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## MARKET PSYCHOLOGY AND AGGREGATE STOCK RETURNS: EVIDENCE FROM AUSTRALIAN CONSUMER SENTIMENT

*Chien-Ting Lin, Chia-Cheng Ho & Hisn-Jung Hsieh*

**Abstract:** *We present evidence that consumer sentiment has a direct effect on excess aggregate stock returns. We also trace the source of this positive effect and find that public perception over the next year's economic condition is the most important determinant for the stock market. Our findings remain conclusive even in the presence of other well known risk-based factors. The evidence thus supports behaviour finance theory that incorporates both psychological judgement and systematic risks. However, we do not find that past stock returns are influential on current sentiment nor do we find current sentiment Granger-cause subsequent stock return.*

**JEL Classifications:** *G12, G14*

**Keywords:** *consumer sentiment, behaviour finance, stock returns*

### INTRODUCTION

A growing number of empirical studies in the asset pricing literature document that stock prices consistently deviate from their fundamental values even after controlling their systematic risk (For example, see DeBondt and Thaler (1985), Jegadeesh and Titman (1993), Lakonishok *et al.* (1994), and Lee *et al.* (1999)). The underlying theme of these studies is that subsequent stock returns are highly predictable. Investors as they argue tend to heavily rely on historical prices or tend to systematically overreact or underreact to new information. In the practitioners' world, this view has also found support from fund managers who, for example, are well known to pursue value and contrarian strategies to exploit investors' continuing misassessment on stocks' long-term values.

Other return anomalies that have been recently reported are directly related to psychological factors. For instance, upbeat mood is linked to sunny weather, which in turn is strongly correlated with stock returns (see Hirshleifer and Shumway (2001)). Or the pronounced negative stock

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returns over the two weekends that fall on the annual daylight saving time changes. Kamstra *et al.* (2000) attribute the anonymous effect to sleep desynchronises. This increasingly line of evidence not only has direct implication on Efficient Market Hypothesis but also casts doubt on the adequacy of the classical risk-based theories.

Behaviour finance theorists argue that the state of investors' psychology rather than the statistical properties of the stock returns plays a much crucial role in the process of price formation. This line of thought can be traced back to Herbert Simon's theory of bounded rationality in which individuals tend to satisfy instead of optimise. The imperfect rationality implies that psychological biases manifested in the likes of heuristic trading, mental accounting, and loss aversion are important for stock price behaviour (See Barberis and Huang (2000), Barberis *et al.* (2001)). As Hirshleifer (2001) puts it, "The central task of asset pricing is to examine how expected returns are related to *risk* and to *investor misvaluation*. He sums it up in his comprehensive review on the literature that a broader psychological paradigm that incorporates full rationality as a special case will subsume the purely rational paradigm over time.

A key psychological factor that could affect investors' valuation on stocks is sentiment. At a simple level, one might look at investor sentiment as having optimistic or pessimistic views about the economic environment. Positive outlook tends to drive up stock prices while negative perception tends to dampen it. When sentiment is strong and persistent, it may give rise to irrational exuberance as evidenced in the high-tech financial bubble during the late 1990s or the panic scenario in the October 1987 crash. Such events do not reflect any sudden changes in the fundamentals but rather the dramatic shifts in investor sentiment (Siegel (1992)). In this stronger level, investor sentiment may be associated with the propensity to speculate (See Baker and Wurgler (2003)).

In this paper, the importance of sentiment in the formation of stock price is examined. Specifically, we address the fundamental question of whether investor sentiment carries any explanatory power alone as well as with other well-known macroeconomic factors on stock returns. We also assess its predictive power in subsequent stock returns, as theories might have suggested. Since the source of changes of investor sentiment is itself of interest and it is widely believed that share market is a factor in investor confidence, we investigate if past stock returns have any influence on the current sentiment. It could be argued that the positive (negative) past returns could improve (dampen) sentiment due to increased wealth or higher expected returns.

Unlike earlier studies that tend to rely on indirect sentiment measures such as advance-decline ratio, close-end fund discounts, and share turnovers or extrapolations based on these measurements, we use a direct survey data, the Australian Consumer Sentiment Index (CSI) published by Westpac and the Melbourne Institute<sup>1</sup>. There are several advantages of using CSI. First, it is a frequent survey of public sentiment about the current and future economic conditions. Along with other macroeconomic data, it is one of the most closely watched and followed monthly news in the media. Therefore, the survey should represent comprehensively about the public perceptions on the economy. Second, the Australian index gathered here tends to reflect economic views from the unformed investors and noise traders rather than from the professional fund managers or arbitrageurs. As a result, it should capture the irrational expectations that are often argued as the source of mispricing of assets from its intrinsic values. Third, CSI is a

composite index that actually consists of 5 survey questions along which each represents the public views on specific component of the economic outlook. The detailed information on each sub-index may potentially enhance our understanding on the role of sentiment in influencing stock price. Fourth, the CSI offers the longest monthly series on survey data to date since September 1974 and allows us to conduct more meaning and robust analysis.

