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Does paying your debt make you happy during the pandemic?

Emmanuel C. Mamatzakis^a, Steven Ongena^b and Mike G. Tsionas^c

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This paper examines the association between happiness and household debt repayments during the pandemic in UK. We employ a Bayesian VAR with time variation in the conditional mean equations. Our n-dimensional model is treated as a set of n univariate estimation problems, and cross-dependence is handled using a student-t skewed distribution with latent autoregressive factors. The evidence reveals that the pandemic has a detrimental impact on happiness, though increasing household debt repayments can enhance happiness. Remarkably, happiness may help to reduce COVID-19 infections and lockdown measures increase happiness and life satisfaction, though stay-at-home policies would increase anxiety.

Keywords: Happiness; household debt repayments; COVID-19; Bayesian VAR.

JEL Codes: C11, I3, D1.

^aDepartment of Management, Birkbeck, University of London, Malet Street, Bloomsbury, London WC1E 7HX, UK. E-mail: e.mamatzakis@bbk.ac.uk. ORCID: 0000-0002-2623-0029.

^b Department of Banking and Finance, University of Zurich, Zurich 8032, Switzerland; Swiss Finance Institute; KU Leuven; NTNU Business School; and CEPR. Email: steven.ongena@bf.uzh.ch. ORCID: 0000-0002-8381-0062 ^cLancaster University Management School, Bailrigg, Lancaster, LA1 4YX, UK. E-mail: m.tsionas@lancaster.ac.uk. ORCID: 0000-0003-3761-8106. Ongena acknowledges financial support from ERC ADG 2016 - GA 740272 lending. The Authors acknowledge financial support from ESRC ES/V015826/1.

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- The research of this paper involves no human participants and/or animals
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1. Introduction

The COVID-19 pandemic has detrimental effects on all aspects of economic and social life in the UK and world-wide. An OECD (2021) report demonstrates that the pandemic enhances anxiety (see also Wang et al. 2020) while recent data from the Office of National Statistics show that individual happiness in the UK has sharply deteriorated during the pandemic (ONS, 2022).¹ In parallel, recent research show that COVID-19 has increase psychological distress in the UK (see Davillas and Jones 2021; Gao, et al 2022). Prior research also showed that household debt repayments would cause higher level of distress across households (Keese and Schmitz 2014; Franklin, et al. 2021). But reports from the Bank of England (see Money and Credit, 2020) show that households had repaid £7.4 billion of consumer credit during the first lock down in April 2020. This repayment was the largest monthly net repayment since the series began.

Following from the above, we examine how individual happiness has been responded to shocks due to the pandemic while controlling for household debt repayments. The underlying causal associations between happiness, household debt repayments and COVID-19 are difficult to disentangle, also considering rapidly changing epidemiologic conditions such as infections and deaths. To simplify things, we employ a unique Bayesian Vector Autoregressive (VAR) model with a student- t , time-varying, skewed copula. This model is quite flexible to model accurately enough most extant data series, and estimation techniques are quite simple. Moreover, as happiness, COVID-19 infections, and deaths as well as debt repayments are time-varying we opt for a the time-varying copula within a Bayesian VAR that all variables are endogenous. The remainder of the paper proceeds as follows. The next section presents our methodology. Section 3 and 4 presents the data and results respectively. Section 5 provides conclusions.

¹ OECD (2021) reports evidence that anxiety and depression have increased during the pandemic whereas mental distress deteriorates with COVID-19 deaths and strict confinement measures.

2. Methodology

Let $y_t = [y_{it}, i = 1, \dots, T]'$ ($t = 1, \dots, T$) be a vector of endogenous variables. In our case we have six, i.e., life satisfaction, happiness, anxiety, confirmed cases (infections), confirmed deaths and total household debt repayments. We assume the marginal distributions are student-t with stochastic volatility. Our model for each equation of the VAR is, thus, as follows.

