare better as predictors of employment growth in an empirical model. But with these exceptions, the unexplained component of the forward-looking indices is simply 'noise' rather than being informative about the future.

Consumer sentiment indicators appear to predict recessions up to four or more quarters ahead, but the corresponding residuals are rarely significant, and often not strongly so when they are. The residuals from the second component index in both surveys ('expected personal financial conditions') are an exception, however, displaying some predictive power between two and four quarters ahead. As we have seen, the personal financial conditions residuals also help predict employment growth when controlling for other variables.

5. Discussion

The results presented in the previous two sections indicate that we can explain a substantial proportion of variation in the sentiment indices. Furthermore, the unexplained variation does not seem particularly useful for predicting the future. The indices themselves have some predictive power, especially with respect to employment growth, but this simply corroborates a point well made in the existing literature. Indeed it would be surprising if a linear combination of lagged activity and financial variables did not predict some variation in economic activity, since GDP itself is likely to be included in that combination.

As far as the business surveys are concerned, only the residuals from the average NAB Actual Conditions index and the two Expected Employment indices appear to have much predictive power (*vis-à-vis* employment growth), suggesting that this index might be more useful than others as a leading indicator. The consumer confidence residuals (especially those gauging personal financial conditions) perform somewhat better overall, but again usually only as predictors of

employment growth.[22] The success of specific filtered indices as predictors of employment growth is not necessarily surprising. Indeed, it is intuitively reasonable that people might factor a variety of informal information about their own employment prospects, and those of their friends, peers and employees into their assessments of economic conditions.

Indices corresponding to different forecast horizons (in both their original and filtered forms) exhibit limited variation in their predictive power. The regressions show that longer horizon variables (Expected Business Conditions (12-month Outlook), and Index 4 from both consumer confidence surveys) tend to perform more poorly than shorter horizon variables. Moreover, the residuals from regressions of forward-looking indices generally predict the future no better than those from backward-looking indices. A plausible interpretation could be that people are better at making assessments of current conditions and conditions over the next quarter than they are at developing more extended forecasts. After all, much the same can be said of professional forecasters.

6. Conclusion

To summarise, we find that when readily available economic information is appropriately 'filtered' from sentiment indices, these indices mostly fail even rudimentary Granger causality tests of predictive ability. The residuals that we would expect to be the most forward-looking (i.e., those extracted from regressions of forward-looking indices) often turn out to be no more useful for predicting the future than those from backward-looking indices. Thus, there is reason to suspect that respondents' forecasts offer little more information about the future path of the economy than a weighted average of lagged economic variables. While sentiment indices appear to explain some of the variation in the growth of GDP, employment and household expenditure, there is no *a priori* basis for presuming that the indices' implicit weighting of economic information is consistently better than other possible weighting schemes. However, if asked to identify the most useful indices among those analysed, we would choose the NAB Actual Business

[22] We view the relatively strong results for Expected Employment – 12-Month Outlook and Index 1 of both consumer confidence surveys with caution, however, as these residuals were taken from regressions that showed signs of parameter instability.

Conditions and Expected Employment 3-month Outlook indices, the Roy Morgan average index of consumer sentiment, and the second component index (expected personal financial conditions) from both consumer confidence surveys.[23] These indicators have some predictive ability for employment growth and (in the case of Index 2 from the consumer confidence surveys) the probability of a recession.

We conclude that while sentiment indicators may provide a rough summary of available economic information, it would be risky to claim much more on their behalf. An investigation of the predictive power of component indices corresponding to the individual survey questions yields limited further insight. Though we document two main exceptions, the simple average of components commonly reported might not, in general, be such a bad compromise. Sentiment indicators can still be viewed as useful summary statistics complementary to an assessment of current conditions, but the extent to which they augment information already available to us should not be exaggerated. On balance the conclusion is rather disappointing for the supporters of confidence surveys. While it is unclear whether the surveys actually measure that ephemeral concept ‘confidence’, it is clear that, with a couple of exceptions, whatever the surveys do measure does not have much predictive ability. That is, confidence surveys don’t appear to tell us much that we didn’t already know.

[23] We do not include filtered indices whose underlying regressions are suspected to be structurally unstable.

