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Abstract

This paper investigates whether there are gender differences in the effects of unemployment and sentiment on suicide rates. We apply linear and nonlinear auto-regressive distributed lag (ARDL) models to monthly Australian data from February 1990 to September 2018. As expected, we find a positive relationship between the unemployment rate and suicide rate, and a negative relationship between consumer sentiment and the suicide rate. However, there is strong evidence of nonlinearity in the effects of both unemployment and sentiment on suicide rates, with substantial gender differences. For men, an increase in the unemployment rate significantly increases the suicide rate, but an unemployment decrease has no effect; we find the opposite for women. For men, an increase in sentiment tends to have stronger effects on the suicide rate than a decrease in sentiment. Again, we observe the opposite effect for women. Among components of sentiment, forward-looking expectations are stronger predictors of suicide rates than components relating to present conditions. We also find that sentiment has a much stronger effect on male suicide rates than on female suicide rates.

JEL classification: C22, E24, E70, I10

Keywords: Suicide rate, unemployment rate, consumer sentiment, Australia, asymmetry

1. Introduction

Globally, suicide is one of the leading causes of non-natural death, with the World Health Organization (WHO) reporting roughly 703,000 suicide deaths each year (WHO, 2021). In Australia, suicide rates are consistently high and pose a significant public health concern. Australian suicide rates are above the OECD average, just slightly lower than the United States (OECD, 2019). Since the mid-1980s, over 2,000 suicides were reported annually in Australia, and from 2017 to 2019 there were between 3,100 and 3,300 suicides each year. Importantly, there is a substantial gender difference with males accounting for just more than three quarters of reported suicides (AIHW, 2019; ABS, 2020a; WHO, 2021). Research into factors that influence suicide rates and into mechanisms through which such factors influence suicide rates can provide valuable information for well-targeted policy initiatives and interventions.

In this paper, we investigate the roles of objective and subjective economic factors in explaining suicide rates. We use unemployment rate as a proxy for objective economic factors and consumer sentiment index (CSI) and its components, as proxies for subjective economic factors. We estimate linear and nonlinear auto-regressive distributed lag (ARDL) models to allow for both symmetric and asymmetric effects of factors on suicide rates, on monthly Australian data from February 1990 to September 2018. Together with the analysis in the aggregate (all respondents), we also split the sample by gender to study possible different mechanisms through which economic factors influence male and female suicide rates. Our choice to work with Australian data is due to advantages of the Westpac-Melbourne Institute Consumer Attitudes, Sentiments, and Expectations (CASiE) survey which is used to construct sentiment measures. CASiE is modelled on the University of Michigan Survey of Consumers (MSC), but it consists of 1,200 consumers per month as compared to around 500 consumers in the MSC. Importantly, CASiE is stratified by gender, age and location so it is representative of the Australian population.

Existing studies on determinants of suicide rates mostly focus on the effects of objective economic factors. The unemployment rate is most frequently used as a proxy for objective economic factors and generally has a significant effect on suicide rates across a range of countries. Specifically, an increase in unemployment rates leads to an increase in suicide rates, and vice versa (Gerdtham and Johannesson, 2003; Barstad, 2008; Altinanahtar and Halicioglu, 2009; Andrés and Halicioglu, 2010, 2011; Andrés et al., 2011; Ceccherini-Nelli and Priebe, 2011; Antonakakis and Collins, 2014; Ruhm, 2015; Aggrawal et al., 2017; Mattei and Pistorei, 2019; Abdou et al., 2020; Atalay et al., 2020, Meda et al., 2021). Real economic growth is the other popular proxy for objective economic factors in the literature though its effect on suicide rates is less pronounced than that of the unemployment rate (Ceccherini-Nelli and Priebe, 2011; Okada and Samreth, 2013; dos Santos et al., 2016).

The limited focus on subjective factors in explaining suicide is surprising. Suicide is ultimately an individual outcome and might therefore also be dependent on personal circumstances or perceptions as opposed to objective economic factors. Moreover, there is growing evidence that negative future economic expectations and uncertainty can adversely impact reported stress levels and individual mental health (Rhode et al., 2016; van Giesen and Pieters, 2019; Avdic et al., 2020; Johnston et al., 2020), and suicide (Korhonen et al., 2016; Christian et al., 2019; Vandoros et al., 2019; de Bruin et al., 2020). The studies of Berk et al. (2006) and Collins et al. (2021) begin to shed some light on the influence of subjective economic factors on suicide rates with CSI being the chosen proxy for subjective factors (Nowzohour and Stracca, 2020). As a subjective measure, CSI can reflect the emotional responses of individuals to their own current or expected economic circumstances and "capture the underlying feeling of economic pressures on an individual that are unlikely to be reflected in measures of unemployment" (Collins et al., 2021:6).

Berk et al. (2006) investigate the effects of a range of objective economic factors as well as CSI on suicide rates using Australian data from January 1968 to August 2002. Estimating a linear regression of suicide rate on a single factor at a time, they find a positive relationship between the unemployment rate and the suicide rate for men, but a negative relationship for women. They also find a negative association between the CSI and the male suicide rate, but no association with the female suicide rate, though the effects of the CSI and its components are generally very small. Also investigating the effects of objective and subjective factors on suicide rates, Collins et al. (2021) estimate several dynamic panel models using US state-level data and find that an increase in the CSI reduces state suicide rates, and that this effect is larger for females than for males. The authors also find that unemployment rate is mostly insignificant in explaining suicide rates. Neither Berk et al. (2006) nor Collins et al. (2021) investigates the possibility of nonlinearity in the effects of objective and subjective factors on suicide rates.

With growing evidence that consumers respond asymmetrically to economic information (Soroka, 2006; Nguyen and Claus, 2013), and that economic stressors play more important roles in suicide among men than among women (Qin et al., 2000; Wunderlich et al., 2001), recent studies also investigate the possible asymmetry in the relationship between suicide rates and objective economic factors. Wu and Cheng (2010) find that economic expansion in the US, measured by positive deviations of the unemployment rate from its trend, significantly reduces fatalities from suicide while recession has no significant effect. This asymmetry only holds for men and working-age groups. Chang and Chen (2017) estimate ARDL and NARDL models to examine the responses of suicide rates to unemployment rates across age groups in the US using annual data between 1928-2013. The authors find evidence that economic expansion (a decrease in the unemployment rate) has a greater effect on the suicide rate of those aged over 45 than economic recession does. Applying asymmetric causality tests and asymmetric generalized impulse response functions on the same dataset, Lin and Chen (2018) also find evidence of asymmetry in the effects of economic cycles on the suicide rates of different age groups. None of these studies, however, considers possible asymmetries in the effects of subjective economic factors on suicide rates.

To our best knowledge, our paper is the first to study the asymmetric effects of both objective subjective economic indicators on suicide rates in a unified framework. Several studies also use other social and economic factors such as the divorce rate, fertility rate, migration, population density, alcohol and cigarette consumption, income, expenditures on mental health, public health and public welfare as controls in their analyses (Wu and Chen, 2010; Chang and Chen, 2017; Collins et al., 2021). However, most of these factors are often insignificant in explaining changes in suicide rates. Therefore, in this paper we choose to focus only on two of the most important factors in the literature, namely the unemployment rate and CSI, in favor of more parsimonious models. Chang and Chen (2017) and Collins et al. (2021) are the two studies closest to our analysis. However, in explaining the suicide rates of different demographic groups, such as males and females, both Chang and Chen (2017) and Collins et al. (2021) use aggregate measures of the economic indicators rather than demographic-specific measures. Although aggregate measures, such as economy-wide unemployment rate and CSI, do influence, say, the male suicide rate, using the male-specific unemployment rate and CSI is likely to be more relevant in explaining male suicide rates.

Our empirical analyses at aggregate level and by gender reveal four key findings. First, the results from both ARDL and NARDL models confirm a long-run level relationship between suicide rates and the unemployment rate and the CSI. As expected, the suicide rate is positively associated with the unemployment rate and negatively associated with the CSI. Second, among the CSI components, expectations of family finances in the next 12 months, and expectations of economic conditions in the next 12 months and in the next 5 years significantly influence suicide rates, but components relating to present conditions are less important. This indicates that influencing forward-looking sentimental factors could be a key channel for policy interventions.

Third, we find that objective and subjective economic factors have very different asymmetric effects on male and female suicide rates. An increase in the unemployment rate significantly increases the suicide rate for men, but a decrease has no effect on male suicide rates. The opposite is true for women. An increase in sentiment tends to have stronger effect on the suicide rate in men than a decrease. Again, the opposite is true for women. This suggests that a policy intervention targeting both men and women, through influencing the unemployment rate and/or sentiment, may not work as well as policy interventions tailored specifically at men and at women.

Finally, we find that sentiment has a much stronger effect on the suicide rate among men than among women. This contrasts with Collins et al.'s (2021) finding, for which there are two possible explanations: (i) Collins et al. (2021) do not consider the possibility of asymmetric effects of sentiment on suicide rates. If the association between sentiment and suicide rates is indeed nonlinear, then a linear analysis could obscure the true relationship and the true magnitude of their association; (ii) In explaining male and female suicide rates, Collins et al. (2021) use aggregate factors, including an aggregate CSI, rather than gender-specific measures. As mentioned above, gender-specific factors are likely to be more relevant in explaining gender-specific suicide rates. Our findings suggest that policy intervention targeting sentiment will likely have a stronger impact on male suicide rates than on female suicide rates.

The remainder of the paper is organized as follows. Section 2 describes the data and Section 3 provides details of our empirical models and testing procedures. Section 4 discusses the results, with the ARDL results in Section 4.1 and NARDL results in Section 4.2. Section 5 concludes.

2. Data

We use monthly data on suicide rates, unemployment rates, and the CSI and its components for the period February 1990 to September 2018. The choice of our sample period is due to two factors. First, unit records for CASiE are only available from February 1990. These are required to construct gender-specific consumer sentiment indices and their components.

Second, detailed suicide rates up to September 2018 were provided in a customised report (see Section 2.2). Figure 1 plots the time series of all variables and Table 1 reports their summary statistics.

---- Insert Figure 1 and Table 1 about here ----

2.1 Suicide Rate

Age-standardised suicide rates, per 100,000 persons, were provided by the Australian Bureau of Statistics (ABS, 2019). These include aggregate suicide rates as well as the male and female suicide rates. The mean aggregate suicide rate over the sample period was 1.01 deaths per 100,000. The mean male suicide rate is about 3.5 times larger than the female suicide rate, at 1.59 deaths per 100,000 among men and 0.45 deaths per 100,000 among women.

2.2 Unemployment Rate

Monthly unemployment rates were obtained from the Australian Bureau of Statistics (ABS, 2020b). We use the aggregate unemployment rate for all analyses of the overall sample, the female unemployment rate for all analyses involving the female sub-sample, and the male unemployment rate for all analyses involving the male sub-sample. The average aggregate unemployment rate is 6.65% and the male unemployment rate (6.73%) is slightly higher than the female unemployment rate (6.54%).

2.3 Consumer Sentiment Survey Data

In our empirical analysis, we use consumer sentiment data from the Westpac-Melbourne Institute Consumer Attitudes, Sentiments, and Expectations (CASiE) survey to approximate Australian households' economic sentiment. CASiE is the longest continuing consumer survey in Australia, starting on a quarterly basis from March 1973 and since February 1990 has been conducted monthly. Prior to March 1993 the sample size varied between 1,000 to 2,500 consumers per month, but it has been fixed at 1,200 respondents since. Before August 2016, data collection was conducted only by telephone but has since changed into a combination of telephone and online survey. The sample is stratified by age, gender and state so that it is representative of the Australian population. Unlike the University of Michigan Survey of Consumers (MSC), no households are re-interviewed. The survey is thus a pure repeated cross-section.