$$y_{it} = W_{it}\beta_{y,i} + \gamma_{y,i}\delta_{it} + \delta_{it}^{1/2} e^{h_{it}/2} \varepsilon_{y,it}, \varepsilon_{y,it} \sim N(0,1).$$

$$h_{i,t+1} = \mu_{h,i} + \phi_{h,i} + (h_{i,t} - \mu_{h,i}) + \sigma_{h,i}\varepsilon_{h,it}, \varepsilon_{h,it} \sim N(0,1). \quad (1)$$

$$\delta_{it} \sim \text{Inv} - \text{Gamma}\left(\frac{\nu_{y,i}}{2}, \frac{\nu_{y,i}}{2}\right), \text{corr}(\varepsilon_{y,it}, \varepsilon_{h,it}) = \rho_i.$$

where W_{it} is the matrix of regressors, that includes lags of y_{it} and exogenous variables which are government interventions to combat the pandemic (i.e., workplace closing and debt contract relief) with coefficients $\beta_{y,i}$, h_{it} is log-volatility, $\nu_{y,i}$ denote the degrees of freedom, $\gamma_{y,i}$ denotes the skewness, and ρ_i is a leverage parameter. Lastly $\mu_{h,i}$, $\phi_{h,i}$, $\sigma_{h,i}$ are unknown parameters.

The copula realizations are denoted $u = (u_{it}, i = 1, \dots, n)$ and are represented as

$$\begin{aligned} u_t &\sim p(u_t | \Lambda_t, X_t, \theta), \\ \Lambda_{t+1} &= \mu + \Phi_\lambda + (\Lambda_t - \mu) + \eta_t, \eta_t \sim N(0, \Sigma), \end{aligned} \quad (2)$$

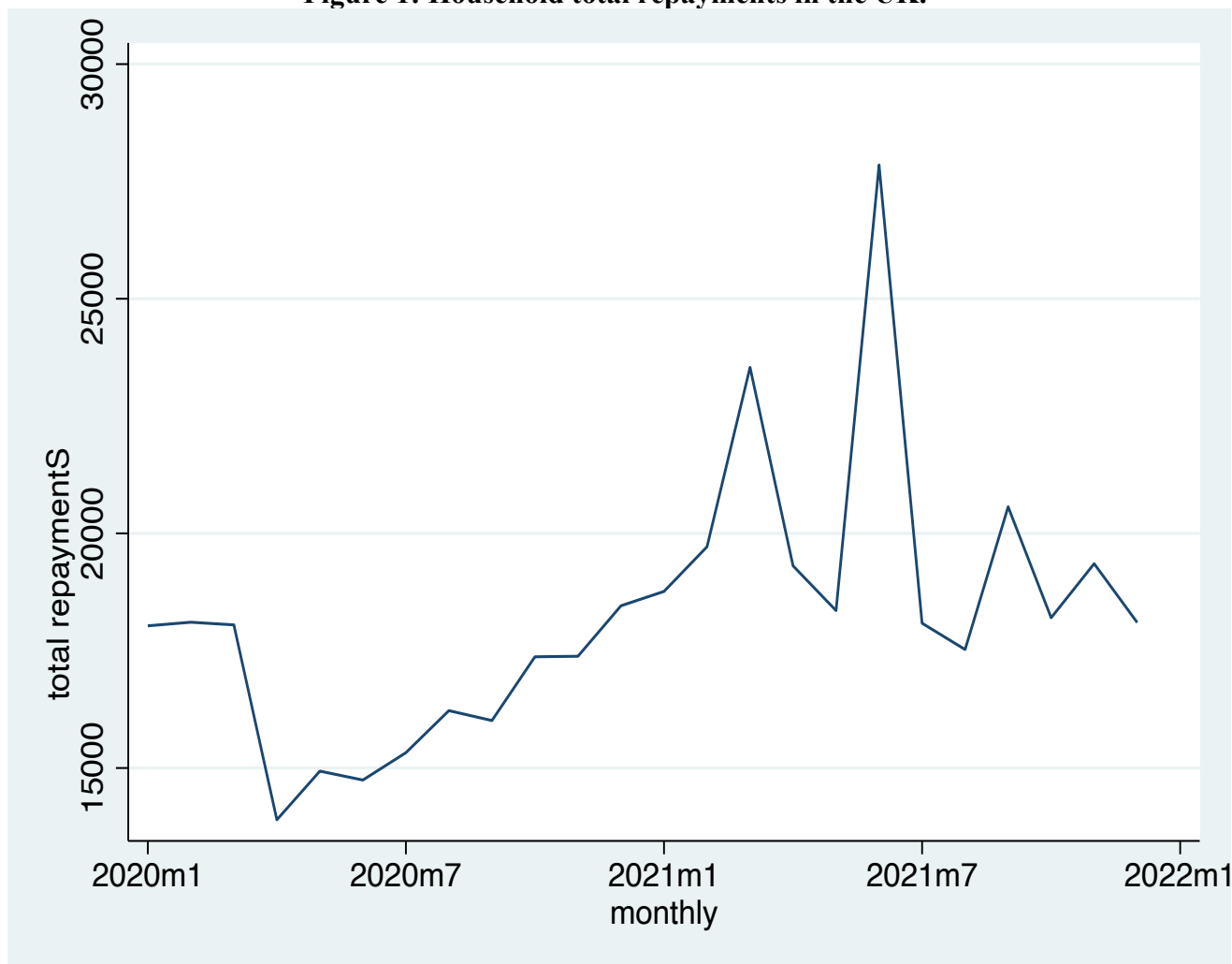
where $p(\cdot)$ is a given density (a skewed student- t in our case), Λ_t is an unobserved state-variable vector, $X_t = (X_{it}, i = 1, \dots, n)$ is a vector of observed data (as defined below), and θ contains all unknown parameters in $\mu, \Phi, \lambda, \Sigma$.

