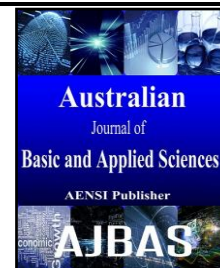




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The Impact of Economic Parameters on Government Total Expenditure in 5 Richest Countries

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ABSTRACT

This Government total expenditure plays an important role in economic growth and it also affects economic performance of a country. In this paper we are presenting the relationship of Government total expenditure with economic parameters. It is observed from previous research that Government total expenditure is closely related with various economic parameters but it is time consuming process to show the relationship among them and very complex to analyze the changes in these parameters to increase the efficiency of Government total expenditure. In this paper we proposed an approach which shows the closely related parameters and their strength with Government total expenditure by using clustering and Pearson correlation techniques. The clustering approach extracts the closely related parameters (similarity of parameters) then finds relationship among them using Pearson correlation method. The performance of our work is evaluated using IMF dataset and result is shown for top 5 richest countries (Qatar, Luxemburg, Singapore, Norway and Hong Kong). Here we are also presenting graphical representation for different countries as a relationship of Government total expenditure with common parameters in terms of correlation.

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INTRODUCTION

According to Salvatore and Danie (1892), OECD (2006) government expenditure is an important factor of national income and economic growth. It plays key roles in the operation of all economies. It refers to expenses incurred by the government for the maintenance of itself and provision of public goods, services and works needed to foster or promote economic growth and improve the welfare of people in the society. However the growth of economy depends on the size, spending capacity, and effective use of capital expenditure in the development process. The study suggests increasing the spending capacity of government and regular monitoring in expenditure tracking and effective use of capital expenditure. Government total expenditure is generally categorized into expenditures on administration, defense, internal securities, population, unemployment, health, education, foreign affairs, etc. The government should focus on other economic parameters such as gross domestic product per capita, gross national savings, total investment, volume of imports of goods and services and general

government revenue etc. to find government total expenditure.

The objective of this paper is to investigate the impact of other economic parameters on Government total expenditure using a time series data on top 5 richest countries (<http://top10thebest.com/top-10-richest-countries-in-the-world/>) for the period 1980-2013 using clustering and correlation models from Alvin (Rencher, A.C., 2003), Levin and Rubin (2006). This study is going to explore the relationship among various economic growth parameters and government expenditure in case of 5 richest countries.

Several researches have been done to show Government expenditure relationship with economy growth. Government expenditure having positive impact on economy growth is analyzed by Taiwo (2011), Sharma (2012), Uma *et al.* (2013), Aigheyis (2013), Irfan *et al.* (2013) for countries such as Nigeria, Nepal, Pakistan using various techniques such as Ordinary Least Square (OLS), Correlation, Co integration, Regression, ADF Unit root test etc.

From the previous researches we come to the point that we will use clustering and correlation to find relationship between Government total

expenditure and other economic parameters. In previous papers researchers analyzed only one parameter in relation with Government total expenditure and only for one country. Here we are using 21 economic and growth parameters for top 5 richest countries. We are applying clustering on each country and find those clusters which contain Government expenditure as a parameter and then find common cluster which contain only those parameters from clusters presents in at least 3 countries. We also calculate correlation of all 20 parameters with Government expenditure and choose those parameter which are highly correlated. Furthermore we perform comparison of both techniques and got a result that both techniques are generating almost similar results i.e. we are getting similar parameters in both techniques with are related with Government expenditure.

The rest of this paper is organized as follows. In section 2 describes Methodology using clustering and correlation techniques. We represent the experimental results in Section 3 and we conclude with Section 4.

Methodology:

2.1 Clustering:

Clustering is the process of partitioning or grouping a given set of patterns in to disjoint clusters. This is done such that patterns in the same cluster are alike and patterns belonging to two different clusters are different. Clustering has been a widely studied problem in a variety of application domains including neural networks, AI, and statistics. The goal is to find an optimal grouping for which the observations or objects within each cluster are similar, but the clusters are dissimilar to each other. We hope to find several algorithms have been proposed in the literature for various clustering algorithms CLARA, CLARANS, DBSCAN and BIRCH by Kaufman and Rousseeuw (1990), Ng and Han (1994), Ester *et al.* (1996) and Zhang *et al.* (1996).