The CSI derived from the CASiE survey is widely accepted and has been applied in many different contexts, such as studying the forecasting of economic output and consumption (Chua and Tsiaplias, 2009), the effect of consumer sentiment on equity markets (Akhtar et al., 2011), the formation of consumer expectations (Claus and Nguyen, 2018), and the response of consumer sentiment to good and bad news (Nguyen and Claus, 2013) and monetary policy analysis (Claus and Nguyen, 2020; Kirchner, 2020).

CASiE is modelled on the MSC and the CSI is constructed based on consumers' responses to the following five core questions:

C1. [CURRENT FINANCIAL SITUATION] "About how people are getting along financially these days. Would you say YOU AND YOUR FAMILY are better-off financially or worse-off than you were AT THIS TIME LAST YEAR?"

1. *Better-off*
2. *Same*
3. *Worse-off*
4. *Uncertain/Don't Know/It depends*

C2. [FUTURE FINANCIAL SITUATION] "Looking ahead to this time NEXT YEAR. Do you expect YOU & YOUR FAMILY to be better-off financially or worse-off or about the same as now?"

1. *Better-off*
2. *Same*
3. *Worse-off*
4. *Uncertain/Don't Know/It depends*

C3. [FUTURE ECONOMIC CONDITIONS] "Thinking of economic conditions in AUSTRALIA AS A WHOLE. During the NEXT 12 months, do you EXPECT WE'LL have good times financially, or bad times, or what?"

1. *Good times*
2. *Good with qualifications*
3. *Some good, some bad*
4. *Bad with qualifications*
5. *Bad times*
6. *Uncertain/Don't Know/It depends*

C4. [5-YEAR ECONOMIC FORECAST] "Looking ahead, what would you say is more likely? That in AUSTRALIA AS A WHOLE, WE'LL have CONTINUOUS good times during the NEXT 5 years or so, or WE'LL have some bad times - or what?"

1. *Continuous good times*
2. *Good with qualifications*
3. *Some good, some bad*
4. *Some bad with qualifications*
5. *Some bad times*
6. *Uncertain/Don't Know/It depends*

C5. [CONSUMER BUYING INTENTIONS] "Next, about the MAJOR THINGS PEOPLE BUY for their homes. SPEAKING GENERALLY, do you think now is a good time or a bad time, FOR PEOPLE to buy major household items?"

1. *Good*
2. *Some good, some bad*
3. *Bad*
4. *Don't know/Uncertain*

The responses to each of the five questions are then used to construct a component index as the weighted proportion of optimists (whose answers are 'better-off'/'good') less the weighted proportion of pessimists (whose answers are 'worse-off'/'bad') plus 100. Weights are based on stratification factors from census surveys of the Australian Bureau of Statistics

(ABS) and are normalized to sum to 100 percent. By construction, the index is bounded between 0 and 200 with 100 being the neutral point where the proportion of optimists equals the proportion of pessimists. At 0 everybody is pessimistic and at 200 everybody is optimistic.

The first component index, *C1*, captures consumers' reported current family financial conditions while the second, *C2*, captures consumers' expected family financial conditions in the next 12 months. The third and fourth component indexes, *C3* and *C4*, reflect information on consumers' expectations of economic conditions in the next 12 months and next 5 years, respectively. The final component, *C5*, reflects consumers' current buying intentions of major household items. The CSI is constructed as a simple average of the five component indexes. An index value greater (smaller) than 100 indicates that the proportion of optimists (pessimists) outweighs the proportion of pessimists (optimists).

On average, a slightly greater proportion of Australians tend to be optimistic than pessimistic (see Table 1 and Figure 1). Highest levels of optimism relate to family finances in the next 12 months and in terms of the times to buy major household items, whereas greatest pessimism relates to family finances in the last 12 months. Men are on average more optimistic than women on the overall CSI as well as in each of its components.

2.4 Unit Root Tests

Before commencing with empirical analysis, we conducted unit root tests on all variables using the Kwiatkowski, Phillips, Schmidt, and Shin (1992) (KPSS) test for the null hypothesis of stationarity of the data series. Table 2 provides the results of the KPSS unit root tests for the levels and first differences of all variables. To allow for the possibility that the variables may display a linear trend over the sample period, we conduct two versions of the KPSS test on the levels of all the variables; without a linear trend (Panel A) and with a linear trend (Panel B). The KPSS test equation for the first differences of all the variables only includes a constant as the deterministic component (Panel C).

--- Insert Table 2 about here ----

Firstly, for the levels of the variables without a linear trend, Panel A indicates that most of the variables are non-stationary. The test results for the levels of the variables with a linear trend in Panel B indicate that all the variables are non-stationary.[1] Secondly, the results for the first differences in Panel C suggest that almost all the first differences are stationary with the only exception being *C5* among females, in which the null of stationarity is rejected at the 5% significance level. However, other unit root tests, including the Augmented Dickey-Fuller (Said and Dickey, 1984) and the Phillips-Perron (Phillips and Perrons, 1988) tests, on the first difference of *C5* in the female sample confirm that it is a non-stationary I(1) series.[2] Overall,

[1] Given the unit root test results for the levels of variables with a linear trend, we also experiment with adding a linear trend to our estimated models in equations (4) and (7) described in the following section, to allow for the possibility that the level relationship between the variables, as specified in equation (2), may include a linear trend. However, the estimated coefficients on the linear trend are highly insignificant in all the estimated models. Therefore, we proceed with our specified models in (4) and (7) without a linear trend.

[2] Regarding other unit root tests on the first difference of *C5* in the female sample (the test equation includes a constant but not a linear trend), the Phillips-Perron test statistic is -38.339 and the Augmented Dickey-Fuller test

our unit root test results show that most of the variables are nonstationary I(1), and importantly none of them are I(2) as required for the ARDL and NARDL modelling approaches (Pesaran, Shin and Smith, 2001).

3. Econometric Methods

The suicide rate, s_t, is assumed to be determined by both objective economic factors and subjective sentiment factors, denoted O_t and S_t, respectively.[3] This is written as:

$$s_t = f(O_t, S_t) \tag{1}$$

To proxy for objective economic factors, we use the unemployment rate, u_t, and to proxy for subjective sentiment factors, we use the CSI, csi_t. Assuming $f(.)$ is linear, the level relationship between the suicide rate and objective and subjective factors is expressed as:

$$s_t = c + \beta u_t + \lambda csi_t + e_t \tag{2}$$

where c is an intercept, $e_t \sim iid(0, \sigma_e)$ is the error term, and β and λ respectively capture the impact of the unemployment rate and consumer sentiment on the suicide rate. We expect that $\beta > 0$ and $\lambda < 0$.

3.1 ARDL Modelling

To investigate the relationship between the suicide rate, the unemployment rate and consumer sentiment in a more general empirical framework, we embed the above level relationship (2) in the following autoregressive distributed lag (ARDL) model:

$$s_t = a + \sum_{i=1}^{p} \pi_i \, s_{t-i} + \sum_{i=0}^{q} \varphi_i \, u_{t-i} + \sum_{i=0}^{q} \theta_i \, csi_{t-i} + \epsilon_t, \; \epsilon_t \sim iid(0, \sigma_\epsilon) \tag{3}$$

The ARDL(*p,q,q*) model in (3) can be rewritten into the following error-correction form:

$$\Delta s_t = a + \alpha s_{t-1} + \mu u_{t-1} + \rho csi_{t-1} + \sum_{i=1}^{p-1} A_i \, \Delta s_{t-i} + \sum_{i=0}^{q-1} B_i \, \Delta u_{t-i} + \sum_{i=0}^{q-1} C_i \, \Delta csi_{t-i} + \epsilon_t \tag{4}$$

where $\alpha = \sum_{i=1}^{p} (\pi_i - 1)$, $\mu = \sum_{i=0}^{q} \varphi_i$, $\rho = \sum_{i=0}^{q} \theta_i$, $A_i = -\sum_{j=i+1}^{p} \pi_i$ for $i = 1, \dots, p-1$, $B_0 = \varphi_0$, $B_i = -\sum_{j=i+1}^{q} \varphi_i$ for $i = 1, \dots, q-1$, $C_0 = \theta_0$, $C_i = -\sum_{j=i+1}^{q} \theta_i$ for $i = 1, \dots, q-1$. Equation (4) can be further written as:

$$\Delta s_t = \alpha e_{t-1} + \sum_{i=1}^{p-1} A_i \, \Delta s_{t-i} + \sum_{i=0}^{q-1} B_i \, \Delta u_{t-i} + \sum_{i=0}^{q-1} C_i \, \Delta csi_{t-i} + \epsilon_t \tag{5}$$

in which α is the adjustment coefficient and e_{t-1} is the error-correction term expressed as:

$$e_{t-1} = s_{t-1} - c - \beta u_{t-1} - \lambda csi_{t-1} \tag{6}$$

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statistic is -18.266. The associated critical values for both test statistics at 1%, 5% and 10% are -3.449, -2.869, and -2.571, respectively. These indicate that the first difference of *C5* for females is a stationary series.

[3] We also explored controlling for the monetary policy environment via the central bank policy rate and also used the ASX200 index to control for the Australian share market. However, these variables were never significant and made no meaningful contribution to explaining suicide rates. These variables were therefore not included in the final estimations, but the results from these exercises are available upon request.

where $c = -a/\alpha$ is the restricted intercept, $L_u = -\mu/\alpha$ and $L_{csi} = -\rho/\alpha$ are the long-run coefficients capturing the level impacts of the unemployment rate and consumer sentiment on the suicide rate. Note that (6) captures the exact level relationship postulated in (2). All ARDL models are estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance. To test if there exists a level relationship between the three key variables, we use the Bounds-testing approach by Pesaran, Shin and Smith (2001). The null hypothesis is:

$$H_{0,ARDL}: a = \alpha = \mu = \rho = 0$$

If the null hypothesis is rejected, there exists a level relationship between the suicide rate, the unemployment rate and consumer sentiment.

Our estimation procedure follows the general-to-specific approach proposed by Pesaran, Shin and Smith (2001). Initially, we estimate a general ARDL model with the lag length guided by the Akaike Information Criterion. We then keep all the lagged level (long-run) regressors, which capture the level relationship among variables, while sequentially removing insignificant first-differenced (short-run) regressors. After arriving at the final model, we apply the Bounds-testing approach to investigate the level relationship among the variables. All ARDL models are estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

3.2 NARDL Modelling

To further investigate whether objective and subjective factors may have nonlinear impacts on the suicide rate, we employ the nonlinear autoregressive distributed lag (NARDL) model proposed by Shin, Yu and Greenwood-Nimmo (2014). Specifically, we decompose changes in the unemployment rate, Δu_t, and consumer sentiment, Δcsi_t, into positive and negative quantities as follows:

$$\Delta u_t^+ = \max(\Delta u_t, 0), \Delta u_t^- = \min(\Delta u_t, 0),$$

$$\Delta csi_t^+ = \max(\Delta csi_t, 0), \Delta csi_t^- = \min(\Delta csi_t, 0),$$

and

$$u_t^+ = \sum_{i=1}^{t} \Delta u_i^+, u_t^- = \sum_{i=1}^{t} \Delta u_i^-,$$

$$csi_t^+ = \sum_{i=1}^{t} \Delta csi_i^+, csi_t^- = \sum_{i=1}^{t} \Delta csi_i^-$$

are partial sum processes of positive and negative changes in the unemployment rate and consumer sentiment. By construction,

$$u_t = u_0 + u_t^+ + u_t^-$$

and

$$csi_t = csi_0 + csi_t^+ + csi_t^-$$

With the above quantities, we estimated the following NARDL version of the error-correction model in (4):

$$\Delta s_t = a + \alpha s_{t-1} + \mu^+ u_{t-1}^+ + \mu^- u_{t-1}^- + \rho^+ csi_{t-1}^+ + \rho^- csi_{t-1}^- + \sum_{i=1}^{p-1} A_i \Delta s_{t-i} + \sum_{i=0}^{q-1} B_i^+ \Delta u_{t-i}^+ + \sum_{i=0}^{q-1} B_i^- \Delta u_{t-i}^- + \sum_{i=0}^{q-1} C_i^+ \Delta csi_{t-i}^+ + \sum_{i=0}^{q-1} C_i^- \Delta csi_{t-i}^- + \epsilon_t \quad (7)$$

in which the error-correction term is now defined as:

$$e_{t-1} = s_{t-1} - c - \beta^+ u_{t-1}^+ - \beta^- u_{t-1}^- - \lambda^+ csi_{t-1}^+ - \lambda^- csi_{t-1}^- \quad (8)$$

where ${L_u}^+ = -\mu^+/\alpha$, ${L_u}^- = -\mu^-/\alpha$, ${L_{csi}}^+ = -\rho^+/\alpha$, and ${L_{csi}}^- = -\rho^-/\alpha$ are the long-run coefficients capturing the possible nonlinear level impacts of the unemployment rate and consumer sentiment on the suicide rate. Note that (8) captures the nonlinear level relationship among variables. For all NARDL models, we follow the same general-to-specific approach (Pesaran, Shin and Smith, 2001). All NARDL models are also estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

