THE INFLUENCE OF THE ECONOMIC CYCLE, RATE OF UNEMPLOYMENT AND AVARAGE INCOME ON SUICIDE IN THE CZECH REPUBLIC

Michaela Antovová – Simona Fučíková

Abstract

The object is to analyse the influence of the economic cycle, rate of unemployment and average income on suicide rate in the Czech Republic. Suicides are discussed topic of the day. It occurs in both types of countries: developed and developing ones. Every culture has different attitude to suicides (positive or negative). Many factors effect on suicide rate. For example, sociological, demographic, historical, cultural, medical, and economic ones, which are analysed in this work.

In recent years, the Czech Republic passed through major changes in the economic situation. In 2008, the economic recession began in the United States and gradually affected many countries around the world, including the Czech Republic. Economic recession had influence on GDP and rate of unemployment.

GDP, rate of unemployment, average income and information about suicide will be used from the Czech Statistical Office.

The work analyses the existence of a relation between GDP and suicide, rate of unemployment and suicide, average income and suicide. Results will be compared with the economic theory by Henry and Short.

Key words: GDP, rate of unemployment, average income, suicide

JEL Code: E23, J19

Introduction

Considerable changes in economic situation happened in the period of last twenty-five years. Firstly, there was a transformation of the Czech economy after the year 1989. Secondly, the split of Czechoslovakia was held in the beginning of the year 1993. A period of economic growth began after that. However, economic depression effected it in 2008. It began as a

mortgage one in the U.S.A. a year earlier and it gave a cause for the world economic depression which gradually affected most of the countries all around the world including the Czech Republic.

The aim of the paper is to find out if the changes in the framework of economic cycle influenced the rate of suicidality and homicide in the Czech Republic. The results will be compared with economic theory of economic-cycle influence on suicidality and homicide according to Henry and Short.

1   Suicide and the economic indicators

According to the Suicide Prevention Centre are risk factors divided into several groups. Biopsychosocial factors are for example, mental illness, addiction and various psychological harm or dysfunction. Environmental ones include events related to the loss of economic security and certainty or loved people. Among sociocultural ones, there are social deprivation and isolation of the individual, cultural and religious convictions. (Woolfová, 2009)

From many factors, that affects on suicidality, this work is focused on economic ones. Economic cycle, alternation of expansion and recession, is very often associated with the number of suicides. to determine dependence of economic situation on suicide Three indicators were selected to determine dependence of economic situation on suicide. GDP per capita, unemployment rate and average income.

1.1   Suicide and economic cycle

1.1.1   Theory of Emil Durkheim

In E. Durkheim's book *Le Suicide. Étude de Sociology*, suicide was discribed from the sociological perspective. The cause of suicides is in the social exclusion of individual from society, i.e. in society behavior to individual. Two basic elements have impact on suicidality: social integration and regulation. Social integration is a possibility of the individual to participate in society - sharing ideas and feelings. Social regulation means limiting behavior of the individual by society. E. Durkheim distinguished four types of suicide. The first is altruistic one, where the suicidal act was done for society, not from own reasons – the person sacrifices its life for society. Suicidal was too much integrated into society. Fatalistic suicide rises from low freedom in society. The individuals are not able, due strictly rules, to fulfill their aspirations. Egoistic one occurs as the result of social exclusion. The anomi onec came after sudden change in the role of the individual in society. For example, loss of property,

funds, etc. Social regulation was too low. This type of suicides is more common during the economic recession and also expansion. In the period of rapid economic change, individuals are not able to adapt in such a short time. For example, during the recession increases the possibility of unemployment, which leads to reduct living standards and seemingly hopeless situation, which can cause suicide. Expansion offers many possibilities, which could person achieve, but the society is not able to secure them. (Durkheim, 1966; Lester, 1997; Mühlpachr, 2008; Petrusek, 2011; Viewegh, 1996)

Tab. 1: Types of suicides by social integration and regulation

	Social integation		Social regulation	
	Weak	Strong	Weak	Strong
Type of suicide	Egoistic	Altruistic	Anomic	Fatalistic

Source: Petrusek, 2011; Lester, 2001

Lester and Yang discribe Durkheim suicide in four equations. The first one shows, that suicidality (S) is a function of social integration (SI) and social regulation (SR). Other two of them indicate that social integration and regulation are closely related to economic cycle. The letter y denotes index of economic growth. For expansion is y > 0 and y < 0 indicates recession. Last equation calculates index of economic growth, i.e. difference between current ($\hat{y}$) and potential economic growth ($\hat{y}^*$). (Lester 1997; Symonds, 1991)

