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A dynamic econometric model of suicides in Turkey

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ABSTRACT

This study is the first attempt to empirically examine the determinants of suicides in the case of Turkey using the time-series data for the period 1974–2007. This research proposes that the suicides in Turkey are related to some economic and social factors and they exhibit a dynamic relationship amongst them. Auto-Regressive Distributed Lag (ARDL) approach to cointegration testing procedure is employed to obtain the short-run and long-run elasticities of suicides with respect to per capita real income, divorce rates, urbanization and liquidation. The empirical results reveal that the urbanization has the highest impact on suicides, which is followed by per capita real income and liquidation. The results also provide some important policy recommendations to reduce suicides.

1. Introduction

Taking someone's own life in many different ways (intentionally) and for many different reasons is called suicide and this type of behavior has attracted the attention of both policy makers and academics alike and has given rise to a number of governmental resolutions and academic papers. Until the late 20th century this subject was mostly studied by sociologists and psychologists. Economists stayed away from topics related to suicide despite its clear economic implications, see for a few exceptions Quinney (1965), Hamermesh and Soss (1974), Platt (1984), Stack (1989), Ruhm (2000), and Suzuki (2008).

Suicide is the 13th leading cause of death worldwide and even higher among young people as presented in WHO (2002). Internationally, suicide rates range between less than 10 and 25 per 100,000 people, see Kaplan and Sadock (1993) as cited in Yaniv (2001).

Due to lack of complete data on causes of suicides and success rates (deaths/suicide attempts) we are able to provide only some statistics for Turkey. According to statistics reported by the Turkish Statistical Institute (TSI), between 1974 and 2006, on average more than 1500 people in Turkey (approximately 1% of the total number of deaths) deliberately kill themselves each year. Even though this number is only a small fraction of the total number of deaths in Turkey, starting from 1974 it has grown by more than 350% whereas the population has increased by only 79%. It is also possible that these numbers are even higher in reality than reported, because many suicide deaths are incorrectly listed as accidents or homicides.[2] Looking at the raw data one may argue the importance of suicides in Turkey. At first this may seem as a valid argument compared to other industrialized economies' suicide rates. However, Turkey's economy is rapidly growing and given previous findings on the relationship between suicide rates and urbanization or suicide rates and income levels, it is only a matter of time before we face much greater suicide rates.

A small body of literature analyzing suicides from economic theory has been growing since the pioneering study of Hamermesh and Soss (1974). They propose that the decision of suicide is an individual decision-making process which will also be influenced by some economic factors, such as long-run economic growths and cyclical fluctuations in income and in unemployment. Hamermesh and Soss (1974) acknowledge most of the empirical and theoretical work done by sociologists in suicides. However, they argue that several aspects of the suicide problem may be rationalized by an economic theory. It is crystal clear that some suicidal behavior may not be related to any economic factor at all.

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[2] Douglas (1967) presents a detailed discussion of this problem.

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Table 1
Summary of previous empirical work in suicide rates.[a].

Author/year	Estimation method	Main findings (explanatory variables)			
		Y (per capita income)	D (divorce rates)	U (urbanization rate)	BU (bankruptcy/unemployment)
Quinney (1965)	DS			+	
Hamermesh and Soss (1974)	CS, TS	–			
Platt (1984)	CS, TS				+
Kowalski et al. (1987)	OLS			+	
Stack (1989)	OLS, TS		+		+
Yang and Lester (1992, 1994)	OLS, TS				+
Rossow (1993)	TS		+		
Yang and Lester (1995)	TS				+
Lester and Yang (1998)	TS		+		
Viren (1999)	OLS, TS, CS	+		+	+
Ruhm (2000)	IV, TS				+
Gerdtham and Johannesson (2003)	DS, PR				+
Neumayer (2003)	PD	–	+	+	
Rodriguez (2005)	PD	+	+		+
Granados (2008)	TS	–			+
Barstad (2008)	TS	+	+		–[b]
Suzuki (2008)	TS				–
Yamamura (2008)	PD	–	+		–
Koo and Cox (2008)	TS, PD, OLS		+		+

Estimation methods: OLS, ordinary least squares; IV, instrumental variables; TS, time-series; CS, cross section; PD, panel data; DS, descriptive statistics; PR, probit regression.

