WHAT IS THE OPTIMUM SIZE OF GOVERNMENT: A SUGGESTION

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─**Abstract** ─

What is the optimum size of government? When the rule of law and the establishment of private property rights are taken into consideration, it is clear that the answer will not be at some 0%. On the other hand, when the experience of the old Soviet Union, East Germany and North Korea is considered, the answer will not be at some 100% either. Therefore, extreme points should not be the right answer. This study offers using normal distribution to answer this question. The study has revealed the following findings: (i) The total amount of public expenditures as % of GDP, a) is at minimum level at 4.55% rate, b) is at optimum level at 13.4% rate, c) is at maximum level at 31.7%. (ii) Thus, as a fiscal rule, countries should: a) choose the total amount of public expenditures as % of GDP ≤ 31.7%   b) target 13.4%. (iii) Tree dimensional (3D) normal distribution demonstrates that a healthy market system could be built upon a healthy government system (iv) This approach rejects Wagner's law. In a healthy growing economy, optimum government size could be kept at 13.4%. (v) The UK, the USA and the European countries have been in the Keynesian-Marxist area, which reduces their average growth.

Key Words: *public expenditure, economic growth, optimum level, public sector*

JEL Classification: *H10, H50, H70*

1. INTRODUCTION

What is the optimum size of government? Obviously, a clear-cut answer at extreme points should be avoided. When the rule of law and the establishment of private property rights are taken into consideration, it is clear that the answer to the question will not be at some 0%. On the other hand, when the experience of the old Soviet Union, East Germany and North Korea is considered, the answer will not be at some 100% either. What is right from the standpoint of maximizing economic welfare?

2. LITERATURE

The search for an optimal size of government has been popularized by Armey (1995). The so-called 'Armey curve' suggests that government size and economic growth have an inverse U shape as Fig. 1 shows. Because of the inverse U shape, one can find the optimum government size that promotes the greatest economic growth rates.

Figure 1: Government Spending and the economy (Armey Curve)
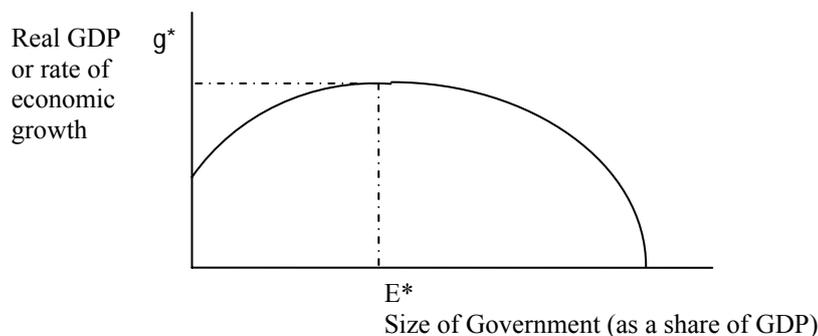
Source: Armey, 1995.

Sheehey (1993) uses cross country data and finds that while government size (government consumption expenditure/GDP) is smaller than 15%, government size and economic growth have a positive relationship, but when government size is larger than 15%, the relationship is negative. Vedder and Gallaway (1998) use a single square regression function to estimate that the optimum government size of the U.S. was 17.45% during 1947–1997. Vedder and Gallaway (1998) also infer the optimum government size of others, including 21.37% in Canada (1854–1988), 26.14% in Denmark (1854–1988), 22.23% in Italy (1862–1988), 19.43% in Sweden (1881–1988), and 20.97% in the United Kingdom (1830–1988). Chao and Gruber (1998) estimated that in the period 1929–1996 optimum size of government spending in Canada was about 27 percent. Pevcin (2004) suggests that the Armey curve for 12 European countries peaks when government spending is between 36.6% and 42.1% of GDP. Tanzi and Schuknecht (1998) and Afonso, Schuknecht and Tanzi (2003) suggest that general government spending in excess of 30 percent of national output reduces economic growth.