To test if there exists a nonlinear level relationship between the three key variables, we also use Pesaran, Shin and Smith's (2001) Bounds-testing approach with the null hypothesis:

$$H_{0,NARDL}: a = \alpha = \mu^+ = \mu^- = \rho^+ = \rho^- = 0$$

If the null hypothesis is rejected, there exists a nonlinear level relationship between the suicide rate, the unemployment rate and consumer sentiment. To test if the level impacts of the unemployment rate and consumer sentiment on the suicide rate are indeed nonlinear, we further test the following hypotheses:

$$H_{0,UNEMPLOYMENT}: \mu^+ = \mu^-; H_{0,SENTIMENT}: \rho^+ = \rho^-$$

$$H_{1,UNEMPLOYMENT}: \mu^+ \neq \mu^-; H_{1,SENTIMENT}: \rho^+ \neq \rho^-$$

Rejecting the null hypothesis suggests nonlinear impacts of the indicator on the suicide rate.

Finally, given that the CSI is a composite measure, we also investigate the possible heterogeneous impacts of the CSI's components on the suicide rate. To do so, we subsequently replace csi_t with c_{it} for $i = 1, \ldots, 5$ (the five components of the CSI) in our ARDL and NARDL models in (4) and (7), respectively.

4. Results

In this section, we report and discuss the estimation results. Specifically, we estimate equation (4) (ARDL) to investigate the impacts of subjective and objective factors on the suicide rate in a linear framework and estimate equation (7) (NARDL) to investigate if these factors have asymmetric impacts on the suicide rate. For each equation, we estimate three sets of results: one for all respondents (aggregate), one for male respondents (males) and one for female respondents (females). The estimated coefficients on the consumer sentiment components are multiplied by ten for ease of interpretation, i.e. the reported estimates are the impacts of an increase of ten index points in the CSI (roughly one standard deviation) on the suicide rate.

To translate the estimated effects of changes in the unemployment rate and CSI into the number of suicides in the actual population of interest (rather than only deaths per 100,000 individuals), we use the Australian Bureau of Statistics' demographic estimates as at June 2020. For those aged 18 and over, the estimates for the aggregate, male, and female populations are 21.03 million, 9.83 million, and 10.2 million, respectively (ABS, 2021). We specifically use the population estimates for the over-18 population because the CASiE survey is sampled based on this population.

4.1 ARDL Estimation Results

The results of the ARDL models for the aggregate sample are reported in Table 3, for males in Table 4 and for females in Table 5. Each table provides six sets of estimation results and test statistics for six models in which subjective factors are sequentially approximated by the CSI and its five component indexes, *C1* to *C5*.

The key parameter estimates are the coefficients on s_{t-1} (α, adjustment coefficient) and on u_{t-1} (μ) and csi_{t-1} (ρ), which capture the impacts of the objective indicators (approximated by the unemployment rate) and subjective indicators (approximated by the CSI and its components), respectively, on the suicide rate. The value of α is expected to be significant and negative (error-correcting adjustment) for the specified model to hold. Furthermore, we expect that $\mu > 0$ and $\rho < 0$. The estimates of L_u and L_{csi}, computed as $L_u = -\mu/\alpha$ and $L_{csi} = -\rho/\alpha$, are the main coefficients of interest. These capture the long-run level impacts of the objective and subjective indicators on the suicide rate, respectively. F_{PSS} is the *F*-statistic for the Bounds test of the null hypothesis of no level relationship between the suicide rate and the subjective and objective indicators ($H_{0,ARDL}$).

---- Insert Table 3 about here ----

The ARDL results for the aggregate sample in Table 3 show that the adjusted R^2 values in all six models are relatively large, indicating that the included objective and subjective factors explain around 32% of the variation in the suicide rate. This variation is similar in size to previous research (Andrés et al., 2011; Korhonen et al., 2016) explaining changes in suicide rates using an ARDL approach. The results of the specification tests show that all models are well-specified. The values of the F_{PSS} statistics in all six models are greater than the provided critical value at 1% significance level. This confirms the existence of a level relationship between the suicide rate and at least one of the included economic indicators (objective or subjective or both), depending on the significance of the parameter estimates for μ and ρ.

Turning to the key parameters, the α estimates are negative and significant in all six models and range from -0.373 to -0.397, indicating a relatively quick speed of adjustment towards the long-run equilibrium (also see Section 4.2.1), consistent with Andrés et al. (2011) and Okada and Samreth (2013). The estimates of L_u are positive and significant in all models and its values range from 0.025 to 0.040. This highlights the significance and importance of the unemployment rate in explaining the suicide rate. Based on these long-run estimates, an increase in the unemployment rate of one percentage point eventually raises the suicide rate by 0.025 to 0.040 persons per 100,000 population in the long run, or an additional 5.26 to 8.41 suicides per 21.03 million population (for example: [21,030,000/100,000] x 0.025 = 5.26). Our finding of a significant increase in suicide rates in response to higher unemployment rates contrasts with recent research by Atalay et al. (2020), who found no evidence of a relationship between unemployment rates and suicide in Australia. It should be noted, however, that Atalay et al. (2020) studied mortality and unemployment at the state level and their findings are thus not entirely comparable to those reported here.

The estimates of L_{csi} are negative and significant in four of the six models with its value ranging from -0.012 to -0.037. The component indexes capturing consumers' current family finances (*C1*) and buying intentions (*C5*) do not appear to matter in explaining movements in the aggregate suicide rate. The significance of the estimates of L_{csi} for the overall CSI and its other component indexes, *C2* to *C4*, suggests that subjective factors do matter for the movement of the suicide rate. The negative coefficients are as expected. Specifically, a 10-index point increase in the CSI lowers the suicide rate by between 0.012 and 0.042 per 100,000 persons, or 2.52 to 8.83 suicides in a population of 21.03 million.

The ARDL estimation results for males and females are provided in Tables 4 and 5, respectively. The specification test results show that all the estimated models for males and females are well-specified. The values of the adjusted R^2 in models for males, ranging from 0.361 to 0.375, are higher than those for the aggregate, but smaller than those for females, ranging from 0.411 to 0.432. All the α estimates are significant and negative in both the male and female samples. Similar to the ranking of adjusted R^2 values, the estimated values of α for males, ranging from -0.420 to -0.434, are higher in absolute terms than those in the aggregate, but smaller in absolute terms than those for females, ranging from -0.491 to -0.532. This suggests that the models for females have higher explanatory power for the female suicide rate and faster speed of adjustment to equilibrium. The values of the F_{PSS} statistics in all the models for males and females are higher than the provided critical value at the 1% level, confirming the existence of a level relationship between the suicide rate and at least one of the included explanatory variables.

---- Insert Tables 4 and 5 about here ----

Turning to the estimates of the parameter capturing the (long-run) level impact of the unemployment rate on the suicide rate, i.e. L_u, all the estimates for males are significant and positive, as expected, ranging from 0.056 to 0.071. Importantly, the magnitude of these estimates is around twice as large as that in the aggregate models (Table 3). In contrast, all the estimates of L_u are insignificant for females. One explanation for the latter finding could be due to an asymmetric relationship between the female unemployment rate and the female suicide rate, which is investigated in Section 4.2. Regarding the estimates of L_{csi}, for males four of the six coefficients are significant and negative with its values ranging from -0.023 to -0.053. This suggests that a 10-index point rise in the CSI or its significant components decreases the suicide rate in the long-run by between 0.023 to 0.053 people per 100,000. The subjective component indexes relating to current family finances (*C1*) and family finances next in the 12 months (*C2*) do not appear to matter in explaining the male suicide rate. For females, the estimates for four of the six subjective factors are significant and negative, ranging from -0.011 to -0.030. The component indexes relating to current family finances (*C1*) and buying intentions (*C5*) are not significant in explaining the female suicide rate.

Overall, our ARDL results for the aggregate sample as well as for males and females indicate that subjective economic indicators do play an important role in explaining the change in the suicide rate. The insignificant level impacts of the unemployment rate among females and some components of the CSI among both males and females could be due to the nonlinear association between the suicide rate and the objective and subjective indicators. We discuss this issue in the following section.

4.2 NARDL Estimation Results

The estimation results of the NARDL models are reported in Table 6 (aggregate), Table 7 (males) and Table 8 (females). The setup of these tables and their content are like those for the ARDL models, but with three important differences. First, there are two estimated coefficients capturing the long-run level impacts of the unemployment rate on the suicide rate, L_u^+ and L_u^-, and two estimated coefficients capturing the level impacts of the CSI (or its components), L_{csi}^+ and L_{csi}^-, on the suicide rate. L_u^+ and L_{csi}^+, respectively, capture the impacts of increases in the unemployment rate and the CSI whereas L_u^- and L_{csi}^- capture the impacts of decreases in the unemployment rate and CSI, respectively. Second, $W_{u^+=u^-}$ is the Wald statistic testing for symmetry between L_u^+ and L_u^-, and $W_{csi^+=csi^-}$ is the Wald statistic testing for symmetry between L_{csi}^+ and L_{csi}^-. Third, F_{PSS} is the *F*-statistic testing for the nonlinear asymmetric level relationship between the suicide rate and the objective and subjective indicators ($H_{0,NARDL}$).

---- Insert Table 6 about here ----

For the aggregate NARDL results provided in Table 6, the values of the adjusted R^2, ranging from 0.317 to 0.339, are similar in magnitude to those of the ARDL models. The estimates of the adjustment coefficient, α, are all significant and negative, ranging from -0.366 to -0.405, roughly on par in terms of magnitude with those in the ARDL models. The values of the F_{PSS} statistics are all greater than the provided critical value at 1% level, indicating a level relationship between the suicide rate and at least one of the included explanatory factors. The results of the Wald tests, $W_{u^+=u^-}$ and $W_{csi^+=csi^-}$, however, show that there is only very weak evidence of asymmetric impacts of the subjective and objective indicators on the aggregate suicide rate. Only in the NARDL model with the suicide rate, the unemployment rate and consumers' expectation of economic conditions in the next 5 years (*C4*), the null hypotheses of symmetry are rejected at the 10% significance level.

With regards to the key parameter estimates, there is at least one significant estimate of L_u^+ and L_u^- that captures the impact of the unemployment rate on the suicide rate in each model. Although there are differences in the magnitude of the estimates of L_u^+ and L_u^-, these differences are not statistically significant, consistent with the results of the Wald tests for asymmetry. For the subjective indicators, there is at least one significant estimate of L_{csi}^+ or L_{csi}^- in each model except for the model with buying intentions (*C5*). The differences between the estimates of L_{csi}^+ or L_{csi}^- are not statistically significant in most NARDL models, as suggested by the Wald tests. Overall, the NARDL results for the aggregate sample show that there is only very weak evidence of a nonlinear relationship between the suicide rate and the objective and subjective economic indicators.