Appendix A: Variables Considered in Section 3

While only some variables are included in the final specifications we searched through a long list of potential explanators. The full list of variables is:

Gross domestic product

Variables: Real GDP, real non-farm GDP and deviation from a Hodrick-Prescott filter (i.e., an output gap).

Units: $m (sa), chain-linked.

Source: ABS Cat No 5206.0, Table 5.

Employment

Variables: Total employed persons and the unemployment rate.

Units: ’000 (sa), and percentage (sa), respectively.

Source: ABS Cat No 6202.0, Table 2.

Job vacancies

Variables: ANZ and ABS job vacancies as a percentage of the labour force.

Units: ANZ job vacancies: average number of weekly job advertisements, ’000 (sa); ABS job vacancies: ’000 (sa); labour force: ’000 (sa).

Sources: ANZ Bank Employment Advertisement series (job vacancies); ABS Cat No 6354.0, Table 5 (job vacancies) and ABS Cat No 6202.0, Table 2 (labour force).

Hours worked

Variables: Employed persons – average hours worked.

Units: ’000 (sa).

Source: ABS Cat No 6203.0, Table 17.

Consumer spending

Variables: Household final consumption expenditure, and selected components (food, furnishings, vehicles, recreation and culture etc).

Units: $m 1998/99 (sa), chain-linked.

Source: ABS Cat No 5206.0, Table 33.

Exchange rate

Variable: Nominal bilateral US$ exchange rate.

Units: A$/US$.

Source: Reserve Bank of Australia *Bulletin*, Table F.10.

Interest rate

Variables: Nominal cash rate, 90-day bank bill rate, housing loan rates, and 10-year bond rate.

Units: Percentage.

Source: Reserve Bank of Australia *Bulletin*, Tables F.1, F.2 and F.5.

Stock market

Variable: CPI-deflated All Ordinaries Index

Units: Index.

Sources: Australian Stock Exchange; ABS Cat No 6401.0, Table 8.

Corporate profitability

Variable: Real gross operating surplus of private corporate trading enterprises (adjusted for privatisations).

Units: $m 1998/99 (sa), chain-linked.

Source: ABS Cat No 5206.0, Table 47.

Appendix B: Additional Results

Table B1: Roy Morgan Consumer Confidence Rating Component Indices

Regressor	Index 1	Index 2	Index 3	Index 4	Index 5
	1.72 (0.73)**	–	–	–	1.76 (0.81)**
ΔGDP_{t-2}	2.80 (0.82)***	–	–	–	–
ΔGDP_{t-3}	1.82 (0.74)***	–	–	–	–
ΔJV_{t-2}	–	–	–	–	0.46 (0.15)***
ΔHW_{t-2}	3.56 (1.57)**	3.44 (1.29)***	–	–	–
ΔHW_{t-3}	2.73 (1.56)*	–	–	–	–
ΔAO_t	–	–	0.40 (0.18)**	–	0.20 (0.09)**
ΔAO_{t-1}	0.19 (0.08)**	0.14 (0.07)*	0.45 (0.19)**	–	–
ΔAO_{t-2}	–	0.18 (0.08)**	0.59 (0.19)***	–	–
ΔAO_{t-3}	0.15 (0.08)*	0.17 (0.08)**	0.52 (0.18)***	–	–
ΔAO_{t-4}	–	–	–	–	–0.27 (0.09)***
ΔER_t	–	–	–	–	0.32 (0.16)**
ΔER_{t-3}	–	–0.25 (0.13)*	–	–	–
$CASH_t$	–1.35 (0.37)***	–	–	–1.96 (0.57)***	–1.71 (0.51)***
$CASH_{t-1}$	–	–1.43 (0.26)***	–	–1.56 (0.58)***	–
$CASH_{t-4}$	–	–	–2.96 (0.76)***	–	–
Rho	0.66 (0.09)***	0.53 (0.09)***	0.62 (0.08)***	0.55 (0.09)***	0.73 (0.08)***
Constant	4.79 (4.35)	12.31 (2.95)***	26.86 (8.33)***	34.58 (4.87)***	15.29 (5.93)***
Observations	86	87	102	103	88
R^2	0.78	0.72	0.63	0.76	0.72
Relevant $R^{2(a)}$	0.54	0.56	0.46	0.61	0.51
Q (1–8) p-value	0.34	0.14	0.57	0.91	0.98

