

Impact of Economic Fluctuation and 1997 Thailand Economic Crisis on Cirrhosis Cause of Death

Yothin Sawangdee

Piyawat Katewongsa

Wimontip Musikaphan

Introduction

The correlation between the economic situation, mortality and sickness among a population has been happening since Thomas R. Malthus and his father, Daniel Malthus, discussed about the main cause of human misery. In the discussion, Malthus stressed population explosion was the main cause while his father emphasized the failure of government policy rather than the population explosion (Stone, 1984). Thus, this paper examines the belief of Malthus's father rather than that of Malthus himself who had written an essay namely "The Principle of Population" in 1798. Important information mainly stated that food famine, mortality and disease among the population were not only caused by natural disasters but could be a negative consequence from a society's economic failure which was related to his father's main concept (Weeks, 1978). The obvious example was the mortality and cases of illness among the population in Spain between 1850 and 1990. The economic fluctuation in Spain brought about the death of many people by various illnesses such as water-borne diseases, diarrhea, air-borne diseases, respiratory diseases etc (Reher and Sanz-Gimeno, 2000). Another example had happened in South Korea in 1990 when severe economic depression brought about a huge number of deaths from cardiovascular, stomach cancer and liver disease since patients could not afford treatment (Khang, Lynch, and Koplan, 2005).

Thailand was confronted with two times economic crises: between 1979 - 1981 and 1996 - 1998. In 1997, Thailand's economy had strongly depressed and ended up with negative economic consequences which quickly spread throughout Asia, Europe

and America in the name of “Tom Yum Kung disease.” This crisis generated a huge number of unemployed laborers due to large scale industries, companies and shops being closed down due to establishments loss of benefits. The worker had no security on their working status and earnings and medical treatment cost was expensive. This brought about some obstacles preventing patients from accessing medical treatment services in hospitals (Jung, Pounsomlee, and Maksum, 2003). This situation leads to the research question of “whether economic fluctuation which had occurred in Thailand had any effects on population mortality the same as those that had happened in Spain and South Korea.” For this reason, the objective of this investigation is to examine the impact of economic fluctuation that had occurred in Thailand and whether it had any consequences on Thai mortality or not. Therefore, cirrhosis as the cause of death is being presented as an example.

Cirrhosis is a harmful disease which mainly occurs from a long duration of drinking which finally brings about failure of inner human organs. There are even some patients who have never drunk but become cirrhosis patients by contracting infectious disease. However the number is not as much when compared to those who always drink alcohol. Moreover, drinking alcohol directly relates with personal purchasing power since personal production of alcohol is illegal. The alcoholic person and cirrhosis patient has to spend money for consuming alcohol and curing themselves. It is obvious that drinking alcohol strongly relates to personal economic status. As a result, it sets the stage for the unemployed worker, who has no security in his earnings to possibly die by cirrhosis being the cause of death. More interesting, among alcohol-related diseases, cirrhosis of the liver is the outstanding one of four serious diseases; (alcohol use disorders, cirrhosis of the liver, mouth and oropharynx cancers and ischemic heart disease) which can generate mortality in every age group.

Thailand ranks fifth in the world in terms of alcohol drinking population. (Department of Mental Health, 2005). The number of cirrhosis patients and deaths are gradually increasing in both groups of population: (15-59 years old) and old age (60 years and over). The report of Suan Pung Hospital revealed that there were 7,789 cirrhosis patients taking medical treatment there. Most of them were of working age.

The average age was 38.9 years old. And the lowest age was 22 years old. Interestingly, the leading factor contributing to alcoholic persons among these patients was household economic fluctuation (Ministry of Public Health, 2003 and Department of Mental Health, 2005). Thus, it is important to examine the impact of economic fluctuation on mortality by employing cirrhosis cause of death as an example. Cirrhosis is one of the degenerative diseases which patients need to spend a high hospital cost. As a result, it is reasonable to use this cause of death as an example when concentrating on the impact of economic fluctuation on mortality. Otherwise, there would not be any evidence to confirm that the impact of economic fluctuation, which had happened in Thailand, has produced some consequences on mortality. To do so, the number of people who have died due to cirrhosis disease has been treated as a dependent variable while independent variable was measured by economic factors. The outcome could be that the lesson learned is an affirmation that short-term monetary and financial failures in Thailand not only have negative impact on the country's economy-macro level, but also result with the deaths of people on micro level.