Our analysis confirms the effect of sentiment on stock returns. We find that changes in the consumer sentiment are contemporaneously associated with stock returns. That is, positive changes in the sentiment tend to drive aggregate stock returns higher in the same period and vice versa. The relationship is robust even in the presence of other known explanatory variables such as dividend yields, default risk, inflation risk and term risk. An examination on the sentiment's sub-indices further indicates that public views about the economic outlook for the next 12 months are particularly important in capturing variation of stock returns. This additional finding appears to be intuitively consistent with the stock price behaviour being influenced by the perception on the economy in the immediate term.

Contrary to suggestions in earlier studies, there is little evidence that sentiment causes subsequent stock returns. Changes in consumer sentiment fail to have any predictive power on stock returns from one month up to 12 months ahead. This perhaps suggests that investors may not systematically overreact or underreact and that the stock market is informationally efficient. Our findings thus raise doubt on the investment strategy of market timing conditioned on sentiment.

Our results also do not support *a priori* that equity returns Granger-cause sentiment. Intuitively, one could conjecture that recent positive (negative) performance in stock market cause investors to have upbeat (depressed) moods as they feel they are wealthier (poorer). However, the VAR tests do not show any causality linkages between stock returns and sentiment. Potentially, macroeconomic factors such as interest rates or job vacancy rates could have more significant effect on sentiment.<sup>2</sup>

The rest of the paper is organized as follows. Section 2 describes the data, defines variables, and provides summary statistics. Section 3 examines the relationship between consumer sentiment and stock returns along with other explanatory variables. The last section concludes the paper.

## DATA AND SUMMARY STATISTICS

### Sample and Variable Description

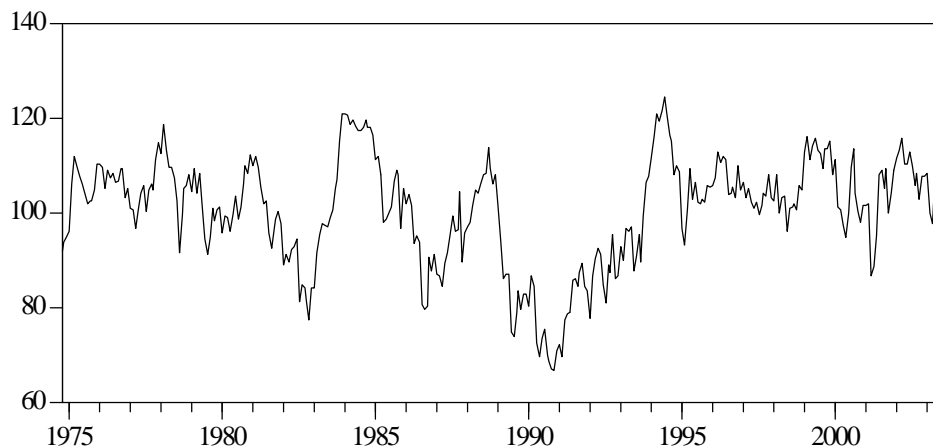
The monthly data in our study starts from September 1974, the first consumer sentiment survey and ends in August 2003. The sample provides a total number of 347 monthly observations. Because certain variables are not available until later dates, some of the empirical analysis conducted falls into shorter sample periods. However, the shortest sample period still carries 236 observations. With the exception of the CSI series, all data are obtained from Datastream. The market returns are obtained from the total monthly market return index adjusted for dividends by taking the first difference of logarithm of the index multiplied by 100. The 90-day dealer bill rate is then subtracted from the market returns to calculate excess market returns.

To test for the robustness of the explanatory power of CSI, we include 4 other well-known factors in our multivariate tests. Keim and Stambaugh (1986) and Fama (1990) document that term spread and default spread respectively are significant in explaining stock returns. Chen et al. (1986) find that along with the two risk premiums, yield change is equally important. Based on Fama and French (1988), we add dividend yield as another control variable. For term spread, it is defined as the difference between the 10-year Treasury bill rate and the 90-day dealer bill rate. Default spread is the difference between the 10-year corporate bond rate and the 10-year Treasury bill rate. Yield spread, which measures changes in inflation, is the monthly changes in the 90-day dealer bill rate. Finally, the dividend yield is the ratio of dividends from the market index and the index level at the year-end.