Chen and Lee (2005) used "total government expenditure divided by GDP" as threshold variable and threshold regime for Taiwan was found to be 22.839%. When the government size is smaller than the regime, economic growth is promoted under expanding government expenditure, but if the government size is

larger than the regime, then the economic growth decreases. Mutaşcu and Miloş (2009) have taken into consideration the real GDP growth and the total amount of public expenditures (as % of GDP), for the period 1999-2008. The main result pointing towards an optimum public size in EU-15 of 30.42% of GDP and in the EU-12 countries a level of 27.46% of GDP. Witte and Moesen (2009) compute the optimal average government involvement in the 23 OECD countries amounts to 41.22% of GDP.

On the other hand, econometrical modelling has been a major problem of studies attempting to determine the optimum size of government. Econometrical modelling offers an optimum level to researchers. However, a generalized optimum level of the public expenditure as % in GDP, which holds for all countries, is not offered. Furthermore, the optimum level obtained is shaped according to the past data and it is likely that the period considered may affect the results of subsequent studies. More importantly, the model reveals results in line with the data used. The significance of the situation becomes clearer when the fact that the total government expenditure/GDP of many countries does not fall to 10% is kept in mind.

3. NORMAL DISTRIBUTION

The most important probability distribution for describing a continuous random variable is the normal probability distribution. The normal distribution is an important distribution because many randomly occurring events follow its distribution of outcomes. In addition, central limit theorem states that the distribution of the sample means of a sufficiently large number of samples will always approximate to the normal distribution. For example, if a coin is tossed 100 times and the number of heads recorded then, if this test is repeated a large number of times, the resulting distribution of the number of heads recorded per 100 tosses would be approximately normally distributed with a mean of 50 heads per 100 tosses.

A normal distribution graph is bell-shaped. You see the bell curve in almost all disciplines. Normal distribution occurs very frequently in statistics, economics, psychology, natural and social sciences. For example, the heights and weights of people, blood pressure, amounts of rainfall, most IQ scores, memory and reading ability of people in a general population, job satisfaction, income distribution in an economy all approximately follow the normal probability distribution shaped like a bell curve. The theory of normal distribution also finds use in advanced sciences like astronomy, photonics and quantum mechanics.

The probability density function for the normal distribution having mean μ and standard deviation σ is given by the function in equation 1.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma^2} \tag{1}$$

If we let the mean μ = 0 and the standard deviation σ = 1 in the probability density function in equation 1, we get the probability density function for the standard normal distribution in equation 2.

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2} \tag{2}$$

The following is the plot of the normal probability density function.

Figure 2 : Normal Distribution
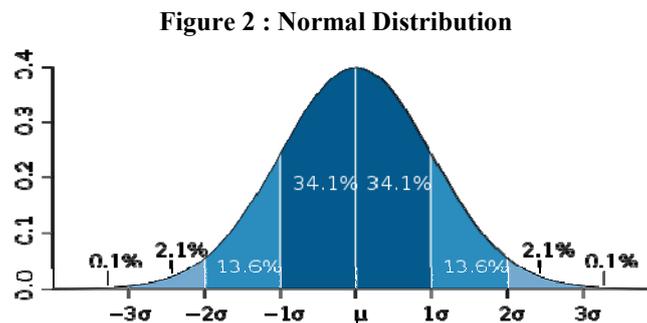
Source: http://en.wikipedia.org/wiki/Standard_deviation

Normal distributions are symmetric around their mean and the area under the normal curve is equal to 1. In statistics, the 68-95-99.7 rule, or three-sigma rule, or empirical rule, states that for a normal distribution, nearly all values lie within 3 standard deviations of the mean. About 68% of the values lie within 1 standard deviation of the mean (or between the mean minus 1 times the standard deviation, and the mean plus 1 times the standard deviation). In statistical notation, this is represented as: μ ± σ. About 95% of the values lie within 2 standard deviations of the mean. The statistical notation for this is: μ ± 2σ. Nearly all (99.7%) of the values lie within 3 standard deviations of the mean. Statisticians use the following notation to represent this: μ ± 3σ.