Data and Method

Data for this examination were from a secondary data source which was available for mortality and socio-economic analysis. Population data and mortality information were time series data from Public Health Statistics Year Book, Ministry of Public Health, between 1979 and 2000. The economic data were from National Economic and Social Development Board (NESDB) on Gross Domestic Product (GPD) recorded in the same period. The units of observation were population, and were divided into two groups. They were people of working age (15-59 years old) and older persons (60 years and over). The unit of analysis was in years, which consisted of 21 years. Distributed Lag Model was employed due to the design of the model that was appropriate for investigating economic consequences at any time effecting a change on human behavior such as the relationship between death cases and illness among population for both short-run or impact, and long-run or total, distributed-lag multiplier. The results from the estimation could be used to forecast the impact of economic fluctuation which has happened in the past and whether there are any short term impacts

or any long term consequences that would occur in mortality rate in the near future (Gujarati, 1995).

To investigate the impact, the population was divided into two groups. They were people in the working age (15 – 19 years old) and persons who were in the older age group (60 years and over). The main reason to divide into two groups was aimed to confirm that a consequence of economic fluctuation is not only for mortality among people in working age, but the older age group as well. For this reason, there are two Distributed Lag Models used here. The first model examined impact that would occur among working age group. Dependent variables for this analysis are measured by the number of death cases by cirrhosis in working age. By the same token, the second model which measured impacts among older people, dependent variables are measured by the number of old people who died due to this disease. Results are shown in the two models, divided into two groups as proposed.

Independent variable is the indicator of economic fluctuation measured by GDP per capita. The GDP per capita is divided into time lag variable. They are Lag0, Lag1 and Lag2. Lag0 is the economic fluctuation status in the present year while Lag1 and Lag2 are in the past one year and two years respectively. Anyway, due to the depressed economic situation in 1997 affecting widespread unemployment of the population, the investigation also determined that the 1997 economic situation to be an additional predictor namely “Bad Economy Development (BED)” as a dummy variable. The economic indication in 1997 is set as “1” while indicators in other years are equal to “0”. However, since dependent distribution measured by the number of deaths by cirrhosis is not being as normal distribution, in order to prepare data appropriate for running through Distributed Lag Model, natural log transformation is employed for adjusting two dependent variables before running in the models. Distributed Lag Models are further shown in part of statistical analysis.

Statistical Analysis

The results gained from Distributed Lag Model are obtained through the formula of:

$$Qx_t = \alpha + \sum_{k=0}^{1,2} b_k \left(\frac{GDP}{t-k} \right) + BED_t + \varepsilon_t$$

Where: Qx = natural log of the number of dead by cirrhosis

α = constant value

t = year, 0 = present year and stepping back to 1, 2 ... k

BED = Bad Economy Development as 1=1997 and 0= other years

ε_t = residual at year " t "

Since one outstanding point of Distributed Lag Model is that it permits opportunity to forecast impact of economic fluctuation that has occurred in the past, it will have strong impact on present year (short-run) or one year after or two years later on (long-run). To make the comparison of the influences of the economic fluctuation between Lag0, Lag1, and Lag2 easier, this analysis employed proportion of coefficients as the method by comparing estimate effect size among present year (lag0), one year after present year (Lag1) and two years after present year (Lag2). The formula below is employed firstly to calculate the total and distributed-lag multiplier which are influential factor values and transform them into percentage in order to make them easier in process of interpretation. And, the method to explain this outcome is that the influences will not be strong when any Lag which is on independent variable has a positive relationship and has the highest percentage with a dependent variable due to mass unemployment and when the decrease in GDP per head reduces mortality, since the dependent and the independent variables go in the same direction. Thus it means that the economic crisis does not have any impact on mortality. By contrast, it will have a strong influence when the relationships have a negative sign. Because when mass