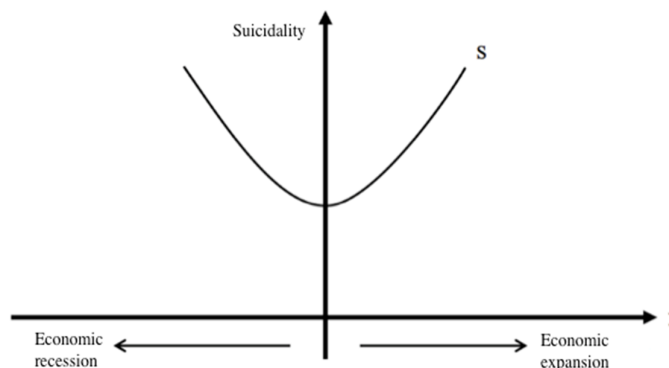$$S = f\,(SI,\ SR) \tag{1.1}$$

$$SI = g\,(y) \tag{1.2}$$

$$SR = h\,(y) \tag{1.3}$$

$$y = \hat{y} - \hat{y}^* \tag{1.4}$$

Durkheim argues, that lower social regulation leads to higher suicidality and significant economic changes to low social regulation. This theory can be written in equation (see (2.5)) or to draw up into simple function (see Figure. 1). (Lester, 1997)

$$\frac{dS}{d\,|y|} > 0 \tag{1.5}$$

Fig. 1: Dependence of suicide on economic cycle, acording to Durkheim
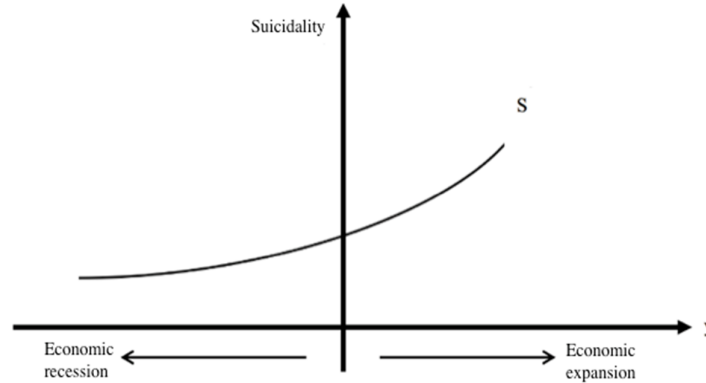

Source: Lester, 1997

1.1.2   Theory of Ralph Ginsberg

Ginsberg enriched Durkheim's sociological idea of anomic suicide of psychological concepts. He noted influence of aspiration on suicide. Durkheim showed anomic suicide on example of financial fall and rise. If social regulation is low, the individual desires will not have limits and their wishes will not be realizable. Ginsberg noted, that anomie is based on individual's discontent, which stems from discrepancy of current rewards and level of their aspirations. If social norms are set, which regulate the level of aspiration and it remains proportional rewards, individual is relatively satisfied. In the case of rapid economic changes, society is not able toregulate (in such a short time) and prepare the individual for the new situation. Then, there will be discrepancy between rewards and aspirations, it causes dissatisfaction. (Lester, 1997)

If rewards are growing faster than desire, the individual is satisfied. Otherwise there will be anomic process, when the aspirations moving away with increasing tendency from rewards. It causes increasing dissatisfaction and leads to growth of suicidality. This pattern is typical in periods of economic expansion. In economy recession aspiration decrease faster than rewards, which leads to reducing differences between them and the rate of dissatisfaction and suicidality is decreasing. In order to record effect of dissatisfaction on suicidality, dissatisfaction of individual was expressed by average level of dissatisfaction. This concept can be summarized by equation below (see (2.6)) and function (see Figure. 2). (Lester, 1997)

$$\frac{dS}{dy} > 0 \qquad\qquad (1.6)$$

**Fig. 2: Dependence of suicide on the economic cycle by Ginsberg**

Source: Lester, 1997

1.1.3 Theory of Henry and Short

Henry and Short analyzed relationship between business cycle and suicide, murder. Their research concluded, that suicidality decrease in the period of economic expansion. They established several assumptions. Aggression is often the result of frustration. Frustration is caused by inability to maintain or improve the position in society. The economic cycle affects on changes in position of social arrangement. During recession occurs relative decrease of status for persons with high position in relation to persons with low position in society. Conversely, during the expansion the high status person position relatively improves. Suicides appear predominantly in higher layer of society and homicide is typical for lower layer of society. People in higher position lost during the economic recession more income (this will be greater decline in their social status) than people in lower position. This leads to frustration and aggression, which is in the higher layer often directed against itself, than against others. These facts leads to conclusion, that suicide inversely dependent on the economic cycle. It is possible to resume it in the following equation (see (2.7)), and clearly indicate into the graph (see Figure. 3). (Lester, 1997)