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) See Section 3.3

Table B2: Westpac-Melbourne Institute Index of Consumer Sentiment Component Indices

Regressor	Index 1	Index 2	Index 3	Index 4	Index 5
ΔGDP_{t-1}	1.24 (0.59) **	1.48 (0.71) **	3.02 (1.48) **	–	1.36 (0.64) **
ΔGDP_{t-3}	–	–	2.65 (1.49) *	–	–
ΔJV_{t-2}	–	0.21 (0.24) *	–	–	–
ΔHW_{t-1}	–	–	–	–3.75 (2.06) *	–
ΔHW_{t-2}	3.58 (1.33) ***	–	8.30 (3.44) **	–	–
ΔHW_{t-3}	–	–	–	–4.66 (2.11) **	–
ΔAO_{t}	–	–	0.51 (0.20) **	–	–
ΔAO_{t-1}	–	–	0.36 (0.18) **	–	0.18 (0.08) **
ΔAO_{t-4}	–0.17 (0.07) **	–	–0.47 (0.18) **	–	–0.25 (0.08) ***
ΔER_{t-3}	–0.28 (0.12) **	–0.31 (0.14) **	–	–0.44 (0.19) **	–
ΔER_{t-4}	–	–	1.08 (0.35) ***	–	–
$CASH_{t}$	–1.11 (0.51) **	–	–2.74 (0.92) ***	–	–1.71 (0.62) ***
$CASH_{t-1}$	–0.96 (0.50) *	–0.81 (0.24) ***	–	–	–
$CASH_{t-2}$	–	–	–	–	–1.13 (0.62) *
$CASH_{t-3}$	–	–	–	–1.95 (0.50) ***	–
Rho	0.90 (0.07) ***	0.44 (0.10) ***	0.72 (0.08) ***	0.62 (0.09) ***	0.83 (0.07) ***
Constant	17.13 (8.58) **	6.35 (2.79) **	19.33 (10.49) *	23.52 (5.93) ***	25.45 (8.54) ***
Observations	87	88	87	86	104
R^2	0.78	0.53	0.67	0.57	0.74
Relevant $R^{2(a)}$	0.61	0.39	0.41	0.54	0.62
Q (1–8) p-value	0.22	0.81	0.60	0.32	0.21

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) See Section 3.3

Table B3: NAB Quarterly Survey Actual Business Conditions

Regressor	Trading	Profitability	Employment
ΔGDP_{t-1}	3.32 (1.51) **	3.27 (1.55) **	–
ΔGDP_{t-2}	5.23 (1.57) ***	3.82 (1.61) **	–
ΔGDP_{t-3}	5.23 (1.99) **	7.30 (1.40) ***	3.87 (0.92) ***
ΔGDP_{t-4}	3.16 (1.50) **	5.30 (1.43) ***	1.92 (0.83) **
ΔJV_{t-1}	–	–	0.36 (0.11) ***
ΔJV_{t-2}	–	0.67 (0.20) ***	0.50 (0.12) ***
ΔHW_{t-1}	6.26 (2.52) **	–	–
ΔAO_{t-2}	0.65 (0.17) ***	0.46 (0.17) ***	–
ΔAO_{t-3}	0.32 (0.16) *	–	0.24 (0.10) **
ΔER_{t-1}	–	–	0.28 (0.15) *
ΔER_{t-2}	–	–	0.39 (0.16) **
ΔER_{t-3}	0.57 (0.28) *	–	–
ΔER_{t-4}	0.85 (0.30) ***	0.82 (0.28) ***	0.48 (0.16) ***
$CASH_{t-1}$	3.64 (2.08) *	–	–
$CASH_{t-2}$	–4.54 (2.10) **	–	–
$CASH_{t-3}$	–	–	4.60 (0.91) ***
$CASH_{t-4}$	–	–	–5.85 (0.92) ***
Rho	0.54 (0.16) ***	0.34 (0.18) *	0.22 (0.18)
Constant	–9.40 (6.09)	–16.69 (3.33) ***	7.34 (2.55) ***
Observations	47	47	47
R^2	0.92	0.87	0.96
Relevant $R^{2(a)}$	0.82	0.76	0.94
Q (1–8) p–value	0.11	0.18	0.11