4. OPTIMUM SIZE OF GOVERNMENT

How can normal distribution help us determine the optimum size of government? There are two players in economy: private sector and government. These two players share the economic system. When it is assumed that economic system has

a normal distribution, putting private sector to the centre of economy and defining its share to economy as +/- 1σ is quite reasonable. This part involves 68.2689% of normal distribution. To put it differently, the share of the private sector to economy should be 68.3% at least. In this case, government will have a 31.7311% of contribution at most. (see Figure 3).

The approach of normal distribution not only provides an answer to the maximum level but also to the minimum and optimum level of government size in economy. Before answering these questions, it is better to provide an operational definition of government size. For this study, the government size has been defined as the total amount of public expenditures as % of GDP. In this sense, a country, without dislocating its economic system can increase its total amount of public expenditures as % of GDP to 31.7% (see Figure 3).

Figure 3 : Maximum Government Size	**Figure 4 : Minimum Government Size**
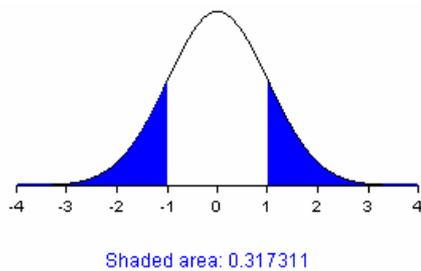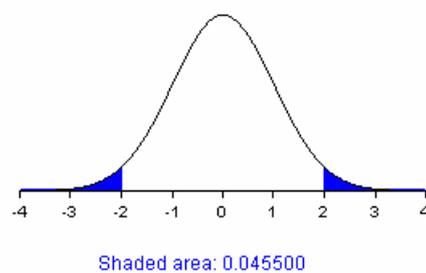
How about the minimum government size? It is 4.55% area which is outside the +/- 2σ area of normal distribution (see Figure 4). Therefore, we can maintain that the total amount of public expenditures as % of GDP should be at least 4.55%. A government size below the given value may lead to a state not functioning properly. The crucial point here is the determination of optimum government size. This size refers to the rate that will give the most efficient growth and it suggests the 13.3614% area excluding +/- 1.5σ area (see Figure 5). The most suitable government&private sector distribution could be reached when the total amount of public expenditures as % of GDP is 13.3614%. It is better to remind that the percentage of private sector in economy is 86.6386%.

Figure 5 : Optimum Government Size
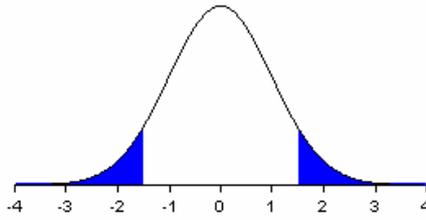
Shaded area: 0.133614

At this point, it is reasonable to apply the approach of normal distribution of government size, which is similar to Skousen's The Totem-Pole Approach (2001).