The k-means method explained by Alsabti *et al.* (1997), Alvin (2003) has been shown to be effective in producing good clustering results for many practical applications. However, a direct algorithm of k-means method requires time proportional to the product of number of patterns and number of clusters per iteration. This is computation ally very expensive especially for large datasets. The techniques of cluster analysis have been extensively applied to data in many fields, such as medicine, psychiatry, sociology, criminology, anthropology, archaeology, geology, geography, remotesensing, market research, economics, and engineering.

This algorithm aims at minimizing an *objective function*, in this case a squared error function. The objective function is:

$$j = \sum_{j=1}^k \sum_{i=1}^n \|x_i^{(j)} - c_j\|^2 \quad (2)$$

where, $\|x_i^{(j)} - c_j\|^2$ is a chosen distance measure between a data point $x_i^{(j)}$ and the cluster centre c_j , is an indicator of the distance of the n data points from their respective cluster centers, k is number of cluster and x is number of parameter.

2.2 Correlation:

Correlation analysis by Levin and Rubin (2006) is the statistical tool we can use to describe the degree to which one variable is linearly related to another. Pearson correlation coefficient, measures the strength of the *linear association* between variables, giving a value between +1 and -1 inclusive, where 1 is total positive correlation, 0 is no correlation, and -1 is total negative correlation.

To evaluate the results, we calculate the mean and variance for each parameter and defining the terms as follows:

x_{ij} , Values of observations (years) i for country j ; $j=1, 2, \dots, k$.

n_j , size of j^{th} country

\bar{x}_j , sample mean of j^{th} country

s_j^2 , sample arithmetic variance for parameter j

The arithmetic mean formula of country j is as follows:

$$\bar{x}_j = \sum_i \frac{x_{ij}}{n_j}, \quad \text{where } i = 1, 2, \dots, n_j \quad (1)$$

which indicates $\sum_i x_{ij} = n_j \bar{x}_j$

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The arithmetic variance formula for country j as follows:

$$s_j^2 = \frac{\sum_i (x_{ij} - \bar{x}_j)^2}{(n_j - 1)}, \quad \text{where } i = 1, 2, \dots, n_j \quad (5)$$

$$\text{Pearson correlation coefficient } r = \frac{\text{Covariance}(x, y)}{\sigma_x \cdot \sigma_y} \quad (6)$$

$$\text{Where, } \text{Covariance}(x, y) = \frac{\sum_{i=1}^n (x_i - \bar{X})(y_i - \bar{Y})}{n-1} \quad (2)$$

$$\text{or, } r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

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where,

x = value of parameter 1

y = value of parameter 2

n = number of data points (years).

Results:

Table 2 results are calculated using Eq. (3), (4) and (5) which contains information about the top 5 richest countries (Qatar, Luxemburg, Singapore, Norway and Hong Kong) for ten variables (GDP per capita, Implied PPP conversion rate, Gross national savings, Volume of Imports of goods, Employment, General government revenue, General government total expenditure, General government primary net lending/borrowing, General government gross debt, Current account balance). The basic information includes the mean, standard and variance.