unemployment occurs and GDP per head has reduced, they might have strong effects on mortality. To calculate proportion of coefficients, the formula is as follows:

$$B_i^* = \frac{\beta_i}{\sum \beta_i} = \frac{\beta_i}{Beta}$$

Where B_i^* = influential forecasting proportion

β_i = regression coefficient of each lag value

$Beta$ = summation of regression coefficient of lag value

Then, influential forecasting percentage = $\frac{\beta_i}{Beta} \times 100$

Results

In order to investigate through Distributed Lag Model, Central Tendency Distribution of each variable was employed. The results in Table 1 show descriptive statistics i.e. mean and standard deviation of independent variables which will be used in this examination.

Table 1: Descriptive statistics for indicators used in Distributed Lag Model

Indicator	Mean	S.D.
Log 15 – 59 ¹	8.12	0.24
Log 60 up ²	7.26	0.35
Lag0	34.45	11.31
Lag1	33.83	10.95
Lag2	33.23	10.63
BED	0.05	0.22

Note: ¹ Natural log of number of cases who died due to cirrhosis at working age

² Natural log of number of cases who died due to cirrhosis at age 60 and over

Besides, fundamental regulation of time series data concerned with auto correlation by Durbin-Watson test (DW) was checked first. If value from DW is higher than 2, it means data set has auto correlation among all variables. For this reason, data correction is strongly needed; otherwise results from prediction may be inaccurate. But results from this step showed that DW of data set provided to analyze people in working age was equal to 1.027 while it was 1.874 in old age group information. These results were lower than the DW standard so it could be concluded that the time series data set for this analysis had no auto correlation. Then, this analysis further examined the impact of economic fluctuation and 1997 Thailand economic crisis on cirrhosis cause of death.

The results were shown in Table 2 which revealed that the economic fluctuation in the present year (lag0) had positive relationship and had the strongest influence on cirrhosis cause of death among the observed population by comparing with one year and two years past (Lag1 and Lag2) which had negative relationship to mortality. This can be explained that when there is a higher unemployment rate or GDP reduction the number of people who die due to cirrhosis cause of death will be reduced. The influences of the fluctuation will be high and have a strong effect on mortality one (Lag1) or two years (Lag2) later, which was caused by cirrhosis after the event has occurred. This finding was shown in the same dimension, direction of relationship and effect size in both of the observed populations. Likewise, when focused on the percentage of influential economic fluctuation variables identified by lag affecting cirrhosis cause of death, which was provided by Table 3 and bar graphs in figures 1 and 2, the influence of the present year (Lag0) was not the highest and had positive dimensions. On the contrary, Lag1 and Lag2 which are one and two years later showed negative impact. This can be explained that the number of people who have cirrhosis disease will die within one and two years after economic fluctuation. For this reason, it is reasonable to confirm that the higher the economic fluctuation such as high unemployment rate and the reduction of GDP per capita in the present year do not have short-run and do not have strongest impact on the number of people who died due to cirrhosis as cause of death. Besides, it contributed to the long-run impact such as the incidence which occurred after one and two years. Estimated percentages in Table 3 present clearly that Lag0 has a positive sign which means that the number of people who have cirrhosis disease cause of death will be reduced during the economic fluctuation that has occurred.

Table 2: Estimated effects by lag of GDP fluctuation on Cirrhosis cause of death

Indicators	Working age		60 years old and over	
	Coefficient	S.E.	Coefficient	S.E.
Lag 0	0.039***	0.005	0.057***	0.004
Lag 1	-0.016**	0.008	-0.021***	0.006
Lag 2	-0.007	0.005	-0.011***	0.004
BED	0.003	0.093	-0.149***	0.070
Constant	7.559***	0.060	6.393***	0.049
R ²	0.892		0.971	
Adjust R ²	0.868		0.963	
Lag Sum $\frac{1}{1}$	0.016		0.025	
F With D.F.= 4	32.949***		132.822***	