Turning to the NARDL estimation results for males and females in Tables 7 and 8, respectively, the adjusted R^2 values are similar in magnitude to those for the ARDL models. Specifically, the values of the adjusted R^2 in the NARDL models for males range from 0.373 to 0.395 while the values of the adjusted R^2 in the NARDL models for females range from 0.418 to 0.468. The values of the F_{PSS} statistics are all greater than the relevant critical value at the 1% level in all the NARDL models for both males and females, confirming the existence of a level relationship between the suicide rate and at least one of the explanatory variables.

---- Insert Tables 7 and 8 about here ----

In contrast to the aggregate results, the gender-specific results of the Wald tests for asymmetry provide stronger evidence of a nonlinear relationship between the suicide rate and the explanatory variables. For males, there is statistically significant asymmetry in the impacts of both objective and subjective indicators in the model with the CSI, the model with *C3*, and asymmetric impacts of subjective indicator only in the model with *C5*. For females, the tests indicate statistically significant asymmetry in the impacts of both objective and subjective indicators in the models with *C1* and *C4*, and asymmetric impacts of subjective indicator only in the model with *C2*.

Regarding the direction of asymmetry, increases in the male unemployment rate (estimates of L_u^+) generally have stronger effects on the male suicide rate than a decrease in the male unemployment rate (estimates of L_u^-). In contrast, decreases in the female unemployment rate generally have a stronger impact on the female suicide rate than increases in the female unemployment rate. With respect to the influence of subjective factors, increases in the CSI and its components (estimates of L_{csi}^+) generally have a stronger impact on the male suicide rate than their decreases (estimates of L_{csi}^-). Again, in contrast to the results for males, decreases in the CSI and its components have a stronger effect on the female suicide rate than their increases.

The above results highlight what is arguably one of the key findings of this paper, namely that objective and subjective indicators of economic activity influence the suicide rates of men and women very differently. For males, the driving source of a reduction in the suicide rate is an increase in consumer sentiment, whereas the driving source of an increase in the suicide rate is an increase in the unemployment rate. For females, the main source of a reduction in the suicide rate is a decrease in the unemployment rate whereas the main source of an increase in the suicide rate is a decrease in consumer sentiment. This demonstrates that the channels through which objective and subjective economic factors influence male and female suicide rates are completely different. These results are summarized in Table 9.

---- Insert Table 9 about here ----

The finding that male suicide rates, but not female suicide rates, increase with higher unemployment rates is consistent with previous evidence of gender differences in the response to unemployment. For example, research has found that unemployment has a much larger negative effect on men's well-being and mental health compared to that of women (Clark, 2003; Artazcoz et al., 2004; Strandh et al., 2013), unemployment increases suicide risk for men but not women often due to gender role expectations (Qin et al., 2000; Payne et al., 2008), and men suffer from feelings of defeat and depression following job loss whereas women tend to view such an event more optimistically, especially if they have children (Forret et al., 2010). On average, men are more optimistic than women (see Table 1). A decline in consumer sentiment may exacerbate average levels of pessimism among women even further. To the extent that consumer sentiment reflects underlying psychological stress and uncertainty (van Giesen and Pieters, 2019; Nowzohour and Stracca, 2020), a decline (increase) in consumer sentiment can increase (decrease) suicide risk for women (men).

Finally, the estimates of the adjustment coefficients are all significant and negative in all the NARDL models for males and females. However, their absolute values are higher, and considerably higher among females, than their counterparts in the ARDL models. The estimates of α range from -0.426 to -0.505 for males and from -0.689 to -0.789 for females. This finding, together with the above results, indicates that there is strong evidence of asymmetry in the impacts of both objective and subjective indicators on the suicide rate in both males and females, and that the NARDL models are preferred over the ARDL models when the sample is disaggregated by gender.

4.2.1 Dynamic Multiplier Analysis

Our ARDL and NARDL analyses indicate that subjective factors matter for suicide rates with evidence of nonlinear associations. In this sub-section, we focus on the asymmetric impacts of consumer sentiment on the suicide rate. We investigate the gender differences and the duration it takes for the impacts of an increase and a decrease in consumer sentiment to be fully embedded in the suicide rate. To do this, we use the NARDL estimates to compute the asymmetric dynamic multiplier impacts of the CSI on the suicide rate (see Shin, Yu and Greenwood-Nimmo, 2014).

The results from both ARDL and NARDL models, as discussed in the previous sections, indicate that among the components of the CSI, consumers' current family finances (*C1*) and buying intentions (*C5*) are not significant in explaining the suicide rate. Therefore, we only study the dynamic multiplier impacts of the other three components— *C2*, *C3* and *C4*—on the suicide rate. The significant level relationships between the three forward-looking components of the CSI – family finances in the next 12 months (*C2*), economic conditions in the next 12 months (*C3*), and economic conditions in the next 5 years (*C4*) – and the suicide rate suggest that the impact of consumer sentiment on the suicide rate is mainly through the consumer expectations channel. Increasing or decreasing optimism about expected future conditions, rather than about current conditions, is key to explaining changes in the suicide rate.

Figure 2 plots the computed dynamic multipliers, capturing the asymmetric impacts of increases and decreases in the CSI and in its three forward-looking components on the suicide rate. The first column reports the results for the aggregate sample, the second column the results for males and the last column the results for females. As we discussed in the previous sections, the suicide rate is negatively associated with the CSI given the negative values of the estimated coefficients on both csi_{t-1}^{+} and csi_{t-1}^{-}, i.e. an increase (decrease) in the CSI lowers (raises) the suicide rate. For ease of demonstration, we multiply the impacts of decreases in consumer sentiment and its components with -1 to contrast with the impacts of their increases.

---- Insert Figure 2 about here ----

A closer look at Figure 2 reveals several stylised findings. First, it takes around six to eight months for the impacts of increases or decreases in the CSI to be fully embedded in the suicide rate, in the aggregate sample as well as for males and females. This indicates that the impact of subjective factors on the suicide rate is cumulative rather than instantaneous. Second, subjective factors have stronger impacts on the suicide rate among males than among females, with the magnitude of the impacts for males at least twice as large as for females. For example, an increase of 10 index points in the CSI reduces the male suicide rate by 0.068 persons per 100,000 after six months (or 6.68 persons in a male population of 9.83 million), whereas it reduces the female suicide rate by 0.015 persons per 100,000 (or 1.53 persons in a female population of 10.2 million).

Finally, though there is very weak evidence of asymmetric impacts of subjective factors on the suicide rate in the aggregate, there is stronger evidence of asymmetry for both males and females, but in opposite directions. For males, the impacts of the CSI and economic conditions in the next 12 months (*C3*) are asymmetric, with increases in these indices having stronger impacts on suicide rates than decreases (Figure 2(b) and 2(h)). For females, the impacts of family finances in the next 12 months (*C2*) and economic conditions in the next 5 years (*C4*) are asymmetric as well, but decreases in these indices having stronger impacts on suicide rates than increases (Figure 2(f) and 2(l)). The opposite directions of asymmetric impacts of subjective economic factors between males and females could be an explanation for the weak evidence of asymmetric impacts of subjective factors in the aggregate.

5. Conclusion

In this paper we combined monthly suicide rates in Australia with both objective and subjective economic indicators to test how these affect suicide rates over time. We use linear and nonlinear ARDL models, proxying objective economic circumstances with the unemployment rate, and subjective economic circumstances with the CSI and its five components. Our study is the first to conduct a detailed investigation into how subjective factors measured by the CSI and its components—that captures perceptions and expectations of both personal and broader economic conditions—explain changes in suicide rates, and whether there is any nonlinearity in how suicide rates respond to changes in the unemployment rate and consumer sentiment. We report several novel findings.

Consistent with previous research, we find that the unemployment rate is an important predictor of suicide rates. In general, an increase in the unemployment rate increases the suicide rate in the long run. The CSI is also a strong predictor of suicide rates, with some of its components being more important than others in explaining suicide. The results show that consumer expectations play a major role, with more positive expectations associated with lower suicide rates. There is also a strong evidence that consumer sentiment has stronger effects on male suicide rates than on female suicide rates.

A striking result is the presence of, and differences in, nonlinear effects in the response of suicide to objective and subjective indicators. Specifically, male and female suicide rates respond very differently to changes in the unemployment rate as well as the CSI and its components. For men, suicides rise significantly when the unemployment rate increases and when consumer sentiment improves. Male suicide rates do not respond to falls in unemployment rates, and generally respond weaker to a decline in sentiment as compared to an increase in sentiment. For women, suicides fall significantly when the unemployment rate declines but increases significantly when consumer sentiment worsens. Female suicide rates do not respond to increases in the unemployment rate and respond weaker to improvements in consumer sentiment.

Our findings have several important implications for suicide prevention policies that use the unemployment rate and sentiment indicators as channels of interest. First, a policy targeting both men and women within a unidimensional framework is likely to be less effective than policies targeting men and women separately. This is because male and female suicide rates respond so differently to changes in the unemployment rate and in consumer sentiment. Second, policy interventions using the sentiment channel will likely be more effective by targeting consumers' expectations of future conditions rather than their current conditions. Finally, the sentiment channel is particularly relevant for men as the effects of the CSI and its forward-looking components on the male suicide rate are around twice as large as those on the female suicide rate.