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) See Section 3.3

Table B4: NAB Quarterly Survey
Expected Business Conditions (3-month Outlook)

Regressor	Average index	Trading	Profitability	Employment
ΔGDP_{t-2}	3.81 (1.32)***	3.40 (1.66)**	–	3.10 (0.88)***
ΔGDP_{t-3}	3.70 (1.25)***	4.60 (1.45)***	3.06 (1.14)***	–
ΔJV_{t-1}	0.89 (0.17)***	0.86 (0.20)***	0.79 (0.17)***	–
ΔJV_{t-2}	0.48 (0.16)***	0.67 (0.22)***	0.69 (0.18)***	–
ΔJV_{t-3}	–0.47 (0.22)**	–	–	–
ΔHW_{t-1}	–	–	–	4.26 (1.34)***
ΔAO_{t-1}	–	–	–	0.22 (0.11)**
ΔAO_{t-2}	–	–	–	0.36 (0.11)***
ΔAO_{t-4}	0.37 (0.12)***	0.32 (0.15)**	0.34 (0.13)**	0.24 (0.10)**
ΔER_{t-2}	0.46 (0.21)**	–	–	0.37 (0.18)**
ΔER_{t-3}	0.45 (0.20)**	0.49 (0.26)*	–	0.67 (0.17)***
$CASH_{t-1}$	–	–	–	3.31 (1.20)***
$CASH_{t-2}$	–	–	–	–4.72 (1.17)***
$CASH_{t-3}$	6.96 (1.46)***	5.66 (1.85)***	6.70 (1.55)***	–
$CASH_{t-4}$	–7.90 (1.52)***	–6.19 (1.82)***	–7.16 (1.51)***	–
Rho	0.31 (0.17)*	0.49 (0.15)***	0.52 (0.14)***	0.48 (0.17)***
Constant	3.73 (3.71)	–0.13 (5.66)	3.54 (4.56)	7.43 (2.60)***
Observations	47	47	47	47
R^2	0.94	0.92	0.91	0.92
Relevant $R^{2(a)}$	0.91	0.86	0.84	0.81
Q (1–8) p–value	0.19	0.30	0.12	0.94

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) See Section 3.3

Table B5: NAB Quarterly Survey
Expected Business Conditions (12-month Outlook)

Regressor	Average index	Trading	Profitability	Employment
ΔJV_{t-1}	–	–	0.64 (0.15)***	–
ΔHW_{t-4}	3.03 (1.63)*	–	–	–
ΔAO_{t-1}	0.23 (0.11)**	0.36 (0.13)***	–	–
ΔAO_{t-2}	0.29 (0.13)**	–	–	0.29 (0.13)**
ΔAO_{t-3}	0.39 (0.12)***	0.29 (0.13)**	–	0.34 (0.13)**
ΔAO_{t-4}	0.26 (0.11)***	–	–	0.42 (0.12)***
$CASH_t$	–	5.86 (1.97)***	–	–
$CASH_{t-1}$	–2.56 (0.75)***	–6.87 (1.92)***	–1.31 (0.64)**	–
$CASH_{t-4}$	–	–	–	–1.54 (0.44)***
Rho	0.85 (0.10)***	0.77 (0.10)***	0.78 (0.10)***	0.65 (0.13)***
Constant	14.26 (7.17)*	8.80 (6.52)	11.15 (6.14)*	11.17 (4.00)***
Observations	44	47	47	44
R^2	0.90	0.89	0.87	0.89
Relevant $R^{2(a)}$	0.60	0.55	0.50	0.72
Q (1–8) p–value	0.42	0.52	0.12	0.45

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) See Section 3.3

Table B6: Bivariate OLS Regressions – NAB Quarterly Survey
Actual Business Conditions

	ΔGDP	ΔEmployment	ΔGOS
Regressors[(a)]		*p*-values	
Average index	0.209	0.000***	0.349
Residuals	0.693	0.003***	0.827
Trading conditions	0.289	0.000***	0.481
Residuals	0.838	0.086*	0.993
Profitability	0.214	0.000***	0.453
Residuals	0.990	0.217	0.968
Employment	0.215	0.000***	0.138
Residuals	0.069*	0.923	0.144

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) In each regression the regressors are four lags of the dependent variable and four lags of the index or residuals in the far left-hand column. Each *p*-value summarises an *F*-test for the joint significance of the lagged index or residuals.

