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The Long-Run Relationship Between Government Expenditure and Income: Evidence from Jordan

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Abstract

In this study, four versions of Wagner's law are examined empirically using Jordanian annual data for the period 1972-2001. The stationarity properties and the order of integration of the data are examined using Augmented Dickey-Fuller tests. The results based on the co-integration test turn out to provide no support for the validity of Wagner's law. The Granger-causality between government spending and income is investigated using the standard first difference VAR models. The results based on these tests provide evidence supporting the short-run dependence of real government spending on real income. On the other hand, the relationship between nominal government spending and nominal income turn out to support the presence of either feedback effect or unidirectional causality running from government spending to nominal income

ملخص

قامت الدراسة باختبار صحة قانون فاجنر (Wagner's Law) باستخدام أربعة مقاييس لكل من الإنفاق الحكومي والدخل القومي في الأردن للفترة الزمنية 1972-2001. وقد لجأت الدراسة إلى استخدام اختبار دكي- فولر الموسع (Augmented Dickey-Fuller Test) لاختبار استقرار السلاسل الزمنية المستخدمة وتحديد درجة تكامليتها. كما فحصت الدراسة مدى وجود التكامل المشترك بين السلاسل التي اتضحت بعدم الاستقرار. وأظهرت هذه الاختبارات عدم وجود علاقة طويلة الأجل بين المتغيرات المختلفة تعزز صحة قانون فاجنر. أما في الأجل القصير، فقد أظهرت النتائج على أساس نموذج (VAR) المقدر أن هناك علاقة سببية تسري من الدخل القومي الحقيقي باتجاه الإنفاق الحكومي الحقيقي، وتصح العلاقة تسير باتجاهين عند استخدام المقاييس الاسمية للدخل القومي والإنفاق الحكومي.

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Introduction

During the last three decades, the role of Jordan's government expenditures has expanded more rapidly than the general economy. Over the entire period from 1972 to 2001, nominal GDP grew by about 25 times, while government spending grew by more than thirty times. In the mid seventies of the last century, government expenditures had grown to the point where they equaled a high proportion of GDP (about 50%), and then dropped down to about 37% percent in the mid eighties, and to little above 30 percent in the late nineties. The correlation coefficient between real government spending and real GDP turns out to be high (0.91) over the entire period. This association reflects the use of government spending as a balance wheel to stabilize the economy at the full employment level.

In recent years, a large amount of empirical and theoretical research has been devoted to testing the Wagner's (1883, 1890) hypothesis, which states that as the economic activity grows, there is a tendency for government activities to increase (Chang, 2002). In its crudest form, Wagner's hypothesis states that public expenditure growth increases even faster than that of national income, confirming the notion that public expenditure is income elastic (Karras, 1993 and 1996; Evans and Karras, 1994a and 1994b).

Oxley (1994) sketched three main reasons for the empirical relationship between government spending and income. Firstly, industrialization would lead to a substitution of public for private sector activity. Secondly, increased wealth would lead to an increase in cultural and welfare services, which are assumed to be income elastic. Thirdly, government intervention would be required to manage and finance natural monopoly. Under these assumptions, a growing economy generates additional tax revenue and creates opportunities for lawmakers to increase popular public sector expenditures including government subsidies. Such an increase in public sector activity continues to flourish even in times of recession (Aschauer, 1988 and 1989; Modigliani and Sterling, 1986; Karras, 1993; Kolluri and et al., 2000). A large number of studies covering a wide spectrum of both developed and developing economies in most of the economic regions and unions have been conducted on the validity of the hypothesis (Wagner and Weber, 1977; Abizadeh and Gray, 1985; Ram, 1987; Henrekson, 1993; Vasudeva, 1993; Bairam, 1995; Afxentiou and

Serletis, 1996; Ahsan and et al., 1996; Kolluri and et al., 2000). Despite the relative economic importance of Arab region to the world economy, the number of studies that have examined Wagner's law either outdated or limited to some oil exporting countries as the studies of Ghamdi (1991), Asseery and et al. (1999) and Burney (2002).

The purpose of this paper is to examine the relationship between public expenditure and income using annual Jordanian data over the sample period 1972-2001, and using cointegration approach. This technique allows us to distinguish between short-run and long-run relationships (Johansen and Juselius, 1990; Hendry and Juselius, 2000), and yields consistent and more efficient parameters than OLS when nonstationary variables are contained in regression.