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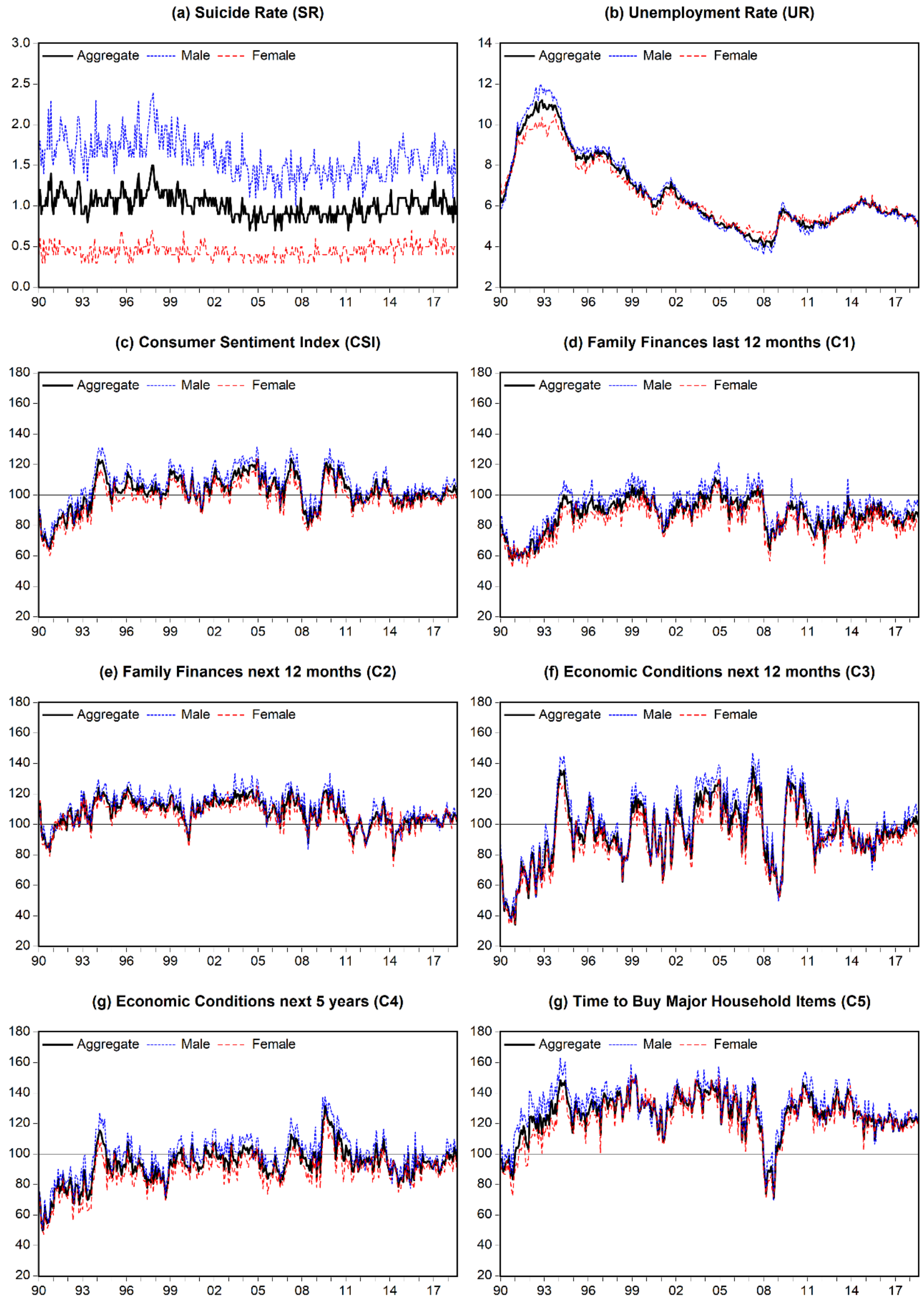
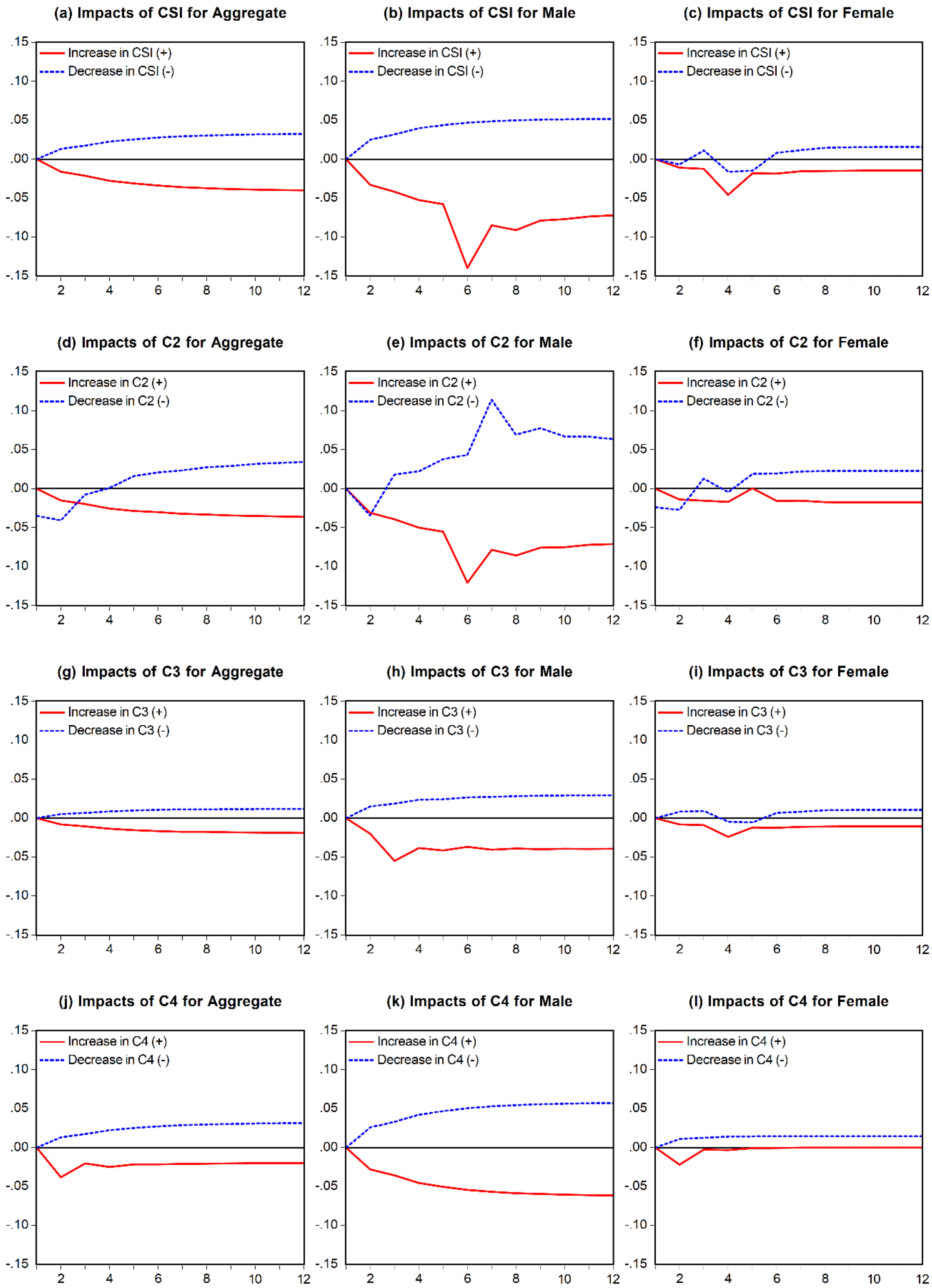
Figure 1: Data Plots



Source: ABS (2019, 2020b), Melbourne Institute

Figure 2: Impacts of Subjective Factors on Suicide Rates - Dynamic Multipliers in NARDL



Note: CSI: consumer sentiment index; C2: family finances in the next 12 months; C3: economic conditions in the next 12 months; C4: economic conditions in the next 5 years.

Table 1: Summary Statistics

		SR	CSI	C1	C2	C3	C4	C5	UR
Aggregate	*Mean*	1.01	101.88	87.19	108.16	94.68	93.02	126.24	6.65
	SD	0.14	11.22	11.05	8.83	19.98	12.13	14.07	1.85
	Max	1.50	123.94	111.22	124.40	137.92	131.31	151.25	11.22
	Min	0.70	64.61	57.24	79.00	34.17	49.78	71.04	3.98
Male	*Mean*	1.59	106.82	92.53	111.44	100.04	98.91	131.17	6.73
	SD	0.25	12.16	12.35	10.17	22.17	13.42	14.29	2.07
	Max	2.40	131.58	121.04	133.51	146.89	137.55	162.95	12.00
	Min	1.00	66.24	56.84	83.63	36.82	50.44	69.97	3.62
Female	*Mean*	0.45	97.90	82.71	105.84	90.32	88.10	122.53	6.54
	SD	0.09	10.96	10.85	8.74	18.67	11.88	15.42	1.58
	Max	0.70	123.89	108.29	125.32	130.46	125.49	151.58	10.52
	Min	0.30	60.16	52.33	72.46	34.62	47.42	71.86	4.24

Note: SR: suicide rate; CSI: consumer sentiment index; C1: family finances in the last 12 months; C2: family finances in the next 12 months; C3: economic conditions in the next 12 months; C4: economic conditions in the next 5 years; C5: time to buy major household items; UR: unemployment rate; SD: standard deviation.

Table 2: Unit Root Tests

	Series Name	Aggregate		Males		Females	
		KPSS stat	*S.L.*	*KPSS stat*	*S.L.*	*KPSS stat*	*S.L.*
Panel A: Level (constant & no trend)	Suicide Rate (SR)	0.971	***	1.344	***	0.476	**
	Unemployment Rate (UR)	1.528	***	1.508	***	1.555	***
	Consumer Sentiment Index (CSI)	0.374	*	0.319	S	0.458	*
	Family Finances Last 12 Months (C1)	0.346	S	0.330	S	0.384	*
	Family Finances Next 12 Months (C2)	0.488	**	0.513	**	0.450	*
	Economic Conditions Next 12 Months (C3)	0.450	*	0.377	*	0.542	**
	Economic Conditions Next 5 Years (C4)	0.797	***	0.616	**	1.001	***
	Time to Buy Major Household Items (C5)	0.178	S	0.169	S	0.257	S
Panel B: Level (constant & trend)	Suicide Rate (SR)	0.319	***	0.308	***	0.402	***
	Unemployment Rate (UR)	0.364	***	0.343	***	0.395	***
	Consumer Sentiment Index (CSI)	0.292	***	0.285	***	0.305	***
	Family Finances Last 12 Months (C1)	0.313	***	0.297	***	0.348	***
	Family Finances Next 12 Months (C2)	0.292	***	0.314	***	0.270	***
	Economic Conditions Next 12 Months (C3)	0.227	***	0.234	***	0.219	***
	Economic Conditions Next 5 Years (C4)	0.257	***	0.249	***	0.268	***
	Time to Buy Major Household Items (C5)	0.182	**	0.138	*	0.220	***
Panel C: First differences (constant & no trend)	Suicide Rate (ΔSR)	0.039	S	0.037	S	0.187	S
	Unemployment Rate (ΔUR)	0.165	S	0.179	S	0.142	S
	Consumer Sentiment Index (ΔCSI)	0.047	S	0.047	S	0.113	S
	Family Finances Last 12 Months (ΔC1)	0.035	S	0.040	S	0.096	S
	Family Finances Next 12 Months (ΔC2)	0.030	S	0.029	S	0.070	S
	Economic Conditions Next 12 Months (ΔC3)	0.028	S	0.031	S	0.046	S
	Economic Conditions Next 5 Years (ΔC4)	0.091	S	0.175	S	0.132	S
	Time to Buy Major Household Items (ΔC5)	0.176	S	0.170	S	0.465	**

Note: *KPSS stat* is the Kwiatkowski-Phillips-Schmidt-Shin LM test statistic for the null hypothesis of stationarity. *S.L.* indicates the significance level at which the null hypothesis of stationarity is rejected. Specifically, ***, **, and * indicates that the null hypothesis of stationarity is rejected at 1%, 5% and 10% significance level, respectively, while S indicates that the null hypothesis is not rejected (i.e. the series is stationary). The asymptotic critical values at 1%, 5% and 10% significance levels, provided by Kwiatkowski, Phillips, Schmidt, and Shin (1992), are 0.739, 0.463, and 0.347, respectively, for the test equation with only a constant as the deterministic component, and are 0.216, 0.146, and 0.119, respectively, for the test equation with both a constant and linear trend as the deterministic components. If the test statistic is greater than the critical values, the null hypothesis of stationarity is rejected.