Unlike Creal and Tsay (2015) we do not assume that Σ is diagonal. In this model, the dependence structure of the conditional copula is time varying as it depends on the state variables Λ_t . The parameters of the model are $\psi_i = (\beta_{y,i}, \gamma_{y,i}, \phi_{h,i}, \mu_{h,i}, \sigma_{h,i}^2, \rho_i, \nu_{y,i})$. Priors for the parameters of the model are in the online appendix of Creal and Tsay (2015).

3. The Data set

The COVID-19 confirmed cases of infections and deaths are from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale et al. 2021). Household debt repayments come from the Money and Credit statistics of Bank of England and the Business Impact of COVID-19 Survey (BICS) of Office of National Statistics. Figure 1 shows total debt repayments of secured lending by individuals (in sterling millions) in the UK since the pandemic started in January 2020. There was a hike in household debt repayments during the first lock down in April 2020, then it dropped to pick up again with the third lock down in June 2021. In July 2021 there is notably drop and a fluctuation around £18,400 million thereafter. Figure 1 shows a roller coaster type of movement in household debt repayments, suggesting high volatility. This repayment patterns may be unsurprising given the nature of the pandemic that proved difficult to treat.

Figure 1: Household total repayments in the UK.



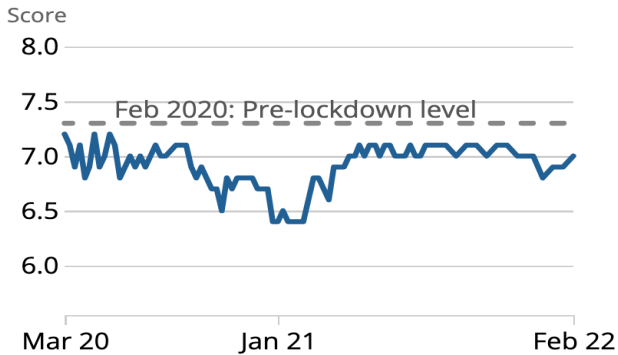
Source: Total repayments of secured lending by individuals (in sterling millions), Bank of England (Money and Credit).

Figure 2 presents the answers to the survey questions of the Office of National Statistics of wellbeing variables in Great Britain. The survey questions refer to life satisfaction, happiness, worthwhileness, and anxiety. Clearly, wellbeing in UK whether measured by life satisfaction or happiness dropped during the first lock down in spring 2020 and thereafter follow a negative trend until January 2021 and there was a correction thereafter, but it has not reached pre-pandemic levels yet. Anxiety, on the other hand, increased during the first lock down and maintained variability over time.