The paper is organized as follows. The next section reviews the most recent literature that related to the study. The third section describes the data used. The econometric methodology is presented in the fourth section. The fifth section presents the empirical findings. Section six concludes.

Previous Studies

This section reviews the results of the most recent studies that have investigated the long-run relationship between public spending and income in terms of cointegration analysis. Most of the empirical studies conducted on Wagner's law evolve around two main points. First, in the case of Wagner's law, cointegration is seen as a necessary condition, but not sufficient. Second, to support Wagner's law would require unidirectional causality from income to government spending.

Chletsos and Kollias (1997) investigated empirically the traditional Wagner's hypothesis in the case of Greek using disaggregated data of public expenditure for over the period 1958-1993. Employing error-correction approach yields evidence suggesting that Wagner's law is valid only in the case of military expenditures. The reported empirical results also suggest that the growth of government expenditure in the case of Greek is not directly dependent on and determined by economic growth as Wagner's law states. The other factors, such as political processes and the Greek development model may be cited as possible explanatory variables for the increase of government expenditure.

Abizadeh and Yousefi (1998) examined the direction of causality

between the growth of government expenditures and economic development using annual data for South Korea. By excluding government expenditures from the national output, their test indicated that private sector's income Granger-causes expenditure growth. In addition, they established empirical evidence supporting the validity of Wagner's law that the income elasticity of demand for public goods is greater than unity. Their results supported the positive and a statistically significant link between government spending and the dependency ratio. This finding is consistent with the results of earlier studies.

Thornton (1999) tested Wagner's law for six developed economies (Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom) using annual data from around the mid-19th century to 1913. With the exception of Germany, the results suggest that nominal GNP and nominal government expenditure and/or real GNP and real government expenditure were cointegrated in the remaining countries. Finally, Granger-causality tests suggest that unidirectional causality ran mainly from income to government expenditure, thus providing considerable support for Wagner's law in 19th century.

Asseery and et al. (1999) tested Wagner's law using disaggregated Iraqi annual data for the period 1950-1980. Their data set is truncated at 1980 in order to avoid the impact that the Iran-Iraq war may have had on public expenditure figures and to take into account the fact that there are breaks in the data in the post-1980 period. Their causality tests suggest that there is some evidence for the existence of Wagner's Law when income and several forms of expenditure are used in nominal terms. When expenditure in real terms is examined the chain of causality runs in the opposite direction.

Kolluri and et al. (2000) examined the long-run relationship between gross domestic product and government spending in the G7 countries for the period 1960-1993. Their findings provide evidence showing that government spending tends to be income elastic in the long-run. This clearly lends credence to the existence of a significant long-run equilibrium relationship between government spending and national income, thus supporting Wagner's Law. The estimates of the long-run elasticity of government expenditure with respect to national income indicates that government spending, whether expressed as an aggregate or by type, is income elastic in the majority of the highly industrialized or

G7 nations.

Anisul (2001) tested Wagner's hypothesis using USA annual data for the period 1929-1996. The reported results provided strong empirical evidence of a long-run equilibrium relation between per capita real income and the relative size of government. On the other hand, the short-run dynamics suggest that the relative size of the public expenditure is found to be a stable function of the progress of the economy with an estimated speed of adjustment of about 47% over a year. Finally, causality tests show that causal linkage flows from real income per capita to relative size of government.

Burney (2002) examined the relationship between government spending and a number of socioeconomic variables in Kuwait for the period 1969-1993. The results corresponding to the cointegration tests provide little for the existence of a long-run equilibrium relationship between government spending and the relevant socioeconomic variables. Conversely, among the different variables considered in the analysis, there is some evidence that in the long-run government spending is influenced by GNP, and the government's disposable revenues (GDR), degrees of openness of the economy, supply of revenues, population composition, and revenue constraint. Furthermore, the evidence does not lend support to the validity of Wagner's law.

Data Description

The dynamic relationships between public spending and income will be examined using Jordanian annual data over the sample period from 1972 through 2001. The variables used are gross domestic product (GDP), consumer price index (1995= 100), government expenditure, and population. All data came from the International Financial Statistics Yearbook (2002 and 2004).