Table 3. ARDL results: Full sample

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.387*** (0.064)	s_{t-1}	-0.376*** (0.063)	s_{t-1}	-0.380*** (0.063)	s_{t-1}	-0.397*** (0.066)	s_{t-1}	-0.390*** (0.064)	s_{t-1}	-0.373*** (0.063)
u_{t-1}	0.013*** (0.004)	u_{t-1}	0.015*** (0.004)	u_{t-1}	0.015*** (0.004)	u_{t-1}	0.013*** (0.004)	u_{t-1}	0.010** (0.004)	u_{t-1}	0.015*** (0.004)
csi_{t-1}	-0.012** (0.005)	csi_{t-1}	0.009 (0.006)	csi_{t-1}	-0.014** (0.006)	csi_{t-1}	-0.005* (0.003)	csi_{t-1}	-0.017*** (0.005)	csi_{t-1}	-0.004 (0.005)
Δs_{t-1}	-0.272*** (0.043)	Δs_{t-1}	-0.279*** (0.046)	Δs_{t-1}	-0.277*** (0.044)	Δs_{t-1}	-0.273*** (0.043)	Δs_{t-1}	-0.280*** (0.043)	Δs_{t-1}	-0.258*** (0.044)
Δu_{t-3}	-0.076** (0.036)	Δu_{t-4}	0.071* (0.036)	Δu_{t-3}	-0.069* (0.035)	Const.	0.357*** (0.070)	Δu_{t-3}	-0.073** (0.033)	Δs_{t-6}	-0.101** (0.042)
Const.	0.427*** (0.085)	Δu_{t-5}	0.068** (0.033)	Const.	0.433*** (0.088)			Δu_{t-5}	0.050* (0.029)	Δu_{t-3}	-0.068* (0.037)
		Δcsi_{t-3}	-0.014* (0.008)					Δcsi_{t-6}	0.017** (0.008)	Δcsi_{t-5}	-0.012* (0.007)
		Const.	0.202** (0.089)					Const.	0.484*** (0.081)	Const.	0.332*** (0.086)
L_u	0.034*** (0.010)	L_u	0.040*** (0.010)	L_u	0.040*** (0.010)	L_u	0.034*** (0.009)	L_u	0.025*** (0.009)	L_u	0.039*** (0.010)
L_{csi}	-0.031** (0.013)	L_{csi}	0.023 (0.018)	L_{csi}	-0.037** (0.015)	L_{csi}	-0.012* (0.007)	L_{csi}	-0.042*** (0.013)	L_{csi}	-0.011 (0.012)
Adj. R^2	0.322	Adj. R^2	0.321	Adj. R^2	0.321	Adj. R^2	0.322	Adj. R^2	0.339	Adj. R^2	0.324
F_{PSS}	9.80	F_{PSS}	10.71	F_{PSS}	10.12	F_{PSS}	9.51	F_{PSS}	10.25	F_{PSS}	9.61
χ^2_N	0.22 [0.892]	χ^2_N	0.08 [0.962]	χ^2_N	0.25 [0.883]	χ^2_N	0.12 [0.944]	χ^2_N	0.02 [0.992]	χ^2_N	0.51 [0.775]
χ^2_{SC}	0.04 [0.979]	χ^2_{SC}	0.07 [0.966]	χ^2_{SC}	0.13 [0.937]	χ^2_{SC}	0.24 [0.887]	χ^2_{SC}	1.22 [0.544]	χ^2_{SC}	0.99 [0.610]
χ^2_{HET}	19.39 [0.002]	χ^2_{HET}	12.97 [0.073]	χ^2_{HET}	20.09 [0.001]	χ^2_{HET}	17.78 [0.001]	χ^2_{HET}	25.72 [0.001]	χ^2_{HET}	18.25 [0.011]
χ^2_{FF}	0.42 [0.519]	χ^2_{FF}	1.33 [0.249]	χ^2_{FF}	0.24 [0.623]	χ^2_{FF}	0.10 [0.749]	χ^2_{FF}	2.56 [0.110]	χ^2_{FF}	0.70 [0.402]

Note: *** p < 0.01, ** p < 0.05, * p < 0.10. $L_u$and L_{csi} are the long-run coefficients of the unemployment rate and consumer sentiment index, respectively. Changes in the suicide rate are in relation to a one percentage point change in the unemployment rate and a ten index point change in the consumer sentiment index. F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu = \rho = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 2 I(1) regressors) are 3.35, 3.87 and 5.00 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 4. ARDL results: Males

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.424*** (0.067)	s_{t-1}	-0.420*** (0.065)	s_{t-1}	-0.412*** (0.067)	s_{t-1}	-0.434*** (0.067)	s_{t-1}	-0.440*** (0.068)	s_{t-1}	-0.430*** (0.071)
u_{t-1}	0.026*** (0.007)	u_{t-1}	0.030*** (0.007)	u_{t-1}	0.028*** (0.007)	u_{t-1}	0.026*** (0.007)	u_{t-1}	0.025*** (0.007)	u_{t-1}	0.030*** (0.007)
csi_{t-1}	-0.021** (0.009)	csi_{t-1}	0.007 (0.009)	csi_{t-1}	-0.005 (0.008)	csi_{t-1}	-0.010** (0.004)	csi_{t-1}	-0.023*** (0.007)	csi_{t-1}	-0.014** (0.006)
Δs_{t-1}	-0.285*** (0.043)	Δs_{t-1}	-0.289*** (0.046)	Δs_{t-1}	-0.310*** (0.043)	Δs_{t-1}	-0.291*** (0.041)	Δs_{t-1}	-0.290*** (0.041)	Δs_{t-1}	-0.299*** (0.043)
Δu_t	-0.078* (0.045)	Δcsi_{t-5}	-0.030** (0.015)	Δcsi_{t-5}	-0.035** (0.016)	Δu_{t-2}	-0.075* (0.046)	Δu_{t-2}	-0.072* (0.041)	Const.	0.663*** (0.131)
Δu_{t-2}	-0.078* (0.046)	Const.	0.406** (0.128)	Δcsi_{t-6}	-0.029** (0.014)	Const.	0.616*** (0.102)	Const.	0.768*** (0.117)		
Δcsi_{t-5}	-0.032* (0.018)			Const.	0.521*** (0.128)						
Const.	0.726*** (0.136)										
L_u	0.062*** (0.013)	L_u	0.071*** (0.014)	L_u	0.069*** (0.013)	L_u	0.060*** (0.013)	L_u	0.056*** (0.013)	L_u	0.070*** (0.013)
L_{csi}	-0.051** (0.021)	L_{csi}	0.016 (0.022)	L_{csi}	-0.012 (0.020)	L_{csi}	-0.023** (0.010)	L_{csi}	-0.053*** (0.016)	L_{csi}	-0.032** (0.013)
Adj. R^2	0.370	Adj. R^2	0.361	Adj. R^2	0.367	Adj. R^2	0.366	Adj. R^2	0.375	Adj. R^2	0.368
F_{PSS}	10.92	F_{PSS}	11.24	F_{PSS}	10.07	F_{PSS}	11.33	F_{PSS}	12.20	F_{PSS}	9.71
χ^2_N	4.41 [0.110]	χ^2_N	6.66 [0.036]	χ^2_N	5.67 [0.059]	χ^2_N	4.69 [0.096]	χ^2_N	2.79 [0.247]	χ^2_N	5.03 [0.081]
χ^2_{SC}	3.03 [0.220]	χ^2_{SC}	4.81 [0.090]	χ^2_{SC}	1.77 [0.413]	χ^2_{SC}	1.34 [0.513]	χ^2_{SC}	1.31 [0.521]	χ^2_{SC}	1.06 [0.588]
χ^2_{HET}	17.55 [0.014]	χ^2_{HET}	16.34 [0.006]	χ^2_{HET}	16.17 [0.013]	χ^2_{HET}	15.46 [0.009]	χ^2_{HET}	21.02 [0.001]	χ^2_{HET}	16.16 [0.003]
χ^2_{FF}	0.33 [0.568]	χ^2_{FF}	0.50 [0.824]	χ^2_{FF}	0.03 [0.856]	χ^2_{FF}	0.02 [0.877]	χ^2_{FF}	0.31 [0.576]	χ^2_{FF}	0.01 [0.938]

Note: *** p < 0.01, ** p < 0.05, * p < 0.10. $L_u$and L_{csi} are the long-run coefficients of the unemployment rate and consumer sentiment index, respectively. Changes in the suicide rate are in relation to a one percentage point change in the unemployment rate and a ten index point change in the consumer sentiment index. F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu = \rho = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 2 I(1) regressors) are 3.35, 3.87 and 5.00 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 5. ARDL results: Females

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.508*** (0.067)	s_{t-1}	-0.499*** (0.065)	s_{t-1}	-0.532*** (0.068)	s_{t-1}	-0.511*** (0.067)	s_{t-1}	-0.513*** (0.069)	s_{t-1}	-0.491*** (0.064)
u_{t-1}	0.000 (0.003)	u_{t-1}	0.001 (0.003)	u_{t-1}	0.003 (0.003)	u_{t-1}	-0.000 (0.003)	u_{t-1}	-0.000 (0.003)	u_{t-1}	0.002 (0.003)
csi_{t-1}	-0.009* (0.005)	csi_{t-1}	-0.004 (0.005)	csi_{t-1}	-0.016*** (0.005)	csi_{t-1}	-0.006** (0.003)	csi_{t-1}	-0.008** (0.004)	csi_{t-1}	-0.001 (0.003)
Δs_{t-1}	-0.316*** (0.071)	Δs_{t-1}	-0.332*** (0.072)	Δs_{t-1}	-0.309*** (0.071)	Δs_{t-1}	-0.316*** (0.071)	Δs_{t-1}	-0.320*** (0.073)	Δs_{t-1}	-0.318*** (0.070)
Δs_{t-2}	-0.149*** (0.055)	Δs_{t-2}	-0.164*** (0.056)	Δs_{t-2}	-0.153*** (0.056)	Δs_{t-2}	-0.150*** (0.055)	Δs_{t-2}	-0.165*** (0.057)	Δs_{t-2}	-0.152*** (0.055)
Δu_{t-3}	-0.036** (0.017)	Δu_{t-3}	-0.038** (0.017)	Δu_{t-3}	-0.039** (0.016)	Δu_{t-3}	-0.038** (0.017)	Const.	0.298*** (0.060)	Δu_{t-3}	-0.031* (0.017)
Δcsi_{t-4}	-0.014** (0.007)	Const.	0.250*** (0.060)	Const.	0.388*** (0.066)	Δcsi_{t-4}	0.008* (0.004)			Δcsi_{t-4}	0.010** (0.004)
Const.	0.311*** (0.071)					Const.	0.282*** (0.050)			Const.	0.216*** (0.056)
L_u	0.001 (0.006)	L_u	0.003 (0.006)	L_u	0.006 (0.005)	L_u	-0.000 (0.006)	L_u	-0.001 (0.006)	L_u	0.004 (0.005)
L_{csi}	-0.017* (0.009)	L_{csi}	-0.009 (0.009)	L_{csi}	-0.030*** (0.009)	L_{csi}	-0.011** (0.005)	L_{csi}	-0.015** (0.007)	L_{csi}	-0.002 (0.007)
Adj. R^2	0.416	Adj. R^2	0.416	Adj. R^2	0.432	Adj. R^2	0.417	Adj. R^2	0.411	Adj. R^2	0.411
F_{PSS}	14.52	F_{PSS}	14.75	F_{PSS}	16.06	F_{PSS}	14.59	F_{PSS}	13.92	F_{PSS}	14.84
χ^2_N	5.10 [0.078]	χ^2_N	4.21 [0.122]	χ^2_N	3.81 [0.149]	χ^2_N	3.77 [0.152]	χ^2_N	2.77 [0.250]	χ^2_N	6.45 [0.040]
χ^2_{SC}	8.13 [0.017]	χ^2_{SC}	7.22 [0.027]	χ^2_{SC}	4.04 [0.133]	χ^2_{SC}	7.51 [0.023]	χ^2_{SC}	1.52 [0.467]	χ^2_{SC}	9.10 [0.011]
χ^2_{HET}	12.68 [0.080]	χ^2_{HET}	7.34 [0.290]	χ^2_{HET}	10.64 [0.100]	χ^2_{HET}	9.49 [0.220]	χ^2_{HET}	9.81 [0.081]	χ^2_{HET}	11.69 [0.111]
χ^2_{FF}	0.06 [0.811]	χ^2_{FF}	0.01 [0.919]	χ^2_{FF}	0.01 [0.922]	χ^2_{FF}	0.02 [0.879]	χ^2_{FF}	0.03 [0.864]	χ^2_{FF}	0.20 [0.658]

Note: *** p < 0.01, ** p < 0.05, * p < 0.10. $L_u$and L_{csi} are the long-run coefficients of the unemployment rate and consumer sentiment index, respectively. Changes in the suicide rate are in relation to a one percentage point change in the unemployment rate and a ten index point change in the consumer sentiment index. F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu = \rho = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 2 I(1) regressors) are 3.35, 3.87 and 5.00 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 6. NARDL results: Full sample