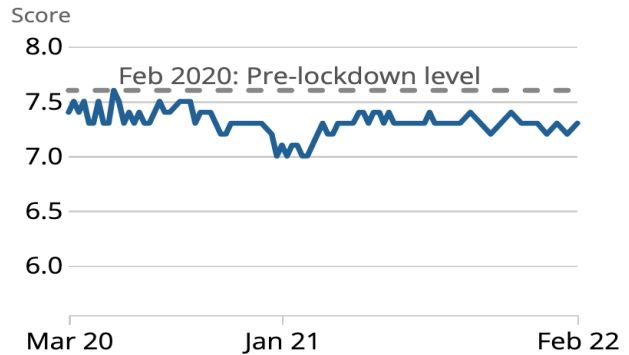
Figure 2: Wellbeing in Great Britain.

Adults in Great Britain, March 2020 to February 2022

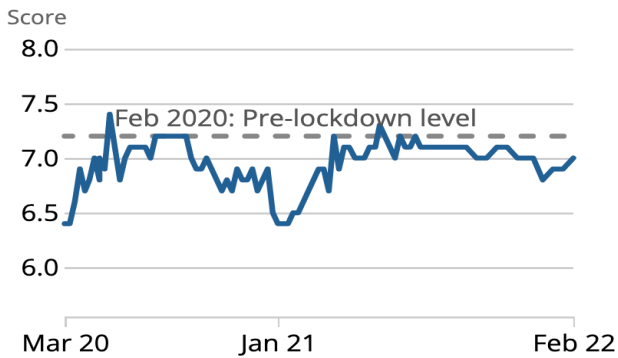
Overall, how **satisfied** are you with your life nowadays?



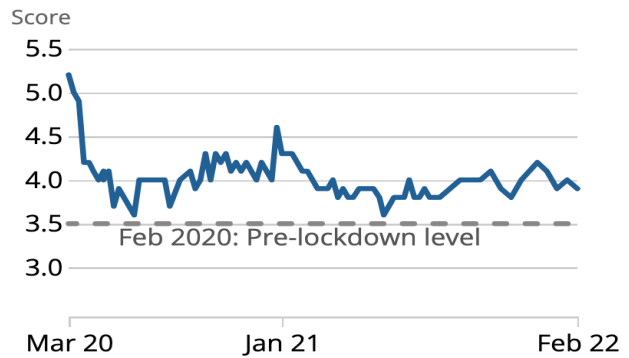
Overall, to what extent do you feel that the things you do in your life are **worthwhile**?



Overall, how **happy** did you feel yesterday?



Overall, how **anxious** did you feel yesterday?



Source: Office for National Statistics – Opinions and Lifestyle Survey

Regarding the exogenous variables, we consider government interventions in three main areas of interventions (from Hale et al. 2021): i) containment and closure, ii) health system, and iii) economic stimulus.² We also employ the overall Stringency Index by Hale et al. (2021) that provides a synthetic measure of the intensity of different non-medical government interventions during the pandemic. The frequency of our data set is weekly, and in Table 1 we report descriptive statistics. The period is from the beginning of the pandemic January 2020 to February 2022; this results in 110 observations.

² The containment and closure interventions include: i) school closing, ii) workplace closing, iii) cancellation of public events, iv) restrictions on gatherings size, v) public transport closed, vi) stay at home requirements, vii) restrictions on internal movement, and viii) restrictions on international travel. The health system interventions include: i) public information campaigns, ii) testing policy, and iii) contact tracing. The third area includes economic stimulus packages such as: income support, and debt or contract relief for households.

Table 1: Descriptive statistics of COVID-19 related data.

	Mean	Std. Dev	Min.	Max
<i>Endogenous Variables</i>				
Life Satisfaction	6.901	0.2078	6.4	7.2
Happiness	6.934	0.2275	6.4	7.4
Anxious	4.022	0.2656	3.6	5.2
Confirmed Cases (infections)	17305	323540	0	1.83E+07
Confirmed Deaths	36487	49725.7	0	15957
Total Repayments	18246	2892.2	13898	27851
<i>Exogenous Variables (government interventions)</i>				
Vaccination Policy	2.4331	2.2511	0	5
School Closing	1.4935	0.9952	0	3
Workplace Closing	1.8709	0.9473	0	3
Close Public Transport	0.7517	0.4320	0	1
Stay Home Requirements	0.6505	0.8107	0	2
International Restrictions	2.0492	1.1329	0	3
Stringency Index	55.368	23.0523	0	87.96
Income Support	1.4363	0.90388	0	2
Debt Contract Relief	1.6181	0.66335	0	2

Note: CPVID-19 data, like infections and deaths, from Hale et al. (2021) are of daily frequency, and we convert to weekly for this study.