[a] This table provides only a part of authors' findings.

[b] Maybe a quotation from Durkheim (1987/2002) p. 214 is in place: "remarkable immunity of poor countries" since "poverty protects against suicide because it is a restraint in itself". This idea has been later debated by modern sociologists Barnes (1983), and Stack (1980).

This paper aims at extending the existing literature by offering a dynamic econometric model of suicides. The proposed dynamic model, Auto-Regressive Distributed Lag (ARDL) has not been employed in the previous empirical studies of suicide. As far as this paper is concerned, there exists no other study which directly deals with the empirical measurement of suicides in Turkey from economic points of view.

The remainder of this paper is formed as follows: the next section highlights the literature on suicide, particularly with respect to economic theory. The third section introduces the study's model and methodology. The fourth section discusses the empirical results and the last section presents the conclusions.

2. Literature review

As mentioned in the previous section, Hamermesh and Soss (1974), were among the first authors who developed an economic theory of suicide on the basis of the argument that much of the variation in aggregate suicide rates is due to economic decision making and, therefore, that such a variation can be explained by using hypotheses derived from economic theory using different economic methods. For instance, Yang and Lester (1996) showed that different economic models, such as cost-benefit analysis,[3] demand and supply model, labor force participation analogy, signalling game theory, and investment under uncertainity, can be applied to suicidal behavior. As Suzuki (2008) presented, generally there has been microeconomic and macroeconomic approaches to the study of suicide. In theoretical literature, suicidal behavior is formalized within a framework of standard microeconomic models, for instance, see Huang (1997). Our aim in this section is not to provide a comprehensive review of the literature on suicide; instead just to review selected works that shed light on the link between suicidal behavior and some economic indicators, namely income, divorce rates, urbanization, and unemployment. Based on the explanatory variables used in this study Table 1 summarizes the previous empirical work in suicide rates.

[3] See Yang (1987).

2.1. Suicide versus other factors

Other than those we have already presented above, there are other factors believed to effect suicide rates, such as: female labor participation rate, the size of the family, religion, ethnicity, failure in education, medical problems, fertility, alcoholism, etc. For instance, Neumayer (2003) argues that lower average household size signals a greater potential for feelings of loneliness and lack of integration and should be positively associated with suicide. Neumayer (2003) also found marriage and fertility rates negatively associated with suicide rates and Rodriguez (2005) found fertility rates negatively related to suicide rates for both males and females. On the other hand, modern research has found evidence that heavy consumption of alcohol is strongly related to higher suicide rate. Neumayer (2003) and Rodriguez (2005) emphasize that heavy alcohol consumption causes lack of integration and also increases the probability of committing violent acts (such as committing suicide) in the state of acute intoxication.

3. Model and econometric methodology

3.1. Model

Following the empirical literature on suicide, we form the long-run relationship between suicide, income, divorce, urbanization and liquidation in linear logarithmic form as follows:

$$s_t = a_0 + a_1 y_t + a_2 d_t + a_3 u_t + a_4 b_t + \varepsilon_t \quad (1)$$

where s_t is the total number of suicides, y_t the per capita real income, d_t the divorce rate, u_t the urbanization rate, b_t the number of liquidated companies, and ε_t is the regression error term. The lower case letters in Eq. (1) demonstrate that all variables are in their natural logarithms. It is assumed that a decrease in income should increase the suicide numbers due to economic hardships, see Quinney (1965). Marriages are regarded as a social pillar in society and they provide solidarity and psychological comfort for the individuals whereas divorces might lead individuals to isolation and psychological break downs. Hence, one expects a positive