$$\frac{dS}{dy} < 0 \qquad (2.7)$$

Fig. 3: Dependence of suicide on the economic cycle, according to Henry and Short
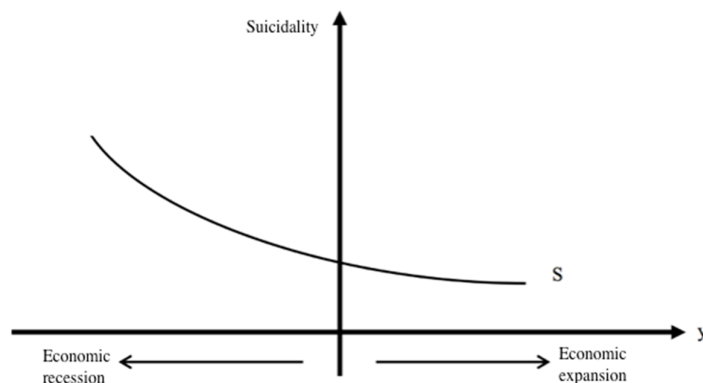
Source: Lester, 1997

1.2 Suicide and the rate of unemployment

Unemployment is unfavorable situation in life of every individual, especially long-term unemployment can have very serious consequences on psychical health. Individual can lose his income and social status, but also important social bonds, that are formed mainly at work. An unemployed person may be excluded from the society. Low social integration leads to, according to Durkheim, increasing probability of suicide.

Okun's law describes relation between unemployment and the rate of growth of gross domestic product. If unemployment rate increases by 1%, this phenomenon will be accompanied by a reduction in GDP of 2-3%. If you would take into consideration the Herny and Short theory of indirect dependence suicide rates and business cycle, it would be true: the rate of unemployment will increase, GDP will decrease and this leads to the increase of suicide rate. (Soukup, 2011)

Hamermesh and Soss theory is based on the maximalization of individual lifelong utility. If the discounted stream of expected utility of life is zero, indivudual will commit suicide. Utility depends on age and permanent retirement. It is possible to note it:

$$U (a, PI) \tag{2.8}$$

U stands for utility and age. PI is permanent retirement. Permanent retirement is expected income over the life of the individual. Income comes mainly from work. If income is higher, it will be lower probability of commiting suicide, because they can afford higher consumption (leading to satisfy requirements) and cost of sacrificed opportunity would be

very high. Costs are incomes, which could individual earn during his life and didn't commit suicide. Total satisfaction decreases with age = marginal utility of consumption declines with age. Consumption will no longer satisfy individual on the same level like in lower age - suicide risk grows. In case of unemployment, spectrum of future income and utility is low and uncertain. Suicide probability is higher. (Hamermesh and Soss, 1974)

1.3   Suicide and avarage income

According to mentioned Hamermesh and Soss function, utility is influenced by permanent retirement..Income in near future is of the top importance. If it rises, the consumption and satisfaction will grow and this will lead to reduction of suicide risk. (Hamermesh and Soss, 1974)

2   Analysis of dependence between rate of suicidality and economic indicators

The relation between rate of suicidality and selected economic indicators were investigated by using time series in statistical software eViews. Firstly, Dickey-Fuller test was used, which determinates, if time series and their residues are stationary or not. If they are non-stationary time series and residuals are stationary, it will be the case of cointegration regression, which suggests that, between time series could be short or long term relation. If the time series and residues are non-stationary ones, it will be apparent regression. Could be find only a short-term relation.

2.1   Suicidality and GDP

Stationarity of time series and residues was verified and was demonstrated cointegration regression.

Tab. 2: Unit root test of suicidality, GDP and residues

	t-Statistics	Prob.
suicidality	-2,010142	0,2806
GDP	-1,561744	0,4837
residues	-2,204980	0,0294

Source: eViews, own calculation

Correlation in time series was detected, therefore it was necessary to add into model delayed variables. After a dynamization model and subsequent removal of statistically insignificant variables were performed diagnostic tests of model, which are consisted from three steps. Verification autocorrelation, normality and conditional heteroskedasticity. Model was proved, because diagnostic tests confirmed, that unsystematic component of model is not autocorrelated (Breusch-Godfrey Serial Correlation LM Test), has a normal distribution (Normality Test: Jarque-Bera) and it is homoskedastic (heteroscedasticity test: ARCH).