Given the inexplicit nature of Wagner's original exposition, it is difficult to define precisely the empirical form of the relationship between 'economic progress' and the 'growth of the state activity'. In this study, four different versions of Wagner's Hypothesis will be empirically investigated . These versions are

$NG = f(NY)$, $RG = f(RY)$, $NGP = f(NYP)$, and $RGP = f(RYP)$

where NG= nominal government spending, RG= real Government

spending, NGP= nominal government spending per capita, RGP = real government spending per capita, NY = nominal GDP, RY = real GDP, NYP = nominal GDP per capita, and RYP = real GDP per capita. All variables are transformed to natural logarithmic form to achieve stationarity in variance. The regression model involving nonstationary time series can induce statistical distortions. The distortion here implies that most of the statistics calculated from such regression do not follow the standard distributions (Tan and Baharumshah, 1999)

Econometric Methodology

As we have mentioned earlier, the basic hypothesis to be tested in this study is Wagner's law, which postulates that as income increases during the industrialization process, the share of public expenditure increases. The most researchers who examine the existence of Wagner's law consider the regression equation (Oxley 1994):

$$L(G_t) = \beta_0 + \beta_1 LY_t + (1-\beta_1)LPOP_t + U_t \quad (1)$$

where G is government expenditure, Y is income, POP is population size, β_0 and β_1 are coefficients to be estimated, and U is a serially uncorrelated error term, and L denotes natural logarithms. In this paper, all series are transformed to natural logarithmic form to achieve stationarity in variance.

The main problem facing most previous studies is that much of econometric theory has been based on the assumption that the observed data come from a stationary process (Hendry and Juselius 2000). The regression model involving nonstationary time series can induce statistical distortions. The distortion here implies that most of the statistics calculated from such regression do not follow the standard distributions. In more precise words, the F-statistics in the regression model involving non-stationary regressors has a substantial rightward shift under the null hypothesis of no causality. Thus the significance of the test is overstated and a spurious regression result is obtained (Chang, 2002).

Tests for nonstationarity of a time series (X_t) involve testing for the presence of unit root. In this study, unit root is tested using Augmented Dickey-Fuller (ADF) test. The test is the t- statistics on θ in the following regression:

$$\Delta X_t = \delta + \theta X_{t-1} + \sum_{j=1}^{n} \varphi_j \Delta X_{t-j} + \eta_t \qquad (2)$$

where Δ is the first-difference operator, X_t is s the series under consideration, η_t is a stationary random error, δ, θ, and φ_j are parameters to be estimated. The hypothesis of non-stationarity is rejected when θ is significantly negative. Here n must be selected large enough to ensure that η_t is a white noise. In this study, the Akaike (1974) information criterion (AIC) is used to determine the appropriate lag length n that will be enough to ensure the stationarity of the error term η_t. The AIC is defined as

$$AIC = T^{*}Ln\,(ESS/T) + 2k \qquad (3)$$

where T is the sample size, ESS is the sum of squared error of the regression in equation 2, and k is the number of parameters, k = n + 2. The appropriate lag length selected by estimating equation 2 over a selected grid of values of n and finding that value of n at which AIC attains its minimum (Engle and Yoo, 1987).

Once a unit root has been confirmed for a data series, the question is whether there exists some long-run equilibrium relationship between public expenditure and income. While the theory of cointegration reveals a long-run equilibrium relationship among the dependent and independent variables, analysis of the short-run dynamics of the system is equally important. An important issue in econometrics has been the need to integrate short-run with long-run equilibrium. The theory of cointegration addresses this issue of integrating short-run dynamics with long-run equilibrium.

Cointegration tests in this study are carried out using the method proposed by Johansen (1988). The Johansen method applies the maximum likelihood procedure to examine the presence of cointegrating vectors in nonstationary time series. Following Hendry and Juselius (2000b), a two-dimensional (2×1) vector autoregressive model with Gaussian errors can be expressed by

$$X_t = \mu + \phi_{1t} X_{t-1} + \phi_2 X_{t-2} + \ldots + \phi_k X_{t-k} + \varepsilon_t \qquad (4)$$
$$t = 1,2, \ldots, T$$

where $X_t = (G_t \text{ and } Y_t)$, and $\varepsilon_t \sim$ i.i.d. N (0,Λ). The covariance matrix of the error process (Λ), and the parameters (ϕ_1, ϕ_2, ϕ_k, μ) are to be estimated. By taking first differencing on the vector level, the model in

error correction form is

$$\Delta X_t = \mu + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} \ldots\ldots + \Gamma_{k-1} \Delta X_{t-k-1} - \Pi X_{t-1} + \varepsilon_t \quad (5)$$