4. The dynamic copula VAR model

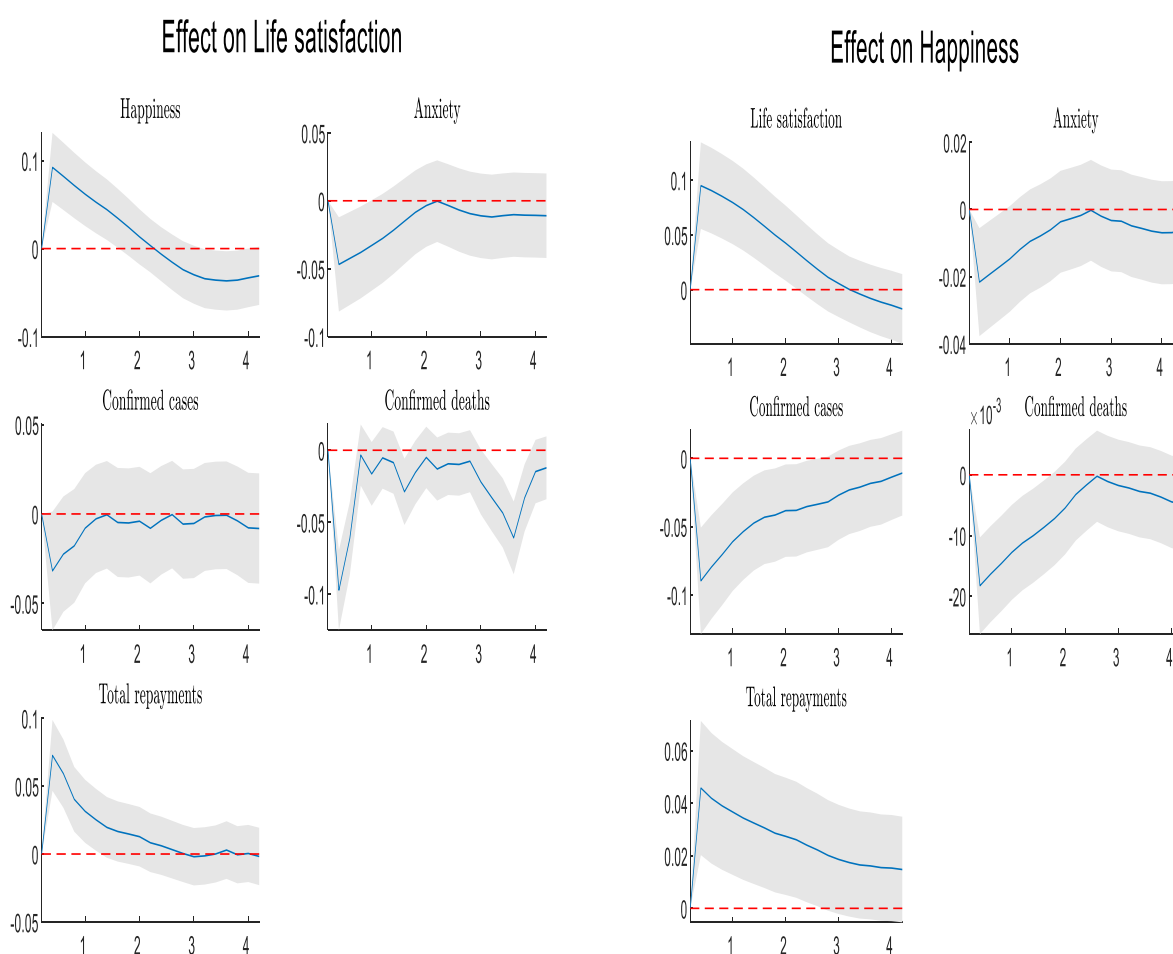
We estimate the stochastic volatility models of Equation (1) by extending MCMC as in Omori et al. (2007). In each MCMC algorithm, we use 25,000 draws and discard the first 5,000 draws as a burn-in. The cumulative distribution functions (CDFs) are not available in closed form but can be evaluated by simulation using the particle filter method. We compute the posterior means $\bar{\psi}_i$ and $\bar{u}_{it} = 1 - F(Y_{it} \leq y_{it} | y_{i,1:t-1}, \bar{\psi}_i)$ where $F(\cdot)$ denotes the CDF using 100,000 particles. In turn, we take $\bar{u}_t = (\bar{u}_{it}, i = 1, \dots, n)$ as data to estimate a skewed Student- t copula. Define $\bar{x}_{it} = \Phi^{-1}(\bar{u}_{it})$ and we test

