

The Index of Happiness and Economic Growth

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Abstract

"Perfect happiness is enthusiasm minus expectation"

Sri Chinmoy

1 Introduction

The goal of economics is commonly stated in textbooks as maximizing social welfare¹. The total welfare is usually related to economic growth or the level of income in the economy. Starting from 1970s a separate growing branch of non-conventional economics has developed around the subject of happiness and its relation to income and non-income factors.² The body of current research includes finding different aspects of happiness and unhappiness. The survey data for the United States shows the following typical factors causing unhappiness: unemployment, stress, economy, healthcare, education, being nervous about future prospects, dissatisfied with public life, politics being corrupted, not saving enough, wars, terrorism, climate change, not pursuing other countries happiness. As indicators of happiness the following reasons are mentioned: high income per capita, America has diversity, freedom of choice of life/location, immigrants want to come here, equality of happiness in spite of inequality of income, religious participation, donations to charities, importance of family and friends.

Some researchers found no direct link between average happiness and average income in cross-country analysis, some found a satiation point beyond which income becomes less important, while others traditionally claim that income has a direct link with significant marginal factor at all levels of income.³ Researchers from other social sciences, such as sociology and psychology significantly contributed to this debate.

Alternative literature on spirituality and happiness explores such variables as one's feelings of love of God, closeness with God, purpose in life, gratitude, self-perfection and experiences similar to climbing to a peak of a

¹See e.g. Mankiw

²In fact more than 200 years ago Thomas Jefferson wrote extensively on the subject of happiness in America and the Declaration of Independence states the pursuit of happiness as an unalienable right. He also advocated economic freedom. See Matthews (1984) among others.

³See Easterling (1974, 1995), Clark et al (2008), Deaton (2008), Stevenson and Wolfers (2008) among others.

mountain. The subject of what brings inner happiness in addition to the outer circumstances is of great importance for the research of happiness. I will take as example Sri Chinmoy's book entitled *The Jewels of Happiness* to encounter for these factors.

There has been some effort on construction of indices of well-being (such as the Gross National Happiness introduced in Butan or the Human Development Index of the United Nations) and its measurement depends on several aspects of well-being of country citizens rather than just based on the Gross National Product.

We would like to introduce several new measures as part of this experiment, in particular, construct the index of happiness that will be composed of standard variables such as income and demographics and some new measures that may not be correlated with income. The new factors will reflect economic freedom, oneness, enthusiasm and expectation. We define these variables below using data from the surveys.

A vast multicountry survey data was collected for a wide range of advanced and developing countries and is available from the World Values Survey website. Our index will be estimated using ordered probit/logit panel data models, since the responses on the questions of happiness and life satisfaction are ordered from 1 to 4 or from 1 to 10.

We use numerous survey variables that may or not be significantly correlated with income and use the principal components (PC) analysis. Since many explanatory variables from the survey are highly correlated the PC help to remove the multicollinearity problem using reduced number of factors (PCs) which are linear combinations of the explanatory variables.

We extend the standard ordered choice models to the ordered choice principal components model where the number of factors (principal components) is selected using several model choice criteria. The standard choice is to select number of factors capturing large part of the variance of the explanatory variables without considering the effect of factors on the dependent variable. The alternative method introduced by Aguilera et al. (2006) for the binary logit model is to use the significance of principal components in the logit model for the response variable and dropping insignificant PCs.

We also consider aspiration or the pursuit of happiness as a dynamic process. Sri Chinmoy⁴ (2010) says on pp 212-213 "At every moment we have to be satisfied with the present. But inside our satisfaction we should always be aiming at a higher goal."

It is well known that the index of consumer sentiment is highly correlated with the business cycle and is one of the leading indicators. After deriving a new index of happiness based on all the factors that were tested in the literature and adding important factors discussed above we will test its relationship with the business cycle and the consumer sentiment index.

Overall, this paper uses a vast dataset with the most general model estimated so far and adds important factors overlooked in the literature. The results are important for economic research and policy.

The paper is organized as follows. In Section 2 we present the principal components for the ordered choice models. The empirical variables, econometric model and methodology are discussed in section 3. Results are explained in section 4, while conclusion and ideas for future research are given in section 5.

2 The Principal Components for the Ordered Choice Models

Let X be a $n \times p$ matrix of independent variables and S the estimated covariance matrix of X . The principal components Z_j are defined as orthogonal linear combinations of X variables $Z_j = XV_j$ ($j = 1 \dots p$), where V_j are the eigenvectors of S with corresponding eigenvalues λ_j sorted in descending order with $\lambda_1 \geq \dots \geq \lambda_p \geq 0$. Note that λ_j is the variance of the j -th principal component. The $n \times p$ matrix of principal components $Z = XV$, where V is a $p \times p$ matrix of eigenvectors.

The eigenvectors are derived from decomposing the covariance matrix

⁴After his passing in 2007, Sri Chinmoy left an unprecedented legacy of writings in addition to his art, music and sports achievements.

$S = V\Lambda V'$, where Λ is a diagonal matrix with $(\lambda_1, \dots, \lambda_p)$ on the diagonal and V orthogonal $VV' = I$.

It follows that $X = ZV'$ and X_j can be approximated by $r \leq p$ principal components:

$$X_j = \sum_{k=1}^r Z_k v_{jk}, \quad j = 1, \dots, p$$

where r is chosen by one of the methods:

- (1) r principal components account for a high percentage of total variability, e.g. $\frac{\sum_{j=1}^s \lambda_j}{\sum_{j=1}^p \lambda_j} \geq .75$.
- (2) the number of principal components is chosen based on the significance of principal components in the regression or ordered probit/logit models.

The ordered probit model is given e.g. in Greene (2008) by:

$$Y^* = X'\beta + \epsilon$$

where Y^* is unobservable. The observable ordered response variable Y is given by

$$\begin{cases} Y = 0 & Y^* \leq 0 \\ Y = 1 & \mu_1 \leq 0 < Y^* \leq \mu_1 \\ \dots & \dots \\ Y = m & \mu_{J-1} < Y^* \end{cases} \quad (1)$$

For the probit model the error term is assumed to have normal distribution, for logit the distribution is logistic. The mean and variance of ϵ are normalized to 0 and 1 respectively. The μ 's and β are unknown parameters to be estimated.

3 Data Analysis

The majority of the data are from the World Values Survey data for the period 1981-2008 for 82 countries. The results of the analysis provide numerous significant factors and the index of happiness that can be compared for the countries in the sample. This work will be continued and submitted for publication later this year.

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