The monthly consumer sentiment survey based on telephone interviews of 1,410 respondents is a simple average of responses from 5 survey questions that address different aspects of respondents' attitudes toward economic outlook. The 5 questions as we index them from CSI1 to CSI5 are the family financial situation over the past year; the expected changes in the family financial situation over the next year; the anticipation of economic prospects in the next year and the next five years; and the views on the buying conditions of major household items respectively. The survey is stratified according to age, sex and location.

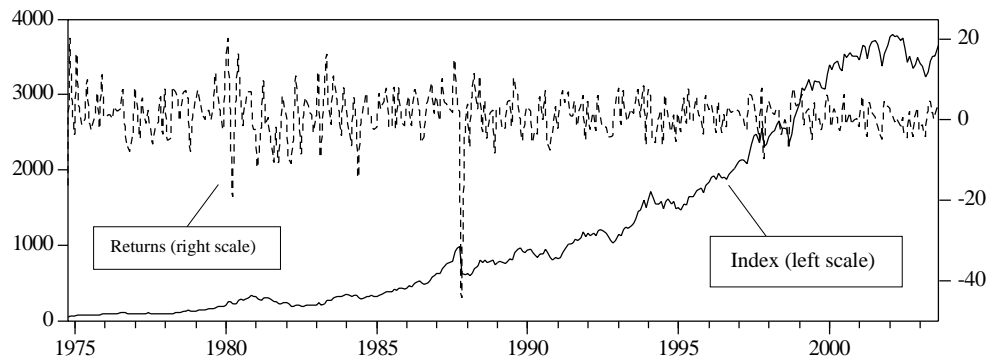
### Summary Statistics

Figure 1a and 1b show the time series measures of the CSI and the market return index over the last 30 years. Both indices seem to track each other quite consistently over time. Sharp changes in the sentiment index tend to associate with large returns in the stock market. Most noticeably in recent years, the October 1987 crash, the early 1990s recession and the high tech bubble burst in 2000 coincide with dramatic negative changes in consumer confidence. On the other hand, we also see the record performance in the stock market with persistent high level and positive changes of sentiment in the late 1990s to early 2000.



**Figure 1a. Australian Consumer Sentiment Index**

Monthly Australian Consumer Sentiment level from September 1974 to August 2003



**Figure 1b. Market Return index**

Monthly market return level and changes from September 1974 to August 2003.  
Market returns are obtained from Datastream total market return index.

The summary statistics of excess market return, changes in CSI (dCSI) and the control variables are presented in Table 1. The average monthly excess return is 0.34% and a standard deviation of 5.68%.<sup>3</sup> Consistent with known stock return behaviours, the excess return is negatively skewed due to larger negative returns. For CSI, the average change is 0.06% with a standard deviation of 4.80%, and is also negatively skewed. The positive average in dCSI suggests that households are on average more optimistic than pessimistic. However, these changes in sentiment can be quite volatile and tend to be dominated by larger downward swings in consumers' confidence. Another interesting observation is the average changes in inflation of  $-0.01\%$  measured by YIELD. This little fluctuation of change in inflation is largely due to the relative low inflation rate in the last decade that offsets the more volatile period in the early 1980s. Last column of the table shows that all the time series data are stationary. Based on the Phillip-Perron tests, the null hypothesis of unit root is rejected at the 1% significant level or less for all the variables.<sup>4</sup> Our results do not come as a surprise since each series is calculated on the first difference of the levels.

**Table 1**  
**Summary Statistics of Monthly Returns Sample**

This table reports summary statistics of monthly aggregate excess returns and the control variables.  $r_t$  is the Datastream total market returns minus 3-month dealer bill rate.  $dCSI_t$  is the change in consumer sentiment index.  $DEF_t$  is the 10-year corporate bond rate minus the 10-year Treasury bill rate.  $DY_t$  is the dividend payment of the index over the index level at the year-end.  $TERM_t$  is the 10-year Treasury bill rate minus the 3-month dealer bill rate.  $YIELD_t$  is the change in the dealer bill rate. The time series starts from September 1974 for  $dCSI_t$  and  $DY_t$ , from February 1976 for  $r_t$  and  $TERM_t$ , from March 1976 for  $YIELD_t$ , and from January 1984 for  $DY_t$ . PP is the Phillip Perron unit root test that includes an intercept term.