for normality using the Anderson-Darling statistic. Normality is found to hold. Additionally, as n is small we use the particle Metropolis–Hastings sampler, see Andrieu et al. (2010). All results are available on request but here we focus on reporting generalized impulse response functions (GIRFs) in the final week of the data.

4.1 The Generalised Impulse Response Functions (GIRFs)

On the x-axis we report months and the y-axis we report GIRFs with 95% highest posterior density intervals. Figure 3 reports the response of happiness to confirmed cases, deaths, and total household debt repayments as well as anxiety.

Figure 3: Response of happiness/ life satisfaction in UK to shocks in debt repayments and COVID-19.

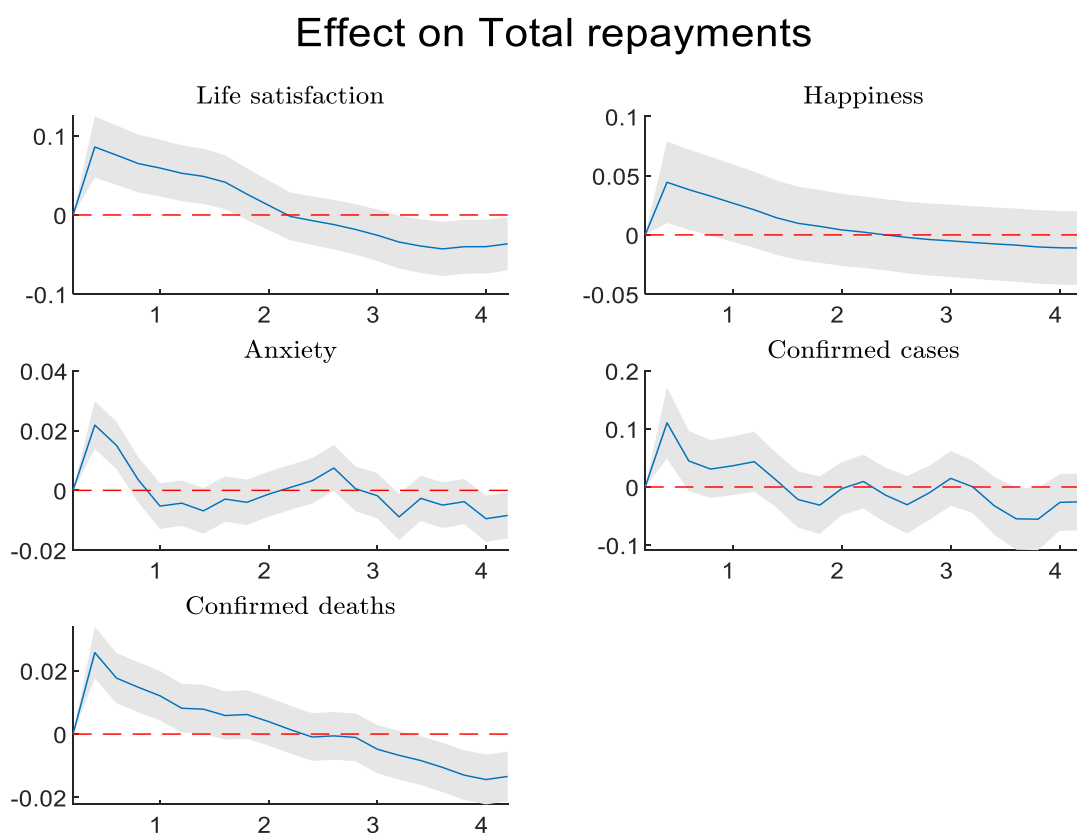


Source: Authors' estimations.