Figure 6 : Smithian System
(4.55% ≤ The total amount of public expenditures as % of GDP ≤ 13.4%)
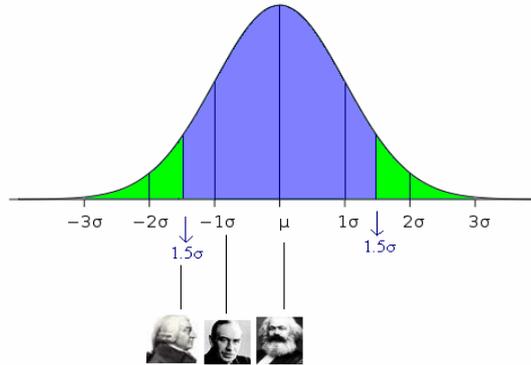
Figure 7 : Keynesian System
(13.4% < The total amount of public expenditures as % of GDP ≤ 31.7%)
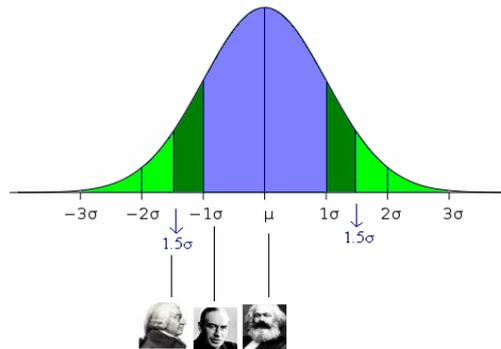
Figure 8 : Keynesian - Marxist System
(31.7% < The total amount of public expenditures as % of GDP ≤ 61.7%)
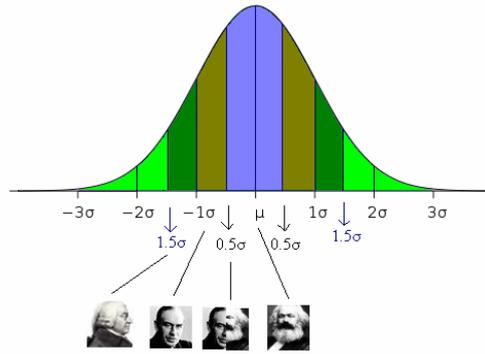
Figure 9 : Marxist System
(61.7% < The total amount of public expenditures as % of GDP ≥ 100%)
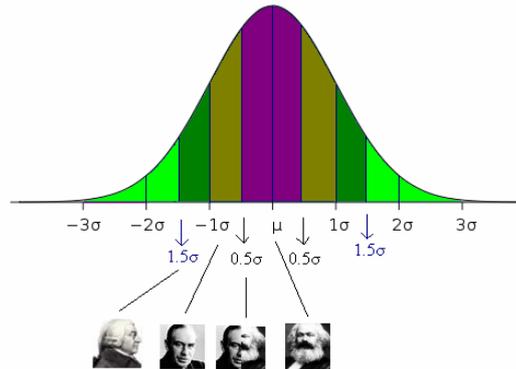
Figure 10 : Bivariate Standart Normal Distribution

Source: www.math.mcmaster.ca/peter/s4m03/s4m03_9899/l02.html

The approach of normal distribution of government size also enables us to analize the relationship between market & government. The figure below shows the bivariate standard normal distribution. This tree dimensional (3D) normal distribution demonstrates that a healthy market system could be built upon a healthy government system.

If the figure is read critically, it is seen that; i) Marxist system refers to a situation in which the whole volume of 3D graphic is owned by government. In this case, the growth of 3D graphic (economic growth) is minimum. ii) 13.4% of the 3D graphic occupying the baseline of the whole volume shows market&government combination which yields maximum growth rate. iii) If government size exceeds 31.7%, the economic system is threatened and average growth rate decreases.

An important point could be reached from here. Wagner's law states that the development of an industrial economy will be accompanied by an increased share of public expenditure in GNP. However, the approach of normal distribution of government size rejects Wagner's law. In a healthy expanding economy, 13.4% optimum government size could be preserved. Therefore providing a reason for the expansion of government size as Wagner's law states is not possible. The expansion of government size even slows down the economic growth.

5. PAST EXPERIENCES AND THE CURRENT SITUATION

Figure 11 shows the historical development of total public spending/GDP rate for the UK and USA. The orange line at the bottom indicates the lowest level of total public spending, which corresponds to 4.55% while the green one indicates optimum total public spending/GDP rate, which is 13.4%. Moreover, the red line shows the highest total public spending/GDP rate, which is 31.7% and the line at the top shows the 61.7% Keynesian- Marxist System.

In 1754, the total public spending/GDP rate of UK went under the minimum government size with 4.05%. The highest total public spending/GDP rate (average 61%) was observed between 1940–45, during the World War II. The most important rate of total public spending/GDP was observed between 1692–1914 with an average 12.5%. This rate was 39.8% for the period between 1947–2011 and it is predicted that the rate will go up to 47% in 2011. Moreover, it crucial to highlight that the UK economy has been in the Keynesian-Marxist area since 1939.

On the other hand, the USA total public spending/GDP rate was 7.9% between 1902–1917 and 13.6% between 1902–1942. Unlike the UK economy, the USA economy has been in the Keynesian-Marxist area after 1975. Moreover, the total public spending/GDP rate for the period between 1975–2008 was 34.8%.