Table B7: Bivariate OLS Regressions – NAB Quarterly Survey
Expected Business Conditions (3-month Outlook)

	ΔGDP	ΔEmployment	ΔGOS
Regressors[(a)]		*p*-values	
Average index	0.047**	0.000***	0.344
Residuals	0.416	0.672	0.991
Trading conditions	0.094*	0.000***	0.382
Residuals	0.561	0.543	0.953
Profitability	0.040**	0.000***	0.385
Residuals	0.304	0.481	0.896
Employment	0.015**	0.002***	0.216
Residuals	0.424	0.124	0.660

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) In each regression the regressors are four lags of the dependent variable and four lags of the index or residuals in the far left-hand column. Each *p*-value summarises an *F*-test for the joint significance of the lagged index or residuals.

Table B8: Bivariate OLS Regressions - NAB Quarterly Survey
Expected Business Conditions (12-month Outlook)

	ΔGDP	**ΔEmployment**	**ΔGOS**
Regressors[(a)]		*p*-values	
Average index	0.210	0.020**	0.434
Residuals	0.549	0.174	0.761
Trading conditions	0.029**	0.004***	0.320
Residuals	0.548	0.699	0.993
Profitability	0.188	0.004***	0.271
Residuals	0.915	0.270	0.787
Employment	0.038**	0.012**	0.136
Residuals	0.267	0.105	0.813

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.

(a) In each regression the regressors are four lags of the dependent variable and four lags of the index or residuals in the far left-hand column. Each *p*-value summarises an *F*-test for the joint significance of the lagged index or residuals.

Table B9: Probability of a Recession – Roy Morgan Consumer Confidence

$P(\text{recession}_t=1)=F(\alpha_0 + \alpha_1 x_{t-k})$
k=lagged quarters

x_t variables	1	2	3	4	5	6	7	8
Average index								
Pseudo $R^{2(a)}$	0.160	0.238	0.191	0.110	0.023	0.012	0.020	0.012
t–stat	–3.25***	–3.44***	–3.34***	–2.87***	–1.51	–1.11	–1.37	–1.09
Residuals								
Pseudo R^2	0.016	0.031	0.014	0.046	0.002	0.008	0.002	0.040
t–stat	1.14	–0.51	–1.05	–1.85 *	0.35	0.81	–0.44	–1.70 *
Index 1								
Pseudo R^2	0.150	0.142	0.117	0.048	0.000	0.000	0.003	0.000
t–stat	–2.96***	–2.93***	–2.83***	–2.09**	–0.13	–0.15	–0.54	–0.19
Residuals								
Pseudo R^2	0.013	0.000	0.015	0.037	0.014	0.007	0.000	0.006
t–stat	1.03	–0.04	–1.09	–1.68*	1.03	0.72	–0.20	–0.70
Index 2								
Pseudo R^2	0.13	0.28	0.235	0.084	0.004	0.006	0.019	0.012
t–stat	–2.90***	–3.26***	–3.19***	–2.57***	–0.68	–0.75	–1.33	–1.09
Residuals								
Pseudo R^2	0.013	0.015	0.060	0.051	0.004	0.007	0.004	0.053
t–stat	1.04	–1.11	–2.11**	–1.95*	0.59	0.75	–0.58	–1.94*
Index 3								
Pseudo R^2	0.193	0.280	0.186	0.098	0.026	0.012	0.011	0.008
t–stat	–3.20***	–3.27***	–3.19***	–2.66***	–1.57	–1.08	–1.03	–0.88
Residuals								
Pseudo R^2	0.002	0.008	0.009	0.015	0.000	0.000	0.002	0.040
t–stat	0.44	–0.90	–0.93	–1.17	–0.09	0.039	–0.43	–1.84*
Index 4								
Pseudo R^2	0.072	0.196	0.120	0.168	0.082	0.064	0.053	0.054
t–stat	–2.51**	–3.06***	–3.07***	–3.03***	–2.53**	–2.31**	–2.13**	–2.14**
Residuals								
Pseudo R^2	0.016	0.015	0.026	0.062	0.002	0.003	0.005	0.016
t–stat	1.23	–1.20	–1.56	–2.27**	–0.45	–0.57	–0.66	–1.20
Index 5								
Pseudo R^2	0.053	0.042	0.030	0.015	0.000	0.001	0.004	0.000
t–stat	–2.31**	–2.07**	–1.74*	–1.24	–0.24	0.29	–0.63	0.03
Residuals								
Pseudo R^2	0.002	0.005	0.000	0.000	0.017	0.064	0.000	0.006
t–stat	0.40	0.68	–0.01	–0.22	1.16	2.10**	–0.01	–0.71

