Journal of Critical Reviews

ISSN- 2394-5125 Vol 7, Issue 12, 2020

REVISITING ASYMMETRIC CAUSAL LINK BETWEEN HAPPINESS AND SMOKING IN JAPAN

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Received: 01.03.2020 *Revised: 03.04.2020* *Accepted: 05.05.2020*

Abstract:
Smoking and happiness both can affect health. A complex question on whether there is correlation between smoking and happiness cannot be simply examined by symmetric methodology. Japan is one of the country with the large smoking population in Asia. This paper reexamines the relationship between happiness and smoking in Japan over the period from 1961-2003, using an asymmetric Granger causality test proposed by Hatemi-J [1]. Empirical results indicate asymmetric Granger causal relationship did exist between happiness and smoking behaviour in Japan. Our results have important policy implications in Japan.

Keywords: Happiness, Smoking, Asymmetric Granger causality test , Japan

DOI: http://dx.doi.org/10.31838/jcr.07.12.06

INTRODUCTION

There are many studies have been devoted towards exploring the relationship between happiness and economic factors such as inflation, employment, and freedom to make life choices [2,3]. However, with the exception of Moore [4], none have been done on causal link between happiness and smoking behaviour.[1]

As we know that both smoking and happiness can affect long-term health and the relationship between happiness and smoking is a complex issue [4]. Empirical evidence suggests that smoking can act as a coping measure when perceived levels of stress increase [5]. Depressed smokers are less likely to quit [6] and cessation can promote depression [7]. However, on the other hand, Goel[8] found that greater economic stress will lower cigarette smoking. We believe that this kind relationship cannot just use simple symmetric methodology to study its relationship and the aim of our study is to revisit the causal relationship that potentially exists between happiness and smoking behaviour in Japan, using an asymmetric Granger causality test proposed by Hatemi-J [1] over the period 1961-2003. The plan of this paper is organized as follows. Section 2 presents the data used in our study. Section3 briefly describes the asymmetric Granger causality test proposed by Hatemi-J and Uddin [9]. Section 4 presents our empirical results and discusses some economic and implications of our empirical findings. Section 5 concludes the paper.

Data

In this study, we use annual data covering the period 1961–2003 for Japan. Data for per capita cigarette consumption is from the Earth Policy Institute data centre and is available for download at: http://www.earth-policy.org/data_center/C26. Data for the Happiness Index is measured in terms of average level of life satisfaction and is sourced from the Trend in Nations from the World Database of Happiness

Asymmetic Granger Causality Test by HATEMI-J (2012)

The Hatemi-J[1] test allows for asymmetric causal effects. Positive or negative shocks may have different causal impacts. Assume that we have two integrated variables $\{y_t\}_{t=1}^{T}$ and $\{x_t\}_{t=1}^{T}$, they have the following data generating process (DGP):

$$y_t = y_{t-1} + \varepsilon_{1t} = y_{10} + \sum_{i=1}^{T} \varepsilon_{1i} \quad (1)$$

and

$$x_t = x_{t-1} + \varepsilon_{2t} = x_{10} + \sum_{i=1}^{T} \varepsilon_{2i} \quad (2)$$

Where y_{10} and x_{10} are the initial values of y and x respectively, and y and x represent happiness and cigarette consumption per capita (to represents smoking behaviour), respectively, and the variables ε_{1t} and ε_{2t} are i.i.d with variance $\sigma^2_{\varepsilon_1}$ and $\sigma^2_{\varepsilon_2}$ respectively. Positive and negative shocks are defined as the following: $\varepsilon^+_{1t} = \max(\varepsilon_{1t},0), \varepsilon^+_{2t} = \max(\varepsilon_{2t},0), \varepsilon^-_{1t} = \min(\varepsilon_{1t},0), \text{and } \varepsilon^-_{2t} = \min(\varepsilon_{2t},0)$ respectively. Therefore, we can express $\varepsilon_{1t} = \varepsilon^+_{1t} + \varepsilon^-_{1t}$ and $\varepsilon_{2t} = \varepsilon^+_{2t} + \varepsilon^-_{2t}$ and write equations (1) and (2) as:

$$y_t = y_{t-1} + \varepsilon_{1t} = y_{10} + \sum_{i=1}^{t} \varepsilon^+_{1i} + \sum_{i=1}^{t} \varepsilon^-_{1i} \quad (3)$$

and

$$x_t = x_{t-1} + \varepsilon_{2t} = x_{10} + \sum_{i=1}^{t} \varepsilon^+_{2i} + \sum_{i=1}^{t} \varepsilon^-_{2i} \quad (4)$$

Following Granger and Yoon (2002), Hatemi-J (2012) defines both positive and negative shocks of each variable in a cumulative form such that

$$y^+_t = \sum_{i=1}^{t} \varepsilon^+_{1i},\ y^-_t = \sum_{i=1}^{t} \varepsilon^-_{1i},\ x^+_t = \sum_{i=1}^{t} \varepsilon^+_{2i}, \text{and } x^-_t = \sum_{i=1}^{t} \varepsilon^-_{2i}$$