where $\Gamma_i = -(I - \phi_1 . \phi_2 ..... \phi_i)$ are short-run parameter matrices, $\Pi = (I - \phi_1 . \phi_2 . \_ \_ - \phi_k)$, sub-index k is the lag-length. The matrix Π conveys information about the long-run relationship between G_t, and Y_t. Testing for cointegration involves testing for the rank of Π matrix r by examining whether the eigenvalues of Π are significantly different from zero. Three possible conditions exist: (a) the Π matrix has full column rank, implying that X_t was stationary in level to begin with; (b) the Π matrix has zero rank, in which case the system is a traditional first-differenced VAR; and (c) the Π matrix has rank r such that $0 < r \leq 1$, implying that there exist r linear combinations of X_t that are cointegrated. If the condition (c) prevails, then Π matrix can be decomposed into two $2 \times r$ matrices, α and β, such that $\alpha\beta' = \Pi$. The loading matrix α represents the error correction parameters, which can be interpreted as speed of adjustment, while the vectors of β represent the r linear cointegrating relationships such that $\beta' Y_t$ is stationary.

Following Johansen (1988) and Johansen and Juselius (1990), the likelihood ratio will be used for testing the number of cointegrating vectors (or the rank of Π). The likelihood ratio statistic for the trace test is

$$LHR = -T\sum_{i=r+1}^{p-2} Ln(1 - \hat{O}_i) \quad (5)$$

where $\hat{O}_{r-1}, \ldots, \hat{O}_p$ are the estimated p-r smallest eigenvalues. The null hypothesis to be tested is that there are at most r cointegrating vectors. That is, the number of cointegrating vectors is less than or equal to r, where r is 0 or 1. In each case, the null hypothesis is tested against the general alternative of r + 1 cointegrating vectors. Thus, the null hypothesis r = 0 is treated against the alternative that r =1.

Since cointegration tests are very sensitive to the choice of lag length used in carrying out such tests, the Schwarz (1978) criterion (SC) will be used to select to select the optimal number of lags required in estimating the cointegration test. The SC is defined as follows:

$$SC = Ln\,\Omega_n^2 + n\,Ln(T)/T \quad (6)$$

where Ω_n^2 is the maximum likelihood estimator of the residual variance obtained from a model with lag length n, that is $\Omega_n^2 = SSE_n/T$, T is the sample size, and n is the number of lags selected to numerically minimize SC in equation (6).

Engle and Granger (1987) show that if two nonstationary variables are cointegrated, the error-correction model is conducted for determining the causality. The error correction model of income and government spending is as follows:

$$\Delta G_t = \theta^{m}_{11}(L)\Delta G_t + \theta^{n}_{12}(L)\Delta Y_t + \alpha_1 ECT_{1t-1} + u_{1t} \quad (7)$$

$$\Delta Y_t = \theta^{m}_{21}(L)\Delta G_t + \theta^{n}_{22}(L)\Delta Y_t + \alpha_2 ECT_{2t-1} + u_{2t} \quad (8)$$

where $\theta^{m}_{ij}(L) = \sum_{L=1}^{M_{ij}} \theta^{m}_{ijL} L^{L}$.

Δ is the first difference operator and L is the lag operator such that $LY_{1t} = Y_{1t-1}$, u_{1t} and u_{2t} are white noise terms, and ECT_{it-1} (i = 1, 2) is the error-correction term (lagged one period) derived from long-run cointegrating relationship to capture the long-un dynamics. The inclusion of these terms, which must be stationary if the variables are cointegrated, differentiate the error–correction model from the standard Granger causality test (Anderson and et al., 2000).

On the basis of error- correction models in (8) and (9), unidirectional causality from Y to G is implied if not only the estmated coefficients on the lagged Y variables in equation (7) are statistically different from zero as a group, but also the coefficient on the error correction term in equation (7) is significant, and if the set of estimated coefficients on the lagged G variables in equation (8) are not statistically different from zero. Similarly, G causes Y if the estimated coefficients on the lagged G variable in equation (8) are statistically different from zero as a group, the coefficient on the error correction term in equation (8) is significant, and if the set of estimated coefficients on the lagged Y variables in equation (7) are not statistically different from zero. Finally, feedback between Y and G would exist if the set of estimated coefficients on the lagged Y variables in equation (7) were statistically significant as a group ad the set of estimated coefficients on the lagged G variables in equation (8) were also statistically significant as a group, and also the coefficients of error correction terms in both equations are significant.