Table 1: Descriptive Analysis

Country	Parameters	Mean	Std. Dev	Variance
Qatar		0.262397	0.304483	0.097087
	Gross domestic product per capita	0.369034	0.304802	0.092905
	Implied PPP conversion rate	0.51595	0.318847	0.101664
	Gross national savings	0.350077	0.23639	0.05588
	Volume of Imports of goods	0.509632	0.325172	0.105737
	Employment	0.586373	0.392219	0.153836
	General government revenue	0.491976	0.349706	0.122294
	General government total expenditure	0.70187	0.190938	0.036457
	General government primary net lending/borrowing	0.359881	0.315323	0.099428
	General government gross debt	0.384458	0.257767	0.066444
Luxemburg	Current account balance	0.409218	0.336838	0.11346
	Gross domestic product per capita	0.333385	0.246091	0.060561
	Implied PPP conversion rate	0.700446	0.268629	0.072162
	Gross national savings	0.688517	0.181019	0.032768
	Volume of Imports of goods	0.33785	0.340287	0.115795
	Employment	0.536625	0.484515	0.234754
	General government revenue	0.506176	0.458161	0.209911
	General government total expenditure	0.365255	0.225345	0.05078
	General government primary net lending/borrowing	0.253989	0.300733	0.09044
	General government gross debt	0.38944	0.376223	0.141544
Singapore	Current account balance	0.36009	0.294613	0.086797
	Gross domestic product per capita	0.39497	0.282317	0.079703
	Implied PPP conversion rate	0.579675	0.241817	0.058476
	Gross national savings	0.418251	0.19253	0.037068
	Volume of Imports of goods	0.395924	0.282741	0.079943
	Employment	0.525311	0.367565	0.135104
	General government revenue	0.458134	0.328116	0.10766
	General government total expenditure	0.408901	0.27347	0.074786
	General government primary net lending/borrowing	0.566288	0.384638	0.147946
	General government gross debt	0.622992	0.264834	0.070137
Norway	Current account balance	0.342018	0.329615	0.108646
	Gross domestic product per capita	0.3994	0.289423	0.083766
	Implied PPP conversion rate	0.434768	0.303973	0.0924
	Gross national savings	0.479023	0.223253	0.049842
	Volume of Imports of goods	0.417882	0.301025	0.090616
Employment				

	General government revenue	0.515795	0.310723	0.096549
	General government total expenditure	0.485235	0.273606	0.07486
	General government primary net lending/borrowing	0.50744	0.27556	0.075933
	General government gross debt	0.47633	0.289907	0.084046
	Current account balance	0.575933	0.290683	0.084497
Hong Kong	Gross domestic product per capita	0.467411	0.311587	0.097087
	Implied PPP conversion rate	0.440304	0.297452	0.088478
	Gross national savings	0.488003	0.234946	0.0552
	Volume of Imports of goods	0.469384	0.212349	0.045092
	Employment	0.509632	0.325172	0.105737
	General government revenue	0.529871	0.385087	0.148292
	General government total expenditure	0.556968	0.396278	0.157036
	General government primary net lending/borrowing	0.13114	0.217022	0.047098
	General government gross debt	0.271048	0.366873	0.134596
	Current account balance	0.522326	0.253157	0.064089

Fig 1. Results are calculated using Eq. (2) which shows the clustering results. We perform clustering technique on each country separately for 21 financial parameters. Below 5 clusters are shown each cluster represents a country. Here we are showing only that

cluster which contains General government total expenditure as a parameter. Then we make a common cluster which contains only those parameters which are present in at least three countries.

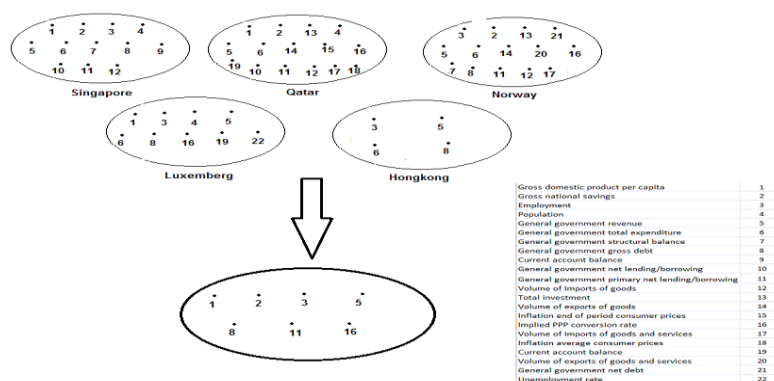


Fig. 1: Clustering results of five countries

Table 3 results are calculated using Eq. (7) which contains information about the correlation of government total expenditure with all 9 parameters

selected from common clustering results of each country.