Variables	Mean	Std. Dev.	Skewness	Minimum	Maximum	N	PP
$r_t$	0.34	5.68	-1.64	-45.53	19.59	331	0.00
$dCSI_t$	0.06	4.80	-0.49	-16.06	12.74	347	0.00
$DEF_t$	0.87	0.48	-0.16	-0.56	2.50	236	0.01
$DY_t$	4.06	0.95	1.07	2.51	8.88	347	0.00
$TERM_t$	0.16	1.93	-0.67	-5.98	4.45	331	0.01
$YIELD_t$	-0.01	0.88	0.76	-4.45	6.55	330	0.00

### THE EFFECT OF CONSUMER SENTIMENT ON STOCK RETURNS

The correlation analysis presented in Table 2 documents a strong contemporaneous relation between changes in sentiment (dCSI) and excess market returns. Their correlation is positive and significant at the 1% level. We also find that the excess return is negatively related to dividend yield (DY) and changes in inflation (YIELD) as documented in the literature. That is, as economic conditions improve (deteriorate), stock prices go up (down) and dividend yields go down (up). Similarly, an increase (decrease) in inflation is related to lower (higher) excess returns. Between dCSI and the other explanatory variables, there is little relationship between them. Since multicollinearity is not a problem here, our subsequent multivariate test results should be less sample-specific and therefore more robust.

**Table 2**  
**Correlation of Aggregate Stock Return and its Explanatory Variables**

This table presents the contemporaneous correlation among market excess returns and the explanatory variables. p-values are reported in parentheses below coefficient estimates.

	$r_t$	$dCSI_t$	$DEF_t$	$DY_t$	$TERM_t$
dCSI	0.192 (0.000)				
DEF	-0.013 (0.848)	-0.015 (0.822)			
DY	-0.182 (0.001)	-0.046 (0.397)	0.204 (0.002)		
TERM	0.013 (0.810)	0.091 (0.099)	-0.311 (0.000)	-0.332 (0.000)	
YIELD	-0.229 (0.000)	-0.099 (0.071)	0.036 (0.582)	-0.008 (0.883)	-0.225 (0.000)

#### Multivariate Tests

We first report the regression results of excess market returns on changes in consumer sentiment alone. Column 2 of Table 3 shows that changes in sentiment is economically and statistically significant in explaining excess returns.<sup>5</sup> For a 5% rise in sentiment, there is a corresponding increase of 1.1% in monthly excess returns. The finding not surprisingly, is consistent with the correlation analysis in Table 2.

To test whether the explanatory power of changes in sentiment remains robust, we run multivariate regressions in conjunction with the control variables. Specifically, we estimate the following model:

$$r_t = b_0 + b_1 dCSI_t + b_2 DV_t + b_3 DEF_t + b_4 TERM_t + b_5 YIELD_t + u_t \quad (1)$$

where  $r_t$  is the excess market returns,  $dCSI_t$  is the change in consumer sentiment index,  $DV_t$  is the dividend yields,  $DEF_t$  is the default spread,  $TERM_t$  is the term spread,  $YIELD_t$  is the change in inflation, and  $u_t$  is the error term. Since these control variables are highly correlated among themselves, we use different combinations of these variables along with dCSI.

Columns 3 to 7 in Table 3 show that dCSI stays consistently and positively significant at the 1% per cent after controlling different sets of independent variables. When individual control variable such as default spread or term spread is added individually with dCSI (column 3 and



4), we find that the coefficient and the significance level of changes in sentiment are almost unchanged. The stability of the sentiment measure indicates that dCSI captures some variation in excess returns that the risk-based factors fail to account for. For multiple control variables that are regressed with changes in sentiment (column 5 to 7), we continue to find that the economic and statistical significance of dCSI are largely unaffected. For example, after controlling for dividend yield, default spread and yield change, one standard deviation change in sentiment (4.86%) gives rise to 0.93% change in excess returns per month. In sum, our evidence supports and complements earlier work that sentiment is an important factor for the stock market (see Lee *et al.* (1991), Shiller (2000), and Shleifer (2000)).

**Table 3**  
**The Effect of Consumer Sentiment on Excess Market Return: Regression Analysis**

This table reports estimates of regressions relating excess market returns on changes in consumer sentiment and other control variables. dCSI<sub>*t*</sub> is the change in consumer sentiment index. DEF<sub>*t*</sub> is the 10-year corporate bond rate minus the 10-year Treasury bill rate. DY<sub>*t*</sub> is the dividend payment of the index over the index level at the year-end. TERM<sub>*t*</sub> is the 10-year Treasury bill rate minus the 3-month dealer bill rate. YIELD<sub>*t*</sub> is the change in the dealer bill rate. dCSI<sub>*t*</sub> is obtained from Westpac and the Melbourne Institute while the others are from Datastream. *t*-statistics are reported in the parentheses below the coefficient estimates.