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) Proposed by Estrella (1998)

Table B10: Probability of a Recession – Westpac-Melbourne Institute Consumer Confidence

$P(\text{recession}_t=1)=F(\alpha_0 + \alpha_1 x_{t-k})$
K=lagged quarters

x_t variables	1	2	3	4	5	6	7	8
Average index								
Pseudo $R^{2(a)}$	0.141	0.202	0.144	0.095	0.031	0.008	0.004	0.001
t–stat	–3.23***	–3.38***	–3.20***	–2.81***	–1.75*	–0.91	–0.60	–0.32
Residuals								
Pseudo R^2	0.012	0.010	0.015	0.023	0.002	0.000	0.001	0.003
t–stat	0.99	–0.92	–1.09	–1.36	–0.38	–0.01	0.29	–0.48
Index 1								
Pseudo R^2	0.108	0.098	0.073	0.038	0.006	0.000	0.001	0.004
t–stat	–2.96***	–2.85***	–2.54**	–1.93*	–0.79	–0.22	0.25	0.65
Residuals								
Pseudo R^2	0.003	0.006	0.018	0.028	0.002	0.001	0.003	0.007
t–stat	–0.47	–0.70	–1.19	–1.48	–0.40	–0.33	0.50	0.76
Index 2								
Pseudo R^2	0.15	0.317	0.237	0.152	0.030	0.008	0.004	0.001
t–stat	–3.28***	–3.32***	–3.33***	–3.17***	–1.72*	–0.88	–0.64	–0.33
Residuals								
Pseudo R^2	0.000	0.052	0.077	0.092	0.009	0.000	0.000	0.000
t–stat	–0.08	–2.04**	–2.43**	–2.59***	–0.87	–0.20	–0.16	–0.02
Index 3								
Pseudo R^2	0.208	0.287	0.174	0.100	0.031	0.010	0.005	0.003
t–stat	–3.26***	–3.11***	–2.37***	–2.68***	–1.68*	–0.98	–0.69	–0.55
Residuals								
Pseudo R^2	0.000	0.035	0.015	0.008	0.000	0.000	0.000	0.002
t–stat	–0.17	–1.65*	–1.09	–0.80	–0.26	0.02	–0.11	–0.35
Index 4								
Pseudo R^2	0.046	0.16	0.139	0.134	0.063	0.032	0.014	0.018
t–stat	–2.08**	–3.04***	–2.98***	–2.94***	–2.28**	–1.72*	–1.18	–1.30
Residuals								
Pseudo R^2	0.004	0.027	0.016	0.042	0.015	0.001	0.003	0.000
t–stat	0.57	–1.47	–1.12	–1.78*	–1.09	–0.34	0.47	–0.072
Index 5								
Pseudo R^2	0.055	0.053	0.032	0.018	0.008	0.000	0.001	0.001
t–stat	–2.35**	–2.28**	–1.81*	–1.37	–0.91	–0.03	–0.24	0.33
Residuals								
Pseudo R^2	0.000	0.007	0.000	0.000	0.002	0.021	0.001	0.004
t–stat	–0.19	–0.87	–0.21	–0.03	–0.45	1.36	0.23	–0.66

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.
(a) Proposed by Estrella (1998)

Table B11: Bivariate OLS Regressions – Roy Morgan

	ΔGDP	ΔEmployment	ΔHousehold spending	ΔRetail trade
Regressors[(a)]	Joint significance tests (*p*-values)			
Average index	0.016**	0.012**	0.020**	0.018**
Residuals	0.527	0.010**	0.750	0.162
Index 1	0.177	0.039**	0.035**	0.048**
Residuals	0.545	0.042**	0.239	0.345
Index 2	0.027**	0.085*	0.023**	0.075*
Residuals	0.770	0.058*	0.433	0.104
Index 3	0.000***	0.003***	0.005***	0.020**
Residuals	0.234	0.050*	0.436	0.280
Index 4	0.155	0.095*	0.479	0.222
Residuals	0.105	0.224	0.934	0.647
Index 5	0.394	0.151	0.020**	0.002***
Residuals	0.807	0.695	0.279	0.104

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.