Each positive as well as negative shock has a permanent impact on the underlying variable. To test the causal relationship between these two components, Hatemi-J [1] and Hatemi-J and Uddin [9] developed a single test statistic in time domain, assuming it holds for all points in the frequency distribution. There are four combinations of positive and negative shocks $((y^+_t, x^+_t), (y^+_t, x^-_t), (y^-_t, x^+_t), \text{and } (y^-_t, x^-_t))$ as suggested by Hatemi-J and Uddin [9]. To test for asymmetric causality, we can us a vector autoregressive (VAR) model with optimal lag length determined by the Schwarz information criteria (SIC). After the optimal amount of lags (*L*) have been

established, we use a Wald test to test for Granger causality via the VAR(L) model. Specifying the VAR(L) model as

$$y^k_{it} = c + A_1 y^k_{it-1} + A_2 y^k_{it-2} + A_3 y^k_{it-3} + ... + v^k_{it} \quad (5)$$

where $Y_{it} = (Y_{1t}, X_{1t})$, and Y and X represent happiness and smoking behaviour, k is the type of components i.e. positive, negative or actual and A_i is the matrix of parameters. The VAR(L) model can be simplified to

$$Y = DZ + \delta \quad (6)$$

The null hypothesis of no Granger causality, thus $R\beta = 0$, is tested by the following:

$$Wald = (R\beta)'[R((Z'Z)^{-1} \otimes S)R')^{-1}(R\beta) \quad (7)$$

Where R is an indicator matrix of the parameters (restricted parameters indicated by ones), β is the column stack of D, S is the variance–covariance matrix of the unrestricted model, and here $\otimes$ is the Kronecker product. As noted by Hatemi-J and Uddin [9], due to the existence of autoregressive conditional heteroskedasticity (ARCH) effects in financial data, they do not usually follow a normal distribution and hence there is the possibility that the distribution of the Wald statistic substantially deviates from its asymptotic distribution. We thus use the bootstrapping simulation technique based on Hatemi-J and Uddin [9] for 10000 iterations to construct the 10%, 5%, and 1% critical values from the empirical distribution.

Empirical Result and Policy Implications

Table 1 reports the results of our Granger causality test for both symmetric and asymmetric forms of Granger causality tests. Based on empirical results from Table 1, we find that one-way symmetric Granger causality running from happiness to smoking behaviour. This result indicates that happiness did relate to smoking behaviour. However, if look at the results from asymmetric Granger causality test and we find that positive shocks from happiness one-way Granger causes negative shocks of smoking behaviour. This result confirms the previous finding from Chang *et al.* [10] indicates that happier people will smoke less. On the other hand, we also find positive shocks from smoking behaviour Granger causes negative shock of happiness. This result further indicates that smoking might only have temporary effect on the happiness of people. For a smoking addicted person, more smoke does not mean more happiness for him or her. There might be existed a threshold in the number of smoking.

Table 1. Granger Causality between Happiness and Smoking (Japan)

	Statistics	CV 10%	CV5%	CV1%
$Y -/-> X$	11.200***	2.831	4.135	7.509
$X -/-> Y$	0.746	2.878	4.212	7.623
$Y^+ -/-> X^+$	0.549	3.087	4.551	8.464
$X^+ -/-> Y^+$	1.824	2.869	4.117	7.972
$Y^- -/-> X^-$	0.003	2.880	4.442	9.066
$X^- -/-> Y^-$	1.647	2.932	4.388	9.386
$Y^+ -/-> X^-$	5.216**	2.850	4.175	7.797
$X^- -/-> Y^+$	0.077	2.808	4.324	10.137
$Y^- -/-> X^+$	2.354	2.892	4.253	8.026
$X^+ -/-> Y^-$	5.173**	2.834	4.404	10.151

Note 1: Both Y and X denotes Happiness and smoking behaviour, respectively.

2. We thus use the bootstrapping simulation technique based on Hatemi-J and Uddin [9] for 10,000 iterations to construct the 10%, 5%, and 1% critical values from the empirical distribution.

There are several major policy implications from our study. First, we find evidence of one-way Granger causality running from happiness to smoking behaviour. Second, we find positive shocks from happiness affect negative shocks of smoking behaviour. These empirical findings further imply that the function of happiness may exert a large impact on the smoking behaviour in Japan. Third, evidence shows one-way asymmetric Granger causality running from positive shocks of smoking behaviour to negative shocks of happiness. This result indicates the more people smoke, the less happiness they feel. Smoking does not do any good for people. The major policy implication of our study is that the government of Japan should create a happier environment and this will further reduce the smoking in Japan.

CONCLUSION

This paper reexamines the relationship between happiness and smoking behaviour in Japan over the period from 1961-2003, using an asymmetric Granger causality test proposed by Hatemi-J (2012). Empirical results indicate asymmetric Granger causal relationship did exist between happiness and smoking behaviour in Japan. Our results have important policy implications in Japan.

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