Note: $\frac{1}{1}$ Lag Sum of economic variable

*** Significant at 0.01 ** Significant at 0.05

As a result, it was clearly stated that cirrhosis patients were not the strongest at risk to die in present year (lag0) of economic fluctuation which is the short-run impact, while in the next one and two years, long-run, the impacts were strong enough to increase the number of deaths. And, the effects are negative relationships. For example, the generated percentage to forecast influences of economic fluctuation on an increasing number of people who will die due to this disease is based on the formula as presented in the material and method section, for both working age group and older age group, such as presented in Table 3, Figure 1 and Figure 2.

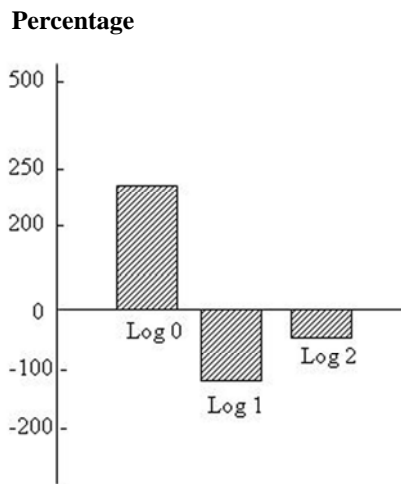
Table 3: Forecasting percentages of consequences of economic fluctuation on number of deaths of cirrhosis disease for the observed populations

Indicators	Working age (15-59)	60 years old and over
Lag 0	243.75	228.00
Lag 1	-100.00	-84.00
Lag 2	-43.75	-44.00
Total	100.00	100.00

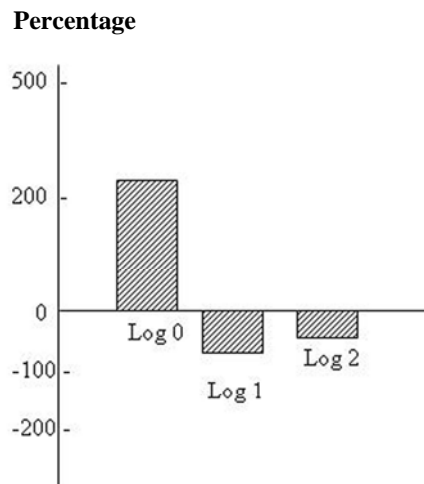
The two graphs show the same pattern of influences. For instance, the most influence and highest impact is short-run (lag0) which has positive dimension. This means that there were not many cirrhosis patients who died during the country's economic recession. Likewise, lag1 and lag2 have negative relationship to the number of deaths. This can be determined that the impacts are quite strong. As a result, it can be affirmed that after one or two years past, long-run, economic fluctuation had been strong enough to generate deaths in cirrhosis patients. Thus, it was obvious that economic fluctuation in present year generated from economic, monetary and financial management failure strongly brought about death of population by cirrhosis significantly in the long-run. The findings here can be affirmed that Thomas R. Malthus father's concept is correct. Figure 1 and Figure 2 present forecasting percentages of consequences of economic fluctuation on number of deaths of cirrhosis disease for both working age group and old age group.

Figure 1

presents forecasting percentages of consequences of economic fluctuation on number of deaths of cirrhosis disease for the working age group

**Figure 2**

presents forecasting percentages of consequences of economic fluctuation on number of deaths of cirrhosis disease for the old age group



Interestingly, the vivid example was the 1997 severe economic fluctuation, measured by BED variable (dummy variable; 1= 1997, 0 = others), which pointed out that it had positive relationship with an increased number of people who died due to cirrhosis disease among population in working age (15-59 years old). However, even BED variable had no statistical significant relationship with an increased number of people who died due to cirrhosis disease among population in working age group, but in overall of the model, which had reliable predictable power by 100 percent ($F = 32.949$ at D.F. =4), it could be explained that BED variable was significant and powerful for this forecasted model (Gujarati, 1995). Thus, it could be stated that the 1997 economic fluctuation strongly influenced cirrhosis deaths among population in working age. The findings were in conformity with the situations that happened in both Spain and South Korea (Reher and Sanz-Gimeno, 2000; Khang, Lynch, and Koplan, 2005), which confirmed that economic fluctuations mostly have long-run impact on working age group since the number of population in old age (60 years and over) tended not to die in present year (lag0), short-run, due to the fact that they are not involved in the unemployment process. Rather, they always receive care support from family and kin (Na Phomphet, 2002). So, present year was not the most influential year for dying among population at risk.