(a) In each regression the regressors are four lags of the dependent variable and four lags of the index or residuals in the far left-hand column. Each *p*-value summarises an *F*-test for the joint significance of the lagged index or residuals.

Table B12: Bivariate OLS Regressions – Westpac-Melbourne Institute

	ΔGDP	ΔEmployment	ΔHousehold spending	ΔRetail trade
Regressors[(a)]	Joint significance tests (*p*-values)			
Average index	0.008***	0.017**	0.072*	0.042**
Residuals	0.318	0.010**	0.089*	0.229
Index 1	0.282	0.099*	0.242	0.200
Residuals	0.741	0.135	0.685	0.610
Index 2	0.000***	0.037**	0.027**	0.125
Residuals	0.013**	0.015**	0.251	0.429
Index 3	0.000***	0.002***	0.016**	0.039**
Residuals	0.606	0.188	0.637	0.658
Index 4	0.175	0.139	0.664	0.081*
Residuals	0.421	0.026**	0.134	0.692
Index 5	0.162	0.153	0.034**	0.024**
Residuals	0.595	0.237	0.644	0.585

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.

(a) In each regression the regressors are four lags of the dependent variable and four lags of the index or residuals in the far left-hand column. Each *p*-value summarises an *F*-test for the joint significance of the lagged index or residuals.

Table B13: Employment Equation
Augmented by filtered consumer confidence indices

	Roy Morgan	Westpac-Melbourne institute
Filtered index (residual series)	Joint significance tests (*p*-values)[(a)]	
Average index	0.077*	0.204
Index 1	0.019**	0.098*
Index 2	0.022**	0.424
Index 3	0.376	0.596
Index 4	0.162	0.322
Index 5	0.959	0.461

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels.

(a) In each regression four lags of the residuals from our earlier regressions of sentiment on economic variables are added to a baseline error-correction model of full-time equivalent employment. The baseline equation on its own explains close to 70 per cent of variation in the dependent variable over the sample period. Each *p*-value summarises an *F*-test for the joint significance of the lagged residuals.

Table B14: Employment Equation
Augmented by filtered NAB business conditions indices

	Actual business conditions	Expected business conditions (3-month outlook)	Expected business conditions (12-month outlook)
Filtered index (Residual series)	Joint significance tests (*p*-values)[(a)]		
Average index	0.078*	0.274	0.610
Trading	0.144	0.196	0.786
Profitability	0.170	0.265	0.740
Employment	0.912	0.060*	0.032**

Notes: *, **, *** denote significance at the 10%, 5% and 1% levels

(a) In each regression four lags of the residuals from our earlier regressions of sentiment on economic variables are added to a baseline error-correction model of full-time equivalent employment. The baseline equation on its own explains nearly 80 per cent of variation in the dependent variable over the sample period. Each *p*-value summarises an *F*-test for the joint significance of the lagged residuals.

References

Adams FG (1964), 'Consumer Attitudes, Buying Plans and Purchases of Durable Goods: A Principal Components, Time Series Approach', *Review of Economics and Statistics*, 46 (4), pp 347–355.

Boehm EA and JS McDonnell (1993), 'Consumer Sentiment Variables as Leading Indicators of Changes in Consumer Spending in Australia', University of Melbourne, Institute of Applied Economic and Social Research Working Paper Series No 4/93.

Bram J and S Ludvigson (1998), 'Does Consumer Confidence Forecast Household Expenditure? A Sentiment Index Horse Race', *Federal Reserve Bank of New York Economic Policy Review*, 4(2), pp 59–78.

Campbell JY and NG Mankiw (1989), 'Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence', in OJ Blanchard and S Fischer (eds), *NBER Macroeconomics Annual*, MIT Press, Cambridge, pp 185–216.