Figure 11 : UK & USA Total Public Spending/GDP (%)
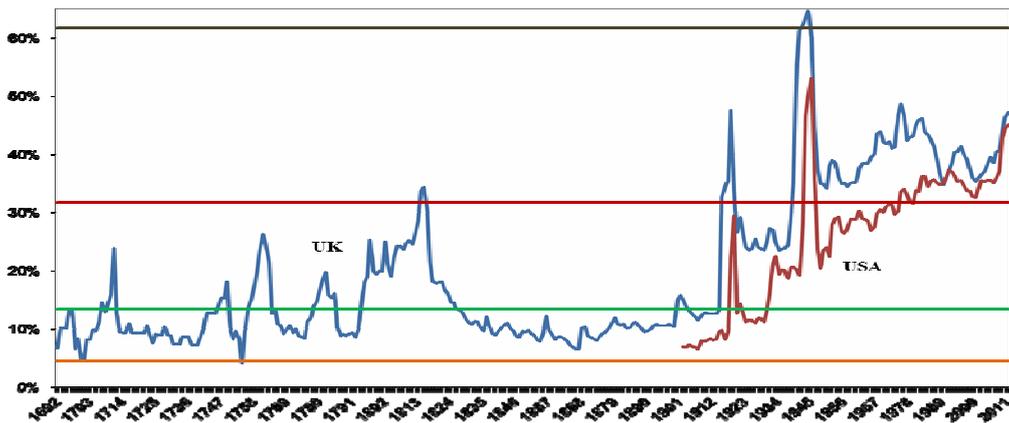
Source: www.ukpublicspending.co.uk, www.usgovernmentspending.com,
Projection values after 2010.

Figure 12 : European Countries total general government expenditure /GDP (%)
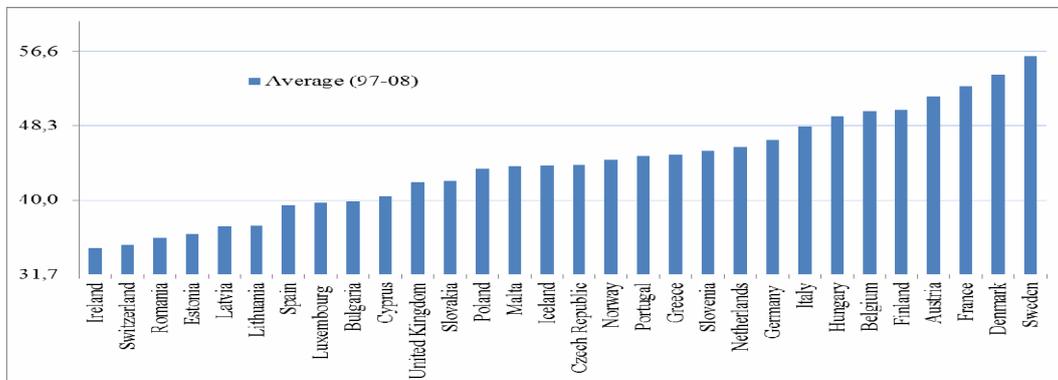
Source: Eurostat

When European countries are analyzed with respect to total general government expenditure/GDP rate between 1997–2008, it is seen that all countries fall into Keynesian-Marxist area. Ireland and Switzerland have the lowest total general government expenditure/GDP rate with a value of 35% whereas the highest rates belong to France, Denmark and Sweden with a rate of 53%, 54% and 56% respectively.

6. CONCLUSION

The approach used in this study has revealed the following findings:

(i) The total amount of public expenditures as % of GDP, a) is at minimum level at 4.55% rate, b) is at optimum level at 13.4% rate, c) is at maximum level at 31.7%.

(ii) Thus, as a fiscal rule, countries should: a) choose the total amount of public expenditures as % of GDP $\leq$ 31.7% b) target 13.4%.

(iii) Tree dimensional (3D) normal distribution demonstrates that a healthy market system could be built upon a healthy government system (the total amount of public expenditures as % of GDP = 13.4%).

(iv) This approach rejects Wagner's law. In a healthy growing economy, optimum government size could be kept at 13.4%.

(v) The UK, the USA and the European countries have been in the Keynesian-Marxist area (31.7% < The total amount of public expenditures as % of GDP $\leq$ 61.7%), which reduces their average growth.

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