Clearly, COVID-19 shocks as measured by confirmed infection cases and deaths assert a negative impact on happiness, while the impact of total debt repayments is positive during the pandemic. The responses of life satisfaction to confirmed cases and deaths are negative like in the case of happiness though these responses are of lower magnitude and short lived as they converge to zero within a month. The impact of anxiety on happiness and life satisfaction is also negative and lasts for two months. These results confirm the descriptive, survey-type, statistical analysis of OECD (2021) that argue that the pandemic could reduce happiness across OECD countries.

As feedback loops could be in operation, Figure 4 reports the responses of household debt repayments to shocks in life satisfaction and COVID-19.

Figure 4: Response of total debt repayments in UK to shocks in life satisfaction and COVID-19.

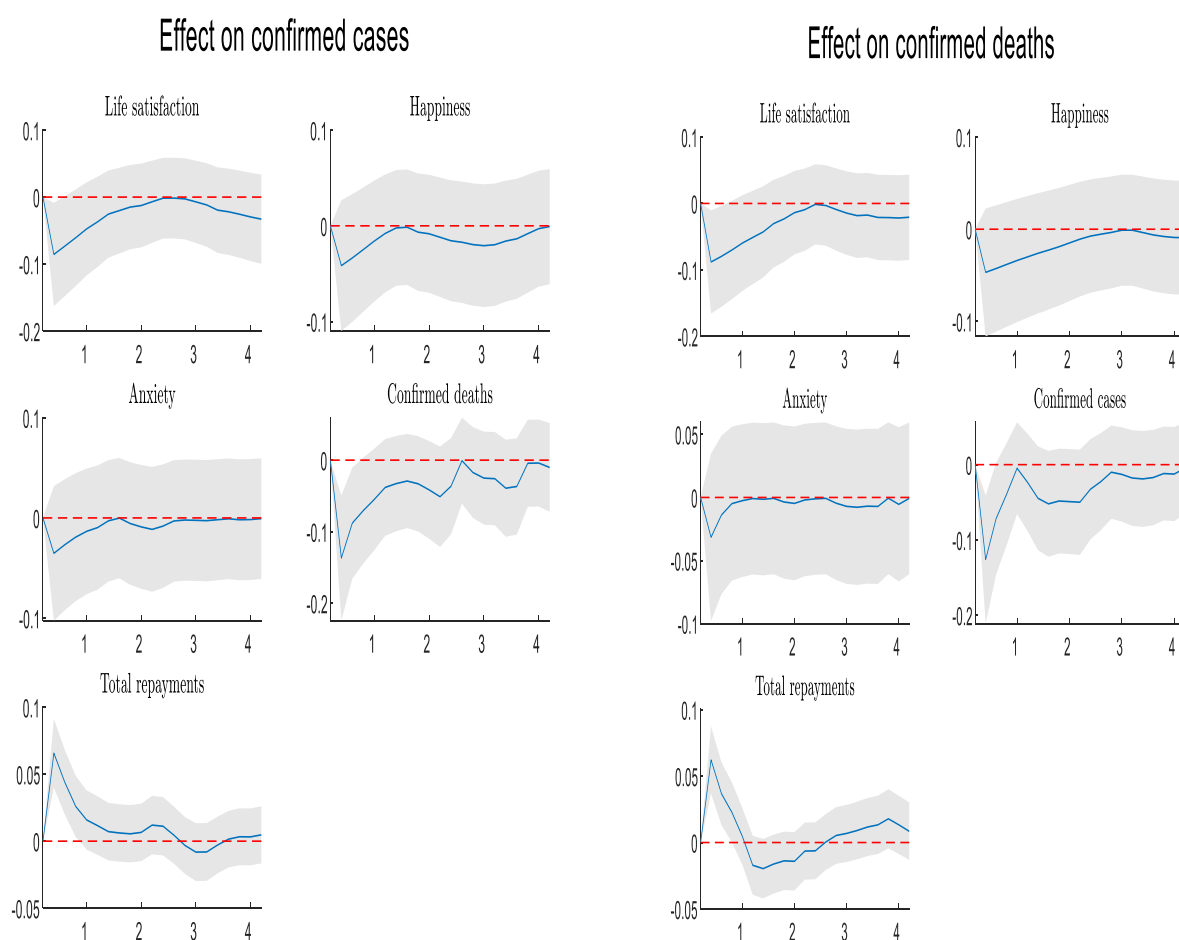


Source: Authors' estimations.