One more interesting point when analyzing the BED variable was that the 1997 economic crisis provided the statistical significant negative influence to cirrhosis death cases among old age group. Hence, it is important to investigate reasons to explain why this relationship is quite different from the working age group. Some articles which were published in Thai have mentioned patient care giving related to Thai social context and Thai culture in which children always take care of their ill parents (Na Phomphet, 2002). Since cirrhosis is a chronic illness, it means that old patients have been taken care of by their children for a long duration. Then, even if a severe economic crisis happens, the probability of dying among old people is not much since they are supported by their children owing to a very good, strong culture of “gratitude”.

Conclusion

Findings from this examination clearly indicated that Thailand's economic fluctuations between 1980 and 2000 generated not only negative impact on economic security among population in both micro and macro levels, but also deaths. The findings are similar to the events of those that had occurred in Spain and South Korea, and have the same pattern i.e. the present year rarely has the highest impact on mortality. Rather, the one and two years after have the most influences. Results from Table 2 and Table 3 which focused on Lag1 and Lag2 equations indicated clearly that cirrhosis takes time to kill people, since the coefficients of the two equations of both groups turned out to be negative, meaning that the reduction of GDP per head increased the deaths due to cirrhosis. Accordingly, it could be concluded that cirrhosis has a significant impact on deaths of population after one or two years, not on the current year of Lag0. Empirical findings here can be affirmed that economic crisis in the present year is not the most important and does not have the most influence on mortality when employing cirrhosis cause of death as an example. The incidence can occur in both working age group and older population. For this reason, it is important for economists to consider any economic policies before implementing to see if there would be any short term impact or long term consequence that would occur after implementation of the policy. Otherwise, the country will be facing the same experiences as that happened in 1997. The economic crisis in 1997 provides us with a memorable experience and lesson since it directly generated deaths from cirrhosis patients in working people.

Acknowledgement

The authors would like to thanks all anonymous readers that give valuable comments and suggestion to make this manuscript completed.

References

- Department of Mental Health. 2005. *Alcohol consumption and risk of death among Thais*. Nonthaburi: Ministry of Public Health.
- Gujarati, Damoda. N. 1995. *Basic Econometrics*. New York: Mc. Graw-Hill Inc.
- Jung, Ku-Hyun; A. Pongsomlee; and M.Maksum. 2003. *Civil Society Response to the Asian Crisis, Indonesia, Korea and Thailand*. Seoul: Institute of East and West Studies, Yonsei University.
- Khang, Young-Ho, Lynch, John. W. and Koplan, George. A. 2005. *Impact of economic crisis on cause-specific mortality in South Korea*. Seoul: Department of Preventive Medicine, University of Ulsan College of Medicine.
- Ministry of Public Health. 2003. *Alcohol Consumption in Thailand*. Nonthaburi: Annual Report of National Committee for Alcohol Consumption Control.
- Na Phomphet, Vichitwong. 2002. *Local Economics*. Bangkok: Dokya Group. (in Thai)
- Reher, David. S. and Sanz-Gimeno, Alberto. 2000. Mortality and economic development over the course of modernization: An analysis of short-run fluctuations in Spain, 1850-1990. *Population Studies*. 54(2): 135-152.
- Stone, Richard. 1984. *Robert Malthus: An Appreciation*. Conference 'forward from Malthus' organized by the British Society for Population Studies.
- Weeks, John. R.1978. *Population: An Introduction to Concepts and Issues*. Belmont, California: Wadsworth Publishing Company.