Carroll CD, JC Fuhrer and DW Wilcox (1991), 'Does Consumer Sentiment Affect Household Spending? If So, Why?', Federal Reserve System Finance and Economics Discussion Series No 168.

Carroll CD, JC Fuhrer and DW Wilcox (1994), 'Does Consumer Sentiment Forecast Household Spending? If So, Why?', *American Economic Review*, 84(5), pp 1397–1408.

Defris LV and JS McDonnell (1976), 'Identification and Measurement of Australian Consumer Sentiment', *Australian Economic Review*, 2nd Quarter, pp 35–44.

Dunkelberg WC and WJ Dennis (1988), 'Uncertainty: A Predictor of Economic Activity?', in KH Oppenländer and G Poser (eds), *Contributions of Business Cycle Surveys to Empirical Economics*, Papers presented at the 18th CIRET Conference, Zurich 1987, Gower Publishing Company, Vermont, pp 463–475.

Estrella A (1998), 'A New Measure of Fit for Equations with Dichotomous Dependent Variables', *Journal of Business and Economic Statistics*, 16(2), pp 198–205.

Estrella A and FS Mishkin (1998), 'Predicting US Recessions: Financial Variables as Leading Indicators', *Review of Economics and Statistics*, 80(1), pp 45–61.

Fair RC (1971), 'Consumer Sentiment, the Stock Market and Consumption Functions', Princeton University Econometric Research Program Research Memorandum No 119.

Friend I and FG Adams (1964), 'The Predictive Ability of Consumer Attitudes, Stock Prices, and Non-Attitudinal Variables', *Journal of the American Statistical Association*, 59(308), pp 987–1005.

Hymans SH (1970), 'Consumer Durable Spending: Explanation and Prediction', *Brookings Papers on Economic Activity*, 2, pp 173–199.

Juster FT and P Wachtel (1972a), 'Anticipatory and Objective Models of Durable Goods Demand', *American Economic Review*, 62(4), pp 564–579.

Juster FT and P Wachtel (1972b), 'Uncertainty, Expectations and Durable Goods Demand Models', in B Strumpel, JN Morgan and E Zahn (eds), *Human Behaviour in Economic Affairs: Essays in Honor of George Katona*, Elsevier Science, Amsterdam.

Katona G (1951), *Psychological Analysis of Economic Behaviour*, McGraw-Hill, New York.

Katona G (1975), *Psychological Economics*, Elsevier Science, Amsterdam.

Leeper EM (1992), 'Consumer Attitudes: King for a Day', *Federal Reserve Bank of Atlanta Economic Review*, 77(4), pp 1–15.

Loundes J and R Scutella (2000), 'Consumer Sentiment and Australian Consumer Spending', Univeristy of Melbourne, Institute of Applied Economic and Social Research Working Paper Series No 21/00.

Lovell MC and PL Tien (2000), 'Economic Discomfort and Consumer Sentiment', *Eastern Economic Journal*, 26(1), pp 1–8.

Matsusaka JG and AM Sbordone (1995), 'Consumer Confidence and Economic Fluctuations', *Economic Inquiry*, 33(2), pp 296–318.

Mishkin FS (1978) 'Consumer Sentiment and Spending on Durable Goods', *Brookings Papers on Economic Activity*, 1, pp 217–232.

Mueller E (1963), 'Ten Years of Consumer Attitude Surveys: Their Forecasting Record', *Journal of the American Statistical Association*, 58(304), pp 899–917.

Pagan AR (1984), 'Econometric Issues in the Analysis of Regressions with Generated Regressors', *International Economic Review*, 25(1), pp 221–247.

Santero T and N Westerlund (1996), 'Confidence Indicators and Their Relationship to Changes in Economic Activity', OECD Economics Department Working Paper No 170.

Stock JH and MW Watson (1993), 'A Procedure for Predicting Recessions with Leading Indicators: Econometric Issues and recent Experience', in JH Stock and MW Watson (eds), *Business Cycles, Indicators, and Forecasting*, University of Chicago Press, Chicago, Studies in Business Cycles Vol 28, pp 95–153.

Throop AW (1992), 'Consumer Sentiment: Its Causes and Effects', *Federal Reserve Bank of San Francisco Economic Review*, 1, pp 35–59.