Tab. 3: Dynamized model of short-term relation between suicidality and GDP

```
Dependent Variable: SEBEVRAZEDNOST
Method: Least Squares
Date: 04/02/14   Time: 20:11
Sample (adjusted): 1991 2012
Included observations: 22 after adjustments
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.028955	3.758682	2.136109	0.0467
SEBEVRAZEDNOST(-1)	0.629937	0.190594	3.305118	0.0039
HDP	-6.38E-05	1.86E-05	-3.419587	0.0031
HDP(-1)	5.77E-05	1.86E-05	3.099369	0.0062

R-squared	0.861651	Mean dependent var	15.80611
Adjusted R-squared	0.838593	S.D. dependent var	1.683669
S.E. of regression	0.676422	Akaike info criterion	2.218966
Sum squared resid	8.235837	Schwarz criterion	2.417337
Log likelihood	-20.40863	Hannan-Quinn criter.	2.265696
F-statistic	37.36868	Durbin-Watson stat	2.352526
Prob(F-statistic)	0.000000		

Breusch-Godfrey Serial Correlation LM Test	1,023036	Prob. F(2,16)	0,3819
Normality Test: Jarque-Bera	0,774615	Prob	0,678882
Heteroskedasticity test: ARCH	0,121979	Prob. F(1,19)	0,7307

Source: eViews, own calculation

From eViews was obtained model

$$\text{SUICIDALITY}_C = 8{,}028 + 0{,}629\ \text{SUICIDALITY}_{t-1} - 6{,}38\text{E-}05\ \text{GDP}_t +$$

$$5{,}77\text{E-}05\ \text{GDP}_{t-1} + a_t$$

Indirect relation between suicidality and GDP is noticeable from the equation, i.e. if GDP decreases, suicidality will inrease. Model explains dynamics of time series, using the index of determination, on 86.1%.

Model of long-term relation between suicidality and GDP could be written by using error correction model (EC).

$$\Delta SUICIDALITY_t = 8,028 \ -6,38E-05 \ \Delta GDP_t \ -0,370(SUICIDALITY_{t-1} \ -3,28E-04$$
$$GDP_{t-1}) + a_t$$

The long-term indirect relation between among indicators is in brackets. Value -0.370 expresses burden (γ). The greater burden, the stronger long-term relation. It is confirmed weak long-term relation.

2.2 Suicidality and rate of unemployment

Time series and residues demontrated non-stazionarity. It is apparent regression.

Tab. 4: Unit root test of suicidality, rate of unemployment and residues

	t-Statistics	Prob.
suididality	-2,010142	0,2806
rate of unemployment	-1,173852	0,6655
residues	-1,938213	0,0520

Source: eViews, own calculation

Differentiation of time series did not find any short-term relation (Prob. 0,3763 a 0,6879).

Tab. 5: Model of suicidality and rate of unemployment after differentiation

```
Dependent Variable: D(SEBEVRAZEDNOST)
Method: Least Squares
Date: 04/03/14   Time: 12:10
Sample (adjusted): 1991 2012
Included observations: 22 after adjustments
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.186410	0.206003	-0.904891	0.3763
D(MIRA_NEZAMESTNANOSTI)	0.057684	0.141506	0.407643	0.6879

R-squared	0.008240	Mean dependent var	-0.163596
Adjusted R-squared	-0.041348	S.D. dependent var	0.911249
S.E. of regression	0.929897	Akaike info criterion	2.779022
Sum squared resid	17.29416	Schwarz criterion	2.878208
Log likelihood	-28.56924	Hannan-Quinn criter.	2.802387
F-statistic	0.166172	Durbin-Watson stat	2.315436
Prob(F-statistic)	0.687867		

Source: eViews, own calculation

Other methods of calculation could have confirmed relation. For example, various types of regression. The method of cointegration in time series might have been successful, if longer time series were available

2.4   Suicidality and avarage income

After application of unit root test was found cointegration regression.

Tab. 6: Unit root test of suicidality, avarage income and residues

	t-Statistics	Prob.
suicidality	-2,010142	0,2806
avarage income	1,037265	0,9141
residues	-2,239534	0,0277

Source: eViews, own calculation

The presence of correlation was confirmed. It was necessary to include delayed variables into model and remove statistically insignificant. Following diagnostic tests proved the correctness of třhe model.