Table 2: Correlation results of five countries

Parameters	Singapore	Qatar	Norway	luxemberg	Hongkong	Rank
Gross domestic product per capita	0.528767369	0.907344575	0.465950592	0.782483918	0.091376	6
Gross national savings	0.694361825	0.727265386	0.855689828	0.272353526	-0.39199	5
Employment	0.502190569	0.095734457	0.593799838	0.793409468	0.855438	3
General government	0.956599119	0.930115752	0.49840434	0.996989839	0.958893	1

revenue			6			
General government gross debt	0.829025968	0.745388203	-0.147761959	0.793779185	0.60352	2
General government primary net lending/borrowing	0.603866007	0.101526896	0.913271866	0.272804569	0.289698	7
Implied PPP conversion rate	-0.380468522	0.334287944	0.506639945	0.454240505	0.05842	8
Volume of Imports of goods	-0.232589853	0.250793491	-0.033401275	0.128510983	-0.30114	9
Current account balance	0.691703997	0.88656901	-0.58781055	0.915750834	0.161173	4

Above Table 3 shows the ranking of all 9 parameters with relationship strength (correlation) which indicates General government revenue, General government gross debt, and Employment are

more responsible for economic growth of a country.

Fig 2. Shows the pictorial representation of General government total expenditure with all 9 parameters.

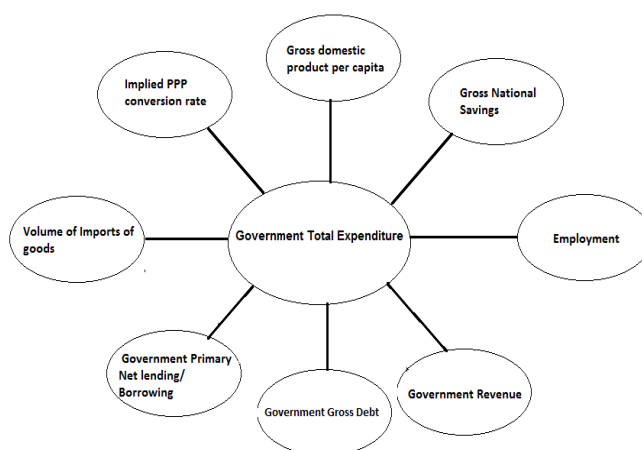


Fig. 2: Pictorial representation of common parameters

Fig. 3(Appendix) shows the graphical representation of General government total

expenditure with all 9 parameters.

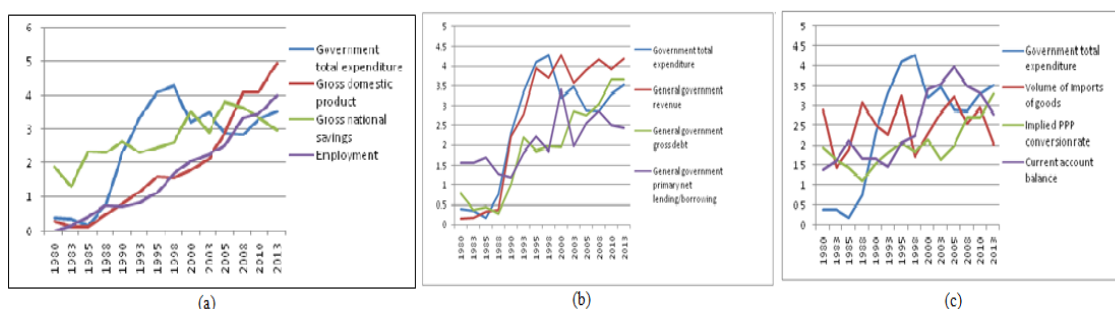


Fig. 3: Graphical representation of 9 parameters with government total expenditure

Conclusions:

This study further brings to the fore, the role of government total expenditure in economic growth and development. It also reveals the dangerous and inhibiting effect of excessive general government total expenditure on the size of the economy of a typical developing country. Government total expenditure has been a significant driver of country economy, though the speed tends to be retarded or

—slowed down by the dominance of other economic parameters.

The contribution of this analysis is to find those parameters which are closely related to government total expenditure. This analysis helps us to reduce the time taken to evaluate all economic parameters to see their impact on Government total expenditure and select some parameters from multiple parameters by using clustering and correlation techniques. It

indicates that if some changes are done on above 9 parameters it affects more in country economic growth. From analysis we come to the point that not all 9 parameters are equally affecting government total expenditure i.e. they are affecting with different strength. For example General government revenue, General government gross debt, and Employment are more responsible in rise and fall of government total expenditure of a country.

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