<i>Independent variable</i>	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.335 (1.09)	0.381 (0.55)	0.337 (1.09)	0.273 (0.40)	5.041 (3.41)	3.898 (2.42)
dCSI <sub><i>t</i></sub>	0.225 (3.54)	0.235 (3.55)	0.225 (3.53)	0.207 (3.17)	0.183 (2.97)	0.193 (2.80)
DEF <sub><i>t</i></sub>		-0.101 (-0.14)		-0.025 (-0.03)		0.328 (0.47)
DY <sub><i>t</i></sub>					-1.195 (-3.86)	-1.036 (-2.48)
TERM <sub><i>t</i></sub>			-0.012 (-0.07)			
YIELD <sub><i>t</i></sub>				-1.803 (-3.19)	-1.386 (-4.10)	-1.883 (-3.36)
Adjusted <i>R</i> <sup>2</sup>	0.034	0.052	0.031	0.091	0.110	0.115
N	331	236	331	236	330	236

### Causality Tests

While change in sentiment is found to affect current market returns, an important question is whether change in sentiment also predicts subsequent returns. This issue is motivated by the behaviour theory that investors tend to systematically overvalue stocks when sentiment is high and undervalue stocks when sentiment is low. Consequently, current sentiment is negatively related to subsequent stock returns when stock prices are corrected to their fundamental values in the periods ahead. A natural extension of this issue is to examine if past returns also influence current sentiment. Conceivably, continuing positive (negative) stock returns boost (dampen) investor confidence and the market becomes more bullish (bearish). Anecdotal evidence during the Internet bubble in the late 1990s suggests that there could be a feedback mechanism between sentiment and stock market.



We address the issue by first regressing current excess market returns on 1-month, 2-month, 3-month, 6-month and 12-month lagged changes in consumer sentiment. Panel A of Table 4 shows that none of the lagged sentiment measures has predictive power on current excess returns. The adjusted  $R^2$  is almost zero in every regression. These results indicate that the market is

**Table 4**  
**Causality between Excess Market Returns and Changes in Sentiment**

This table presents the estimates of regressions of excess market returns on lagged changes in sentiment. Panel A reports the univariate regression estimates of excess returns on lagged 1-month to 12-month changes in consumer sentiment index. Panel B reports the bivariate Vector Autoregression (VAR) estimates between the excess returns and consumer sentiment with 2 lags. t-statistics are reported in the parentheses below the coefficient estimates.

Panel A: Regressions of excess market returns on lagged changes in sentiment				
Independent variable				
Constant	0.336 (1.08)	0.334 (1.07)	0.335 (1.07)	0.336 (1.07)
dCSI <sub><i>t</i>-1</sub>	0.068 (1.06)	0.072 (1.10)	0.072 (1.11)	0.069 (1.06)
dCSI <sub><i>t</i>-2</sub>		-0.004 (-0.058)	-0.002 (-0.03)	0.002 (0.03)
dCSI <sub><i>t</i>-3</sub>		0.066 (1.02)	0.067 (1.04)	0.066 (1.02)
dCSI <sub><i>t</i>-6</sub>			0.044 (0.67)	0.048 (0.74)
dCSI <sub><i>t</i>-12</sub>				-0.050 (-0.76)
Adjusted $R^2$	0.000	0.007	0.008	0.10
N	331	331	331	331

Panel B: VAR between excess market returns and changes in sentiment				
Independent variable	Lag	Dependent variable		
		$r_t$	dCSI <sub><i>t</i></sub>	
$r_t$	1	0.083 (1.49)	0.042 (0.88)	
	2	-0.152 (-2.71)	-0.057 (-1.18)	
Granger Causality p-value			0.36 (2.03)	
dCSI <sub><i>t</i></sub>	1	0.054 (0.83)	-0.101 (-1.80)	
	2	0.017 (0.26)	-0.06 (-1.07)	
Granger Causality p-value		0.70 (0.72)		
Constant		0.356 (1.14)	0.029 (0.11)	
F-Statistics		2.56	1.55	
Adjusted $R^2$		0.02	0.01	

informationally efficient and that any contrarian strategy conditioned on sentiment will not be profitable. Our evidence thus contradicts suggestions in the literature that individuals' views about stocks tend to be systematically biased.

Next, we use Vector Autoregression (VAR) framework to analyze the causal relation (if any) between sentiment and excess stock returns. The VAR methodology estimates the relation as a system and thus should improve the modeling on the dynamics between these two variables. In addition, the VAR results should also shed light on the interaction between past stock returns and current sentiment. The VAR model is defined as

$$y_t = c + \sum_{i=1}^p b_i y_{t-i} + \varepsilon_t \quad (2)$$

where  $y_t$  is a vector consists of  $r_t$  and  $dCSI_t$ ,  $c$  is the constant terms and  $\varepsilon_t$  is the error terms. Based on the Akaike Information Criteria (AIC) and Schwarz criteria (SC), we choose a lag order of 2.<sup>6</sup>

Panel B of Table 4 reports the monthly bivariate VAR estimates.<sup>7</sup> Consistent with the simple regression results in Panel A in Table 4, we find that sentiment does not Granger-cause excess return. Instead, its own lagged return has significant predictive power at the 1 percent level. Our analysis also fails to find Granger-causality of excess return on sentiment. This particular result is quite interesting given it is widely believed that stock market tends to have substantial influence on the public sentiment. Perhaps in Australia, other possible factors such as unemployment rate and other economic indicators carry more weight in changing sentiment.<sup>8</sup> Such finding may also reflect the fact that an average investor's portfolio in Australia is heavily tilted towards real estate rather than stocks as in the U.S. Overall, as indicated by the low Adjusted  $R^2$  of 0.01 and 0.02, we do not find much dynamic interaction between the two measures in the sense that their lagged terms have very little subsequent effects.