Life satisfaction and happiness assert a positive impact on debt repayments that lasts for two months. Anxiety also asserts a positive impact but last shorter and has lower magnitude than life satisfaction. Both infections (confirmed cases) and deaths increase total debt repayments, but this effect lasts for less than a month. These GIRFs provide evidence that although feedback loops from happiness to household debt repayments are also in operation the dominant time varying causal association is from the latter to the former.

Figure 5 reports the response of infections (confirmed cases) and deaths to shocks in life satisfaction and happiness as well as anxiety, and total household debt repayments.

Figure 5: Response of infections in UK to shock in life satisfaction and total repayments.



Source: Authors' estimations.

Shocks in life satisfaction and happiness assert a negative impact on infections, suggesting that being happy may mitigate COVID-19 infections and deaths, maybe by strengthening the immune system. The impact of anxiety is negative but of low statistical significance. Interestingly shocks in debt repayments increase infections and deaths in the very short run. So, paying household debt does little to battle COVID-19.

Our model in Equation (1) also includes exogenous control variables that refer to government interventions. Table 2 reports the effects of these exogenous variables on happiness, infections, deaths, and total repayments from the Bayesian VAR. Remarkably all governments interventions whether these refer to lock down measures, such as workplace closing, pharmaceutical interventions, like vaccination policy, or other financial interventions, such as income support and debt contract relief, positively impact upon happiness and life satisfaction. On the other hand, stay at home would increase anxiety. All government interventions but financial interventions seem to reduce infections and deaths. Lastly all government interventions, but international travel controls, positively affect debt repayments.

Table 2: Effects of Exogenous Variables on Happiness, COVID-19 and Debt Repayments.

	Happiness	Life Satisfaction	Anxiety	Infections	Deaths	Total Repayments
Stringency Index	0.032*** (3.717)	0.005** (2.132)	0.012 (1.320)	-0.0035*** (3.470)	-0.051*** (2.818)	0.035*** (2.442)
Vaccination Policy	0.015*** (2.671)	0.0032 (1.788)	0.015 (0.552)	-0.0022*** (4.719)	-0.072*** (3.455)	0.082*** (2.655)
School Closing	0.071*** (2.552)	0.0044 (1.825)	-0.034 (1.505)	-0.015*** (2.851)	-0.055*** (2.913)	0.054** (2.165)
Work Place Closing	0.032 (0.015)	0.0031** (2.166)	-0.012 (1.673)	-0.047*** (2.780)	-0.177*** (2.941)	0.030*** (2.365)
Close Public Transport	0.005** (2.141)	0.004 (0.166)	0.005 (1.128)	-0.056 (3.781)	-0.059*** (2.621)	0.0071*** (3.793)
Stay at Home Requirements	0.002*** (2.772)	0.003 (1.232)	0.004*** (2.352)	-0.14*** (5.322)	-0.166*** (3.012)	0.055 (1.336)
International Travel Controls	0.0024*** (4.761)	0.001 (0.043)	0.035 (1.892)	-0.071*** (5.215)	-0.072*** (2.555)	-0.0052 (0.0820)
Income Support	0.056*** (3.782)	0.005 (0.717)	-0.025 (1.787)	0.045 (0.0321)	-0.033 (0.457)	0.235*** (5.882)
Debt Contract Relief	0.0015 (1.423)	0.002 (0.474)	-0.0044 (0.785)	0.017 (0.022)	0.0045 (0.775)	0.351*** (4.558)

Notes: Posterior z-statistics in parentheses (viz. posterior means divided by posterior standard deviations).

5. Conclusion

This paper examines whether the increase of household debt repayments during the early COVID-19 lockdowns has asserted an impact on life satisfaction in UK. Our evidence reveal that increasing household debt repayments may enhance happiness, while happiness seemingly reduces infections. Interestingly lock down measures increase happiness and life satisfaction, though stay at home increases anxiety. At the same time, income support and debt relief would increase household debt repayments.

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