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.392*** (0.065)	s_{t-1}	-0.379*** (0.072)	s_{t-1}	-0.400*** (0.060)	s_{t-1}	-0.403*** (0.066)	s_{t-1}	-0.405*** (0.068)	s_{t-1}	-0.366*** (0.067)
u^+_{t-1}	0.019* (0.010)	u^+_{t-1}	0.013 (0.011)	u^+_{t-1}	0.011 (0.011)	u^+_{t-1}	0.025** (0.010)	u^+_{t-1}	-0.002 (0.016)	u^+_{t-1}	0.020** (0.010)
u^-_{t-1}	0.012** (0.006)	u^-_{t-1}	0.019*** (0.006)	u^-_{t-1}	0.012** (0.005)	u^-_{t-1}	0.009 (1.413)	u^-_{t-1}	0.015** (0.006)	u^-_{t-1}	0.012* (0.006)
csi^+_{t-1}	-0.016** (0.006)	csi^+_{t-1}	0.014* (0.007)	csi^+_{t-1}	-0.015** (0.007)	csi^+_{t-1}	-0.008** (0.003)	csi^+_{t-1}	-0.008 (0.007)	csi^+_{t-1}	-0.005 (0.005)
csi^-_{t-1}	-0.013** (0.005)	csi^-_{t-1}	0.011* (0.006)	csi^-_{t-1}	-0.015*** (0.006)	csi^-_{t-1}	-0.005* (0.003)	csi^-_{t-1}	-0.013** (0.005)	csi^-_{t-1}	-0.004 (0.004)
Δs_{t-1}	-0.270*** (0.044)	Δs_{t-1}	-0.259*** (0.047)	Δs_{t-1}	-0.286*** (0.046)	Δs_{t-1}	-0.258*** (0.046)	Δs_{t-1}	-0.271*** (0.046)	Δs_{t-1}	-0.272*** (0.045)
Δu^+_{t-3}	-0.112* (0.062)	Δs_{t-6}	0.077* (0.043)	Δs_{t-4}	-0.084** (0.041)	Δs_{t-6}	-0.085* (0.045)	Δu^+_{t-5}	0.104** (0.044)	Δs_{t-6}	-0.087* (0.045)
Const.	0.398*** (0.066)	Δu^+_{t-5}	0.132** (0.057)	Δu^+_{t-5}	0.092* (0.051)	Δu^+_{t-5}	0.098* (0.055)	Δu^-_{t-3}	-0.114* (0.0660)	Δu^+_{t-5}	0.110** (0.053)
		Δu^-_{t-4}	0.117** (0.057)	Δu^+_{t-6}	-0.103* (0.057)	Δu^+_{t-6}	-0.099* (0.055)	Δcsi^+_{t-1}	-0.030** (0.005)	Δu^+_{t-6}	-0.101* (0.055)
		Δcsi^+_{t-5}	-0.052** (0.021)	Δu^-_{t-3}	-0.107* (0.061)	Const.	0.365*** (0.065)	Const.	0.457*** (0.085)	Δu^-_{t-4}	0.096* (0.056)
		Δcsi^-_{t-6}	-0.027* (0.016)	Δcsi^-_{t}	0.035** (0.014)					Δcsi^-_{t-4}	0.028*** (0.010)
				Δcsi^-_{t-1}	0.045*** (0.017)					Const.	0.368*** (0.064)
		Const.	0.379** (0.072)	Const.	0.423*** (0.063)						
L^+_u	0.050** (0.023)	L^+_u	0.034 (0.029)	L^+_u	0.028 (0.026)	L^+_u	0.063*** (0.022)	L^+_u	-0.006 (0.040)	L^+_u	0.054** (0.024)
L^-_u	0.030** (0.013)	L^-_u	0.052*** (0.014)	L^-_u	0.031** (0.012)	L^-_u	0.021 (0.014)	L^-_u	0.036*** (0.011)	L^-_u	0.032** (0.015)
L^+_{csi}	-0.040*** (0.015)	L^+_{csi}	0.036* (0.020)	L^+_{csi}	-0.038** (0.027)	L^+_{csi}	-0.020*** (0.008)	L^+_{csi}	-0.021 (0.018)	L^+_{csi}	-0.014 (0.012)
L^-_{csi}	-0.034*** (0.013)	L^-_{csi}	0.031* (0.017)	L^-_{csi}	-0.038** (0.015)	L^-_{csi}	-0.013* (0.007)	L^-_{csi}	-0.031** (0.013)	L^-_{csi}	-0.010 (0.010)
Adj. R^2	0.317	Adj. R^2	0.335	Adj. R^2	0.339	Adj. R^2	0.330	Adj. R^2	0.338	Adj. R^2	0.333

F_{PSS}	6.96	F_{PSS}	8.10	F_{PSS}	8.79	F_{PSS}	6.99	F_{PSS}	7.53	F_{PSS}	7.18
χ^2_N	0.19 [0.911]	χ^2_N	0.83 [0.659]	χ^2_N	0.31 [0.856]	χ^2_N	0.24 [0.885]	χ^2_N	0.046 [0.977]	χ^2_N	0.82 [0.664]
χ^2_{SC}	0.17 [0.920]	χ^2_{SC}	1.49 [0.474]	χ^2_{SC}	1.78 [0.410]	χ^2_{SC}	0.27 [0.874]	χ^2_{SC}	0.08 [0.960]	χ^2_{SC}	1.60 [0.449]
χ^2_{HET}	22.16 [0.002]	χ^2_{HET}	19.83 [0.048]	χ^2_{HET}	26.48 [0.009]	χ^2_{HET}	17.13 [0.047]	χ^2_{HET}	21.93 [0.009]	χ^2_{HET}	17.64 [0.009]
χ^2_{FF}	0.32 [0.571]	χ^2_{FF}	0.36 [0.546]	χ^2_{FF}	0.35 [0.553]	χ^2_{FF}	1.19 [0.274]	χ^2_{FF}	0.97 [0.331]	χ^2_{FF}	0.85 [0.355]
$W_{u^+=u^-}$	0.94 [0.331]	$W_{u^+=u^-}$	0.44 [0.507]	$W_{u^+=u^-}$	0.02 [0.900]	$W_{u^+=u^-}$	3.24 [0.072]	$W_{u^+=u^-}$	1.09 [0.297]	$W_{u^+=u^-}$	0.89 [0.345]
$W_{csi^+=csi^-}$	1.03 [0.311]	$W_{csi^+=csi^-}$	0.61 [0.434]	$W_{csi^+=csi^-}$	0.00 [0.982]	$W_{csi^+=csi^-}$	3.37 [0.067]	$W_{csi^+=csi^-}$	1.27 [0.268]	$W_{csi^+=csi^-}$	0.97 [0.325]

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. L_u^+ and L_u^-, respectively, are the long-run coefficients related to positive and negative changes in the unemployment rate (by one percentage point). L_{csi}^+ and L_{csi}^-, respectively, are the long-run coefficients related to positive and negative changes in the consumer sentiment index (by ten index points). F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu^+ = \mu^- = \rho^+ = \rho^- = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 4 I(1) regressors) are 3.09, 3.49 and 4.37 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. $W_{u^+=u^-}$ is the Wald test for long-run symmetry in the unemployment rate ($L_u^+ = L_u^-$), and $W_{csi^+=csi^-}$ is the Wald test for long-run symmetry in the consumer sentiment index ($L_{csi}^+ = L_{csi}^-$). Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 7. NARDL results: Males

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.480*** (0.067)	s_{t-1}	-0.426*** (0.070)	s_{t-1}	-0.454*** (0.065)	s_{t-1}	-0.506*** (0.066)	s_{t-1}	-0.450*** (0.066)	s_{t-1}	-0.451*** (0.071)
u_{t-1}^{+}	0.031** (0.012)	u_{t-1}^{+}	0.029* (0.016)	u_{t-1}^{+}	0.027** (0.013)	u_{t-1}^{+}	0.034*** (0.012)	u_{t-1}^{+}	0.021 (0.016)	u_{t-1}^{+}	0.037*** (0.014)
u_{t-1}^{-}	0.011 (0.009)	u_{t-1}^{-}	0.019** (0.010)	u_{t-1}^{-}	0.016* (0.009)	u_{t-1}^{-}	0.006 (0.009)	u_{t-1}^{-}	0.016* (0.009)	u_{t-1}^{-}	0.018* (0.009)
csi_{t-1}^{+}	-0.033*** (0.008)	csi_{t-1}^{+}	0.018 (0.010)	csi_{t-1}^{+}	-0.031*** (0.011)	csi_{t-1}^{+}	-0.020*** (0.004)	csi_{t-1}^{+}	-0.028*** (0.009)	csi_{t-1}^{+}	-0.027*** (0.007)
csi_{t-1}^{-}	-0.025** (0.007)	csi_{t-1}^{-}	0.005 (0.009)	csi_{t-1}^{-}	-0.027*** (0.009)	csi_{t-1}^{-}	-0.015*** (0.004)	csi_{t-1}^{-}	-0.026*** (0.007)	csi_{t-1}^{-}	-0.023*** (0.006)
Δs_{t-1}	-0.252*** (0.044)	Δs_{t-1}	-0.283*** (0.049)	Δs_{t-1}	-0.281*** (0.043)	Δs_{t-1}	-0.252*** (0.046)	Δs_{t-1}	-0.279*** (0.042)	Δs_{t-1}	-0.279*** (0.044)
Δu_{t}^{-}	-0.234*** (0.069)	Δu_{t}^{+}	0.171* (0.102)	Δu_{t}^{-}	-0.215*** (0.072)	Δs_{t-3}	-0.078* (0.046)	Δu_{t}^{-}	-0.220*** (0.072)	Δu_{t}^{-}	-0.198*** (0.072)
Δu_{t-2}^{-}	-0.177** (0.082)	Δu_{t}^{-}	-0.256*** (0.080)	Δu_{t-2}^{-}	0.171** (0.085)	Δu_{t}^{-}	-0.211*** (0.075)	Δu_{t-2}^{-}	-0.177** (0.086)	Δcsi_{t-4}^{-}	0.029* (0.015)
Δcsi_{t-5}^{+}	-0.078** (0.034)	Δcsi_{t-5}^{+}	-0.060** (0.028)	Δcsi_{t-5}^{+}	-0.061** (0.027)	Δu_{t-2}^{-}	0.167** (0.083)	Const.	0.733*** (0.116)	Const.	0.743*** (0.117)
Const.	0.754*** (0.110)	Const.	0.639*** (0.113)	Δcsi_{t-1}^{-}	0.061** (0.024)	Δcsi_{t-2}^{+}	-0.030** (0.015)				
				Δcsi_{t-6}^{-}	-0.065*** (0.022)	Const.	0.725*** (0.109)				
				Const.	0.691*** (0.111)						
L_{u}^{+}	0.064*** (0.023)	L_{u}^{+}	0.067** (0.032)	L_{u}^{+}	0.059** (0.027)	L_{u}^{+}	0.067*** (0.021)	L_{u}^{+}	0.046 (0.034)	L_{u}^{+}	0.081*** (0.027)
L_{u}^{-}	0.023 (0.017)	L_{u}^{-}	0.044** (0.021)	L_{u}^{-}	0.034* (0.018)	L_{u}^{-}	0.012 (0.018)	L_{u}^{-}	0.036* (0.018)	L_{u}^{-}	0.039** (0.018)
L_{csi}^{+}	-0.068*** (0.018)	L_{csi}^{+}	0.004 (0.022)	L_{csi}^{+}	-0.068*** (0.024)	L_{csi}^{+}	-0.040*** (0.009)	L_{csi}^{+}	-0.062*** (0.020)	L_{csi}^{+}	-0.061*** (0.016)
L_{csi}^{-}	-0.053*** (0.016)	L_{csi}^{-}	0.012 (0.021)	L_{csi}^{-}	-0.059*** (0.022)	L_{csi}^{-}	-0.029*** (0.009)	L_{csi}^{-}	-0.058*** (0.016)	L_{csi}^{-}	-0.051*** (0.014)
Adj. R^2	0.394	Adj. R^2	0.373	Adj. R^2	0.390	Adj. R^2	0.395	Adj. R^2	0.386	Adj. R^2	0.381
F_{PSS}	10.13	F_{PSS}	7.17	F_{PSS}	9.31	F_{PSS}	13.99	F_{PSS}	11.23	F_{PSS}	7.57
χ_{N}^{2}	4.09 [0.130]	χ_{N}^{2}	8.27 [0.016]	χ_{N}^{2}	2.21 [0.332]	χ_{N}^{2}	4.71 [0.095]	χ_{N}^{2}	2.214 [0.331]	χ_{N}^{2}	4.27 [0.118]