### Consumer Sentiment Components and Excess Returns

Since more detailed information is embedded in the composite CSI, a further investigation into the specific elements of the sentiment that might influence the behaviour of the stock prices is warranted. As discussed in Section 2, the composite index is made up of 5 survey questions on different aspects of family finance and general economic outlook. We therefore would expect that the relation between excess market returns and individual component to vary across.

The summary statistics of these 5 changes in sentiment components in Table 5 provide an interesting picture on the consumers' views about their current and future financial and economic conditions. On average, they tend to be more optimistic about the near term as indicated by the positive changes in attitude towards their financial situation ( $dCSI2 = 0.048$ ), economic conditions ( $dCSI3 = 0.212$ ), and buying major household items ( $dCSI5 = 0.100$ ) over the next year. In contrast, they are slightly less satisfied on average about their current financial situation ( $dCSI1 = -0.032$ ). For a longer economic outlook of 5 years, they seem to form somewhat neutral views perhaps due to the lack of immediate concern ( $dCSI4 = -0.024$ ).

The public also tends to endure a wider swing in confidence on general economic conditions than on family conditions and purchasing major household items. This is especially the case for

**Table 5**  
**Summary Statistics of Consumer Sentiment Index Component**

This table reports summary statistics of the 5 sentiment index components. The variables  $dCSI1_t$ ,  $dCSI2_t$ ,  $dCSI3_t$ ,  $dCSI4_t$ , and  $dCSI5_t$  denote changes in each index component. PP is the Phillip Perron unit root test that includes an intercept term.

<i>Variables</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Skewness</i>	<i>Minimum</i>	<i>Maximum</i>	<i>N</i>	<i>PP</i>
$dCSI1_t$	-0.03	5.67	-0.28	-22.37	14.48	347	0.00
$dCSI2_t$	0.05	4.56	-0.03	-14.75	13.39	347	0.00
$dCSI3_t$	0.21	11.57	-0.27	-49.92	44.25	347	0.00
$dCSI4_t$	-0.02	7.38	-0.30	-25.93	19.77	347	0.00
$dCSI5_t$	0.10	4.82	-0.43	-18.09	16.86	347	0.00

the 1-year economic expectation where the standard deviation of 11.57 is 55% more volatile than the 5-year economic expectation and more than twice of the others. It suggests that family finance and real consumption on goods and services tend to smooth out over time despite more drastic economic perception. Furthermore, the larger changes in the shorter-term economic outlook may indicate that the public has clearer and more accurate views about the economic activities over the next 12 months. In column 4 and 8 of Table 5, we also find that consistent with the characteristics of the composite index, the changes in sentiment components are negatively skewed and are stationary at the 1 per cent level.

Table 6 reports the correlation coefficients between the sentiment components and the control risk variables. The correlations appear to be surprisingly low, ranging only from  $-0.099$  to  $0.118$ . It suggests that sentiment components, if important, capture variations in average excess market returns that are different from those by the well-known control variables. Both sentiments and risk based factors may therefore be both important in explaining average stock returns.

The univariate OLS results in Table 7 document that excess aggregate return is significantly related to the 1-year and 5-year economic outlook ( $dCSI3$  and  $dCSI4$ ) at the 1 per cent level. These findings are consistent with the intuition that expectations on economic environments are important for stock market. These expectations could in turn be derived from fundamental variables such as the level and changes in interest rate as well as the unemployment rate.

Another look at  $dCSI4$  reveals that although statistically significant, it captures only 1.7% of variation in excess returns compared to the 8.2% return variation by  $dCSI3$  (see Table 7). The economic significance of  $dCSI4$  can also be demonstrated to be far less than that of  $dCSI3$ . For example, a one standard deviation rise in the 1-year and 5-year economic outlook corresponds to an increase of 1.65% and 0.78% in the excess returns respectively. The outcome of the comparison highlights that confidence in near term economic condition is the most important determinant of the excess stock returns. This comes as no surprise since the economic expectation over the shorter horizon tends to have the most immediate impact on the stock market.