Tab. 7: Dynamized model of short-term relation between suicidality and avarage income

```
Dependent Variable: SEBEVRAZEDNOST
Method: Least Squares
Date: 04/03/14   Time: 12:53
Sample (adjusted): 1994 2012
Included observations: 19 after adjustments

Variable           Coefficient   Std. Error    t-Statistic    Prob.

C                   19.93313     0.926328      21.51844      0.0000
PRUMERNA_MZDA      -0.001692     0.000546      -3.099392     0.0069
PRUMERNA_MZDA(-1)   0.001509     0.000534      2.827040      0.0121

R-squared           0.651206     Mean dependent var    15.33744
Adjusted R-squared  0.607607     S.D. dependent var    1.258557
S.E. of regression  0.788376     Akaike info criterion  2.506257
Sum squared resid   9.944596     Schwarz criterion     2.655379
Log likelihood     -20.80944     Hannan-Quinn criter.  2.531494
F-statistic         14.93617     Durbin-Watson stat    1.138845
Prob(F-statistic)   0.000219
```

Source: eViews, own calculation

$$\text{SUICIDALITY}_C = \quad 19{,}933 \quad -0{,}00169 \quad \text{AVARAGE\_INCOME}_t \quad + \quad 0{,}0015$$
$$\text{AVARAGE\_INCOME}_{t-1} + \ a_t$$

The model reveals indirect dependence of suicide and average income. If avarage income decreases, suicidality will increase. Model explains 65.1% dynamics of time series suicidality.

Conclusion

Main aim of study was analysis of relation between suicidality and economic indicators.

The relation between suicidality and GDP per capita has been confirmed by many tests in EViews. Result showed opposite behavior of examined indicators. If GDP decrease,

suicidality will increase. This led to confirmation of Henry and Short theory, that suicide is inversely related to GDP.

In case of suicide and unemployment, short-term and long-term relations were not found. It doesnt mean, that there is no relation between variables. Other statistical methods could detect dependency. Direct relation between suicidality and rate of unemployment would be probably proved, which confirms Okun's law for the validity Henry and Short theory. If rate of unemployment increases, GDP will decrease and the risk of suicide will increase. Also Hamermeshe and Sosse theory expresses the same trend of these two indicators. If rate of unemployment increases, future income will be reduced, benefit and probability of suicide will increase.

There is a direct relation between suicidality and average income. If income decreases, suicidality will increase. In this case was confirmed Hamermesh and Sosse theory.

Obviously, economic factors have a considerable influence on society, its behavior and therefore on suicides.

It would be interesting, if time series were examining with delay, because negative economic consequences must affect some time on individual before he decides to commit suicide.

References

Arlt, J., & Arltová, M. The relationship of budget deficit and current account balance - Panel data analysis. Politická ekonomie, 53, 747-764.

Arltová, M., & Langhamrová, J. Analysis of the relations of the time series of the birth rate and marriage rate in the Czech republic in the years 1960-2007. Politická ekonomie, 57, 495-508.

Camargo, C. A., & Bloch, D. A. Fluoxetine and suicide rates: Suicide and the economy. Plos medicine, 3, 2161-2164.

Durkheim, E. (1966). Suicide: A study in sociology (pp. 145-277). New York: The Free Press.

Hamermesh, D., & Soss, N. (1974). An economic theory of suicide: The Journal of Political Economy (pp. 83-89).

Lester, B.Y. Learnings from Durkheim and beyond: The economy and suicide. Suicide and life-threatening behavior, 31, 15-31.

Lester, D., & Yang, B. (1997). The economy and suicide: Economic perspectives on suicide. Commack, N.Y.: Nova Science.

Muhlpachr, P. (2008). Sociopatologie (1. vyd. ed., pp. 117-129). Brno: Masarykova univerzita.

Petrusek, M. (2011). Dějiny sociologie (Vyd. 1. ed., pp. 87-177). Praha: Grada.

Soukup, J. (2011). Makroekonomie (2., aktualiz. vyd. ed., p. 518). Praha: Management Press.

Symonds. Suicide, a study in sociology - Durkheim,E. British Journal of Psychiatry, 159, 739-741.

Viewegh, J. (1996). Sebevražda a literatura (Vyd. 1. ed.). Brno: Janeček.

Woolfová, V., & Plathová, S. (2009). Sebevražedná triáda (Vyd. 1. ed.). Praha: Academia.

Contact

Michaela Antovová

University of Economics in Prague

W. Churchill Sq. 4

130 67 Prague 3

michaela.antovova@vse.cz

Simona Fučíková

University of Economics in Prague

W. Churchill Sq. 4

130 67 Prague 3

simona.fucikova@vse.cz