χ^2_{SC}	2.05 [0.359]	χ^2_{SC}	0.86 [0.652]	χ^2_{SC}	1.26 [0.532]	χ^2_{SC}	0.54 [0.762]	χ^2_{SC}	1.36 [0.506]	χ^2_{SC}	0.37 [0.832]
χ^2_{HET}	23.21 [0.006]	χ^2_{HET}	22.53 [0.007]	χ^2_{HET}	27.77 [0.004]	χ^2_{HET}	21.29 [0.019]	χ^2_{HET}	27.30 [0.001]	χ^2_{HET}	18.85 [0.016]
χ^2_{FF}	0.25 [0.616]	χ^2_{FF}	0.04 [0.851]	χ^2_{FF}	0.20 [0.653]	χ^2_{FF}	0.39 [0.531]	χ^2_{FF}	0.37 [0.542]	χ^2_{FF}	0.07 [0.789]
$W_{u^+=u^-}$	3.58 [0.058]	$W_{u^+=u^-}$	0.47 [0.494]	$W_{u^+=u^-}$	1.01 [0.316]	$W_{u^+=u^-}$	7.65 [0.006]	$W_{u^+=u^-}$	0.08 [0.783]	$W_{u^+=u^-}$	2.30 [0.129]
$W_{csi^+=csi^-}$	5.04 [0.025]	$W_{csi^+=csi^-}$	0.68 [0.410]	$W_{csi^+=csi^-}$	1.75 [0.185]	$W_{csi^+=csi^-}$	9.85 [0.002]	$W_{csi^+=csi^-}$	0.13 [0.715]	$W_{csi^+=csi^-}$	3.11 [0.078]

Note: *** p < 0.01, ** p < 0.05, * p < 0.10. L_u^+ and L_u^-, respectively, are the long-run coefficients related to positive and negative changes in the unemployment rate (by one percentage point). L_{csi}^+ and L_{csi}^-, respectively, are the long-run coefficients related to positive and negative changes in the consumer sentiment index (by ten index points). F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu^+ = \mu^- = \rho^+ = \rho^- = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 4 I(1) regressors) are 3.09, 3.49 and 4.37 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. $W_{u^+=u^-}$ is the Wald test for long-run symmetry in the unemployment rate ($L_u^+ = L_u^-$), and $W_{csi^+=csi^-}$ is the Wald test for long-run symmetry in the consumer sentiment index ($L_{csi}^+ = L_{csi}^-$). Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 8. NARDL results: Females

Consumer Sentiment Index (CSI)		Family Finances last 12 months (C1)		Family Finances next 12 months (C2)		Economic Conditions next 12 months (C3)		Economic Conditions next 5 years (C4)		Time to Buy Major Household Items (C5)	
Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)	Variable	Coeff. (S.E.)
s_{t-1}	-0.757*** (0.069)	s_{t-1}	-0.744*** (0.072)	s_{t-1}	-0.789*** (0.075)	s_{t-1}	-0.753*** (0.074)	s_{t-1}	-0.751*** (0.078)	s_{t-1}	-0.689*** (0.069)
u_{t-1}^{+}	0.015 (0.009)	u_{t-1}^{+}	-0.003 (0.009)	u_{t-1}^{+}	0.002 (0.011)	u_{t-1}^{+}	0.019* (0.010)	u_{t-1}^{+}	-0.004 (0.010)	u_{t-1}^{+}	0.013 (0.009)
u_{t-1}^{-}	0.015*** (0.005)	u_{t-1}^{-}	0.014*** (0.005)	u_{t-1}^{-}	0.013** (0.005)	u_{t-1}^{-}	0.016*** (0.006)	u_{t-1}^{-}	0.022*** (0.005)	u_{t-1}^{-}	0.016*** (0.005)
csi_{t-1}^{+}	-0.011* (0.006)	csi_{t-1}^{+}	0.007 (0.005)	csi_{t-1}^{+}	-0.014** (0.005)	csi_{t-1}^{+}	-0.008** (0.004)	csi_{t-1}^{+}	-0.003 (0.005)	csi_{t-1}^{+}	-0.000 (0.005)
csi_{t-1}^{-}	-0.012** (0.005)	csi_{t-1}^{-}	0.001 (0.005)	csi_{t-1}^{-}	-0.018*** (0.005)	csi_{t-1}^{-}	-0.008*** (0.003)	csi_{t-1}^{-}	-0.011*** (0.004)	csi_{t-1}^{-}	-0.002 (0.004)
Δs_{t-1}	-0.115** (0.046)	Δs_{t-1}	-0.126*** (0.047)	Δs_{t-1}	-0.112** (0.048)	Δs_{t-1}	-0.116** (0.047)	Δs_{t-1}	-0.128*** (0.049)	Δs_{t-1}	-0.123*** (0.047)
Δu_{t-3}^{+}	-0.068** (0.033)	Δcsi_{t-3}^{+}	-0.024** (0.009)	Δu_{t-3}^{+}	-0.059** (0.029)	Δu_{t-3}^{+}	-0.070** (0.033)	Δu_{t-3}^{+}	-0.063** (0.031)	Δu_{t-3}^{+}	-0.077** (0.030)
Δcsi_{t-3}^{+}	-0.032** (0.015)	Const.	0.350*** (0.039)	Δcsi_{t-4}^{+}	0.018* (0.010)	Δcsi_{t-3}^{+}	-0.014* (0.008)	Δcsi_{t-1}^{+}	-0.022** (0.009)	Δcsi_{t-2}^{+}	0.015* (0.008)
Δcsi_{t-1}^{-}	0.019 (0.012)			Δcsi_{t}^{-}	0.024** (0.012)	Δcsi_{t-3}^{-}	0.015* (0.008)	Const.	0.362*** (0.041)	Δcsi_{t-4}^{-}	0.022*** (0.008)
Δcsi_{t-3}^{-}	0.029** (0.013)			Δcsi_{t-1}^{-}	0.043*** (0.008)	Δcsi_{t-4}^{-}	0.014** (0.007)			Δcsi_{t-6}^{-}	0.013* (0.008)
Δcsi_{t-4}^{-}	0.026** (0.012)			Δcsi_{t-3}^{-}	0.021** (0.009)	Const.	0.323*** (0.041)			Const.	0.299*** (0.040)
Const.	0.346*** (0.040)			Const.	0.369*** (0.042)						
L_{u}^{+}	0.020 (0.013)	L_{u}^{+}	-0.004 (0.012)	L_{u}^{+}	0.003 (0.014)	L_{u}^{+}	0.025* (0.013)	L_{u}^{+}	-0.005 (0.013)	L_{u}^{+}	0.019 (0.012)
L_{u}^{-}	0.020*** (0.006)	L_{u}^{-}	0.019*** (0.007)	L_{u}^{-}	0.016** (0.007)	L_{u}^{-}	0.021*** (0.007)	L_{u}^{-}	0.030*** (0.007)	L_{u}^{-}	0.023*** (0.007)
L_{csi}^{+}	-0.015* (0.008)	L_{csi}^{+}	0.009 (0.007)	L_{csi}^{+}	-0.018** (0.007)	L_{csi}^{+}	-0.011** (0.004)	L_{csi}^{+}	-0.004 (0.007)	L_{csi}^{+}	-0.000 (0.007)
L_{csi}^{-}	-0.016** (0.006)	L_{csi}^{-}	0.002 (0.007)	L_{csi}^{-}	-0.023*** (0.006)	L_{csi}^{-}	-0.011*** (0.003)	L_{csi}^{-}	-0.015*** (0.005)	L_{csi}^{-}	-0.003 (0.006)
Adj. R^2	0.442	Adj. R^2	0.437	Adj. R^2	0.468	Adj. R^2	0.439	Adj. R^2	0.453	Adj. R^2	0.418
F_{PSS}	24.79	F_{PSS}	19.93	F_{PSS}	23.82	F_{PSS}	19.08	F_{PSS}	19.01	F_{PSS}	18.23
χ_{N}^{2}	8.91 [0.012]	χ_{N}^{2}	5.11 [0.078]	χ_{N}^{2}	5.40 [0.067]	χ_{N}^{2}	7.69 [0.021]	χ_{N}^{2}	6.47 [0.039]	χ_{N}^{2}	11.81 [0.003]

χ^2_{SC}	2.88 [0.237]	χ^2_{SC}	2.55 [0.279]	χ^2_{SC}	3.48 [0.176]	χ^2_{SC}	4.93 [0.085]	χ^2_{SC}	3.05 [0.217]	χ^2_{SC}	3.22 [0.199]
χ^2_{HET}	11.54 [0.400]	χ^2_{HET}	10.86 [0.145]	χ^2_{HET}	19.68 [0.050]	χ^2_{HET}	12.11 [0.278]	χ^2_{HET}	12.92 [0.115]	χ^2_{HET}	11.24 [0.339]
χ^2_{FF}	0.27 [0.606]	χ^2_{FF}	0.10 [0.753]	χ^2_{FF}	0.00 [0.966]	χ^2_{FF}	0.00 [0.970]	χ^2_{FF}	0.50 [0.478]	χ^2_{FF}	0.01 [0.936]
$W_{u^+=u^-}$	0.00 [0.993]	$W_{u^+=u^-}$	7.21 [0.007]	$W_{u^+=u^-}$	2.53 [0.112]	$W_{u^+=u^-}$	0.07 [0.799]	$W_{u^+=u^-}$	5.58 [0.018]	$W_{u^+=u^-}$	0.10 [0.754]
$W_{csi^+=csi^-}$	0.17 [0.681]	$W_{csi^+=csi^-}$	10.64 [0.001]	$W_{csi^+=csi^-}$	4.62 [0.032]	$W_{csi^+=csi^-}$	0.00 [0.945]	$W_{csi^+=csi^-}$	7.31 [0.007]	$W_{csi^+=csi^-}$	0.51 [0.474]

Note: *** p < 0.01, ** p < 0.05, * p < 0.10. L^+_u and L^-_u, respectively, are the long-run coefficients related to positive and negative changes in the unemployment rate (by one percentage point). L^+_{csi} and L^-_{csi}, respectively, are the long-run coefficients related to positive and negative changes in the consumer sentiment index (by ten index points). F_{PSS} is the Pesaran, Shin and Smith (2001) F-statistic for the Bounds-Test of the null hypothesis $a = \alpha = \mu^+ = \mu^- = \rho^+ = \rho^- = 0$; the associated nonstandard critical values (for the case with a restricted intercept and no trend, 4 I(1) regressors) are 3.09, 3.49 and 4.37 at 10%, 5%, and 1% significance levels. χ^2_N, χ^2_{SC}, χ^2_{HET}, and χ^2_{FF} are LM tests for normality, serial correlation, heteroscedasticity, and functional form, respectively. $W_{u^+=u^-}$ is the Wald test for long-run symmetry in the unemployment rate ($L^+_u = L^-_u$), and $W_{csi^+=csi^-}$ is the Wald test for long-run symmetry in the consumer sentiment index ($L^+_{csi} = L^-_{csi}$). Where relevant, *p*-values are in [.]. All models estimated with Newey-West HAC (heteroscedasticity and autocorrelation consistent) standard errors and covariance.

Table 9: Summary of NARDL results with respect to unemployment and sentiment

		↑ UR	↓ UR
Suicide rate	Male	↑	0
	Female	0	↓

		↑ CSI	↓ CSI
Suicide rate	Male	**↓**	↑
	Female	↓	**↑**

Note: UR and CSI denote the unemployment rate and consumer sentiment index, respectively. Bold arrows reflect a very strong effect, non-bold arrows denote a small to moderate effect, and 0 denotes no effect.

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