In Table 7, we do not find significant relation of other index components with excess returns. The expected personal financial condition into the next year ( $dCSI2$ ) can be viewed to be endogenous that is subject to expected macroeconomic conditions and hence have little

**Table 6**  
**Correlations of Sentiment Components with Control Variables**

This table presents the contemporaneous correlations between sentiment components and the explanatory variables. p-values are reported in parentheses below coefficient estimates.

	$DEF_t$	$DY_t$	$TERM_t$	$YIELD_t$
dCSI1 <sub>t</sub>	0.025 (0.707)	-0.069 (0.201)	0.115 (0.037)	-0.032 (0.564)
dCSI2 <sub>t</sub>	0.030 (0.651)	-0.020 (0.707)	0.034 (0.540)	-0.052 (0.351)
dCSI3 <sub>t</sub>	-0.016 (0.812)	-0.040 (0.454)	0.061 (0.268)	-0.088 (0.111)
dCSI4 <sub>t</sub>	-0.015 (0.434)	-0.022 (0.682)	0.022 (0.686)	-0.074 (0.177)
dCSI5 <sub>t</sub>	-0.023 (0.720)	-0.007 (0.899)	0.118 (0.031)	-0.099 (0.073)

**Table 7**  
**The Effect of Sentiment Components on Excess Market Returns: Univariate Analysis**

This table reports estimates of univariate regressions relating excess market returns on changes in consumer sentiment. dCSI1 to dCSI5 are sentiment component variables. t-statistics are reported in the parentheses below the coefficient estimates.

<i>Independent Variable</i>					
Intercept	0.337 (1.08)	0.335 (1.07)	0.335 (1.12)	0.343 (1.11)	0.331 (1.06)
dCSI1 <sub>t</sub>	0.025 (0.47)				
dCSI2 <sub>t</sub>		0.077 (1.14)			
dCSI3 <sub>t</sub>			0.143 (5.51)		
dCSI4 <sub>t</sub>				0.106 (2.58)	
dCSI5 <sub>t</sub>					0.108 (1.67)
Adjusted R <sup>2</sup>	-0.002	0.000	0.082	0.017	0.008
N	331	331	331	331	331

explanatory power. The financial condition over the past year (dCSI1) also makes little impact on stock prices. The result is consistent with our earlier analysis that lagged sentiment carries little predictive power on excess returns. Our evidence also does not support positive feedback trading hypothesis, which argues that investors form expectations about future prices by extrapolating trends.

Contrary to the conventional wisdom, expected consumption on major household items (dCSI5) is weakly related to excess returns. Column 6 of Table 7 shows that dCSI5 is marginally significant at the 10 percent level. With an adjusted of 0.8%, it captures very little variation in excess returns. The finding suggests that the change in expected real consumption may not reflect the change in the overall expected cash flow or that such change reflects in both expected cash flow and expected return with the opposing effect.

Our final analysis looks at the robustness on the changes in economic outlook components (dCSI3 and dCSI4) that are found to be the only significant index components. Based on equation 1, we regress excess return on each and both of the sentiment components with various combinations of the control variables. Table 8 confirms that dCSI3 continues to be significant both economically and statistically, and is almost unaffected by other factors. It remains to be the most important source of sentiments for excess stock returns.<sup>9</sup>

**Table 8**  
**The Effect of Consumer Sentiment components on Excess Market Return: Regression Analysis**

This table reports estimates of regressions relating excess market returns on changes in consumer sentiment components and other control variables. dCSI3<sub>*t*</sub> and dCSI4<sub>*t*</sub> are the changes in sentiment index variables. DEF<sub>*t*</sub> is the 10-year corporate bond rate minus the 10-year Treasury bill rate. DY<sub>*t*</sub> is the dividend payment of the index over the index level at the year-end. TERM<sub>*t*</sub> is the 10-year Treasury bill rate minus the 3-month dealer bill rate. YIELD<sub>*t*</sub> is the change in the dealer bill rate. dCSI3 and dCSI4 are obtained from Westpac and the Melbourne Institute while the others are from Datastream. t-statistics are reported in the parentheses below the coefficient estimates.

<i>Independent Variable</i>								
Intercept	0.337 (1.12)	4.739 (3.28)	0.260 (0.39)	5.958 (3.89)	0.339 (1.09)	5.281 (3.57)	0.235 (0.338)	5.915 (3.86)
dCSI3 <sub><i>t</i></sub>	0.143 (5.50)	0.127 (5.02)	0.136 (5.30)	0.128 (5.07)				0.155 (4.70)
dCSI4 <sub><i>t</i></sub>					0.106 (2.57)	0.089 (2.24)	0.070 (1.65)	-0.064 (-1.27)
DEF <sub><i>t</i></sub>			-0.006 (-0.01)				0.010 (0.01)	
DY <sub><i>t</i></sub>		-1.119 (-3.13)		-1.414 (-3.73)		-1.255 (-3.41)		-1.404 (-3.70)
TERM <sub><i>t</i></sub>	-0.013 (-0.09)			-0.369 (-2.24)	0.030 (0.19)			-0.373 (-2.27)
YIELD <sub><i>t</i></sub>		-1.339 (-4.06)	-1.739 (-3.20)	-1.521 (-4.50)		-1.430 (-4.21)	-1.996 (-3.50)	-1.532 (-4.54)
Adjusted R <sup>2</sup>	0.08	0.15	0.14	0.15	0.02	0.09	0.05	0.17
N	331	330	236	330	331	330	236	330

## CONCLUSIONS

Sentiment, a behavioural factor that has often been argued to influence stock prices is examined in this study. We use Australian Consumer Sentiment Index (CSI) as the proxy for the sentiment. CSI has advantages over other measures of sentiment in that it is a monthly survey of public sentiment about the current and future economic conditions. The survey reflects economic perception from uniformed investors and therefore should capture the irrational expectations that are often viewed as the source of systematic price deviation from an asset's intrinsic value.

Our empirical analysis shows that changes in consumer sentiment are positively related to excess market returns. The relationship remains robust in the presence of well known risk-based factors. In particular, when we account for default risk, term risk, changes in inflation, and dividend yields in explaining average excess market returns, the importance of sentiment is largely unchanged. It therefore suggests that sentiment captures part of stock return variations that is unexplained by the traditionally risk-based factors. Our results support Hirshleifer (2001) who argues that expected returns are related both to risk and to investor misvaluation.

We further examine the source of the sentiment which might partially be driven by previous stock market performance. However, we find that past market performance carries little impact on the current sentiment. It appears that sentiment and excess market returns are only contemporaneous correlated and that the lagged sentiment and lagged excess market returns are not influential on the subsequent excess market returns and sentiment. It suggests that any trading strategy to exploit public sentiment may not be successful.

Since the Australian CSI is made up of 5 different survey questions, each measures a different aspect of economic outlook, we investigate which particular economic perceptions are especially important for the stock market. We find that the average perception of economic condition over the next 12 months is the most important factor. The effect of the aggregate CSI on excess market returns appears to be largely related to the sentiment over this short-term economic outlook.

In sum, our findings suggest that sentiment affects stock price behaviour. The presence of sentiment however does not diminish the importance of the neoclassical risk-based factors in pricing assets. Our empirical evidence therefore has implication for next generation of asset pricing models in which psychological-based and risk-based systematic factors should both be incorporated.

### *Notes*

1. The Australian Consumer Sentiment Index (CSI) is similar to the CSI in the U.S. conducted by the Survey Research Centre of the University of Michigan. A more detailed description of the index appears in section 2.
2. Since the main focus of the paper is on the role of consumer sentiment, we did not pursue this line of research further in this paper.
3. Quite interestingly, the annual equity premium over this long sampling period is a little over 4%, rather than the larger premiums that have been reported recently in the asset pricing literature.
4. We conduct both Phillip-Perron and Augmented Dicky-Fuller (not tabulated here) tests with different lagged terms and obtain similar results.
5. We also run White's heteroscedasticity consistent tests and Newey-West tests to correct heteroscedasticity and autocorrelation in the estimation, and the results are similar to those of OLS regressions reported here.
6. We also run VAR with different lag orders and the results are similar to those reported here.
7. We also conduct VAR tests with all the variables including the control variables. The results are consistent with those shown in the table and therefore they are not tabulated here.
8. Wan (2001) finds that changes in unemployment rate is the most important determinant of consumer expectation. Personal outlook on the labour market may be important on the overall outlook of the economy.

9. We probably have exaggerated the multicollinearity problems among the control variables. The highest correlation among them is -0.332 between dividend yield (DY) and Term (term spread). Therefore, other correlations between the control variables are even lower. In our multiple regression tests, we vary the inclusions of the control variables widely to ensure our results are robust. For example, when we regress excess returns on consumer sentiment reported in Table 3, we also include only DEF in column 3, TERM in column 4, DEF and YIELD in column 5, DY and YIELD in column 6, and DEF, DY, and YIELD in column 7. We have regressed other combinations of the control variables not reported in the Table but the significance of consumer sentiment remains robust.

To establish the importance of sentiment components in explaining excess market returns, we first run the regressions of excess market returns on sentiment components alone. Once the significance of the sentiment component is established, we then add the control variables in the multiple linear regressions shown in Table 8 to test for the robustness of the sentiment component.

We did not run regressions on all of the sentiment components together since they are highly correlated and may cause the results to be highly sample specific. We therefore identify the significant sentiment components first (in Table 7) before adding the control variables for the multiple regression tests in Table 8.

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