Empirical Findings

Because cointegration equations require the use of nonstationary time series, each data series is first examined for the probable order of difference of stationary using the ADF unit root test. Following the recommendations by Dickey et al. (1986) and Miller and Russek (1990), the ADF tests are performed by estimating equation 2 over a grid of n = 1, 2, and 3 to select the optimal lag structure that minimizes the AIC as shown in table 1. According to the applicable test statistics, nonstationarity can be rejected for the level of (LNG, LNGP, LNY, LRYP, LNYP) series, and for (LRG, LRGP, LRY) series when are differenced. In general, these results confirm the fact that deflated government spending and income in Jordan turn out to be nonstationary in variance compared to nominal measures.

Table 1
Augmented Dickey-Fuller Unit Root Tests

Variable	Level			First-difference		
	Lag	AIC(	ADF	Lag	AIC(n)	A
LNG	1	-5.22	-4.46**			
LRG	2	-5.12	-2.86	1	-4.92	-2.51*
LRGP	2	-4.69	-1.76	1	-4.71	-2.62*
LNGP	1	-5.22	-4.46**			
LNY	1	-5.77	-3.48*			
LRY	2	-5.30	-2.95	2	-5.04	-2.32*
LRYP	2	-4.96	-3.04*			
LNYP	2	-5.52	-3.80**			

*(**) denotes rejection of the hypothesis at 5%(1%) significance level.

The above results indicate that using OLS in estimating the dynamics between government spending and income using real magnitudes will yield inconsistent and less efficient results. Since a unit root has been confirmed for LRG, LRGP, and LRY series, the question is whether there exists some long-run cointegrating relationships between (LRG and LRY), and (LRGP and LRYP), because it is possible that common trends exist within them as a group. Regarding cointegration technique, a VAR model is first fitted to these series to select an optimal lag structure. The VAR methodology approves its efficiency in selecting the appropriate lag intervals on which cointegration models are based.

The VAR models are estimated on a grid of 1, 2, and 3 lags to select the optimal lag intervals that minimizes the SC as shown in table 2. The SC suggests 2 lags for the cointegration models (LRG & LRY), and (LRGP & LRYP), and 1 lag for the models (LNG & LNY), and (LNGP & LNYP).

Table 2
Schwarz Criterion based on VAR models

VAR	Lag Structure	SC	VAR	Lag Structure	SC
LNG/LNY	1	-5.18	LNY/LNG	1	-5.87
	2	-5.07		2	-5.63
	3	-4.95		3	-5.74
LNGP/LNYP	1	-5.03	LNYP/LNGP	1	-5.37
	2	-5.01		2	-5.23
	3	-4.79		3	-5.06
LRG/LRY	1	-5.04	LRY/LRG	1	-4.93
	2	-5.16		2	-4.90
	3	-5.14		3	-4.82
LRGP/LRYP	1	-4.17	LRYP/LRGP	1	-4.69
	2	-4.60		2	-4.70
	3	-4.41		3	-4.51

To examine for the presence of cointegrating relationship between real government spending and real income measures, the cointegration tests are carried out on 2 lag length intervals as suggested by the SC statistic. To compare the robustness of results across different cointegrating modes, the likelihood ratio statistics (equation 5) are estimated on two assumptions: (a) no deterministic trend in data, and (b) linear deterministic trend in the data.

As shown in table 3, the likelihood ratio statistic corresponding to equation 5 reveals evidence suggesting no cointegrating equation for all of the four models estimated. The results suggest that the standard Granger regressions as indicated in equations (7 - 8) without error–error correction terms would be implemented to examine the causality between government spending and income.

Table 3
Cointegration Test Results

Variables	Eigenvalue	Likeli-hood Ratio	5% Critical Value	1% Critical value	Hypoth-esized No of CE(S)	Assumption
LRG & LRY	0.23	9.20	12.53	16.31	r = 0	Deterministic Trend
	0.06	1.75	3.84	6.51	r = 1	
	0.40	23.48	25.32	30.45	r = 0	No Deterministic Trend
	0.30	9.50	12.25	16.26	r = 1	
LRGP & LRYP	0.19	5.60	12.53	16.31	r = 0	Deterministic Trend
	0.00	0.00	3.84	6.51	r = 1	
	0.34	19.70	25.32	30.45	r = 0	No Deterministic Trend
	0.27	8.52	12.25	16.26	r = 1	

* denotes rejection of the hypothesis at 5% significance level.

Table 4 reports the statistical analysis based on the first difference VAR models on the causal relationships between government spending and income using four alternative measures. The Granger-statistics are estimated on the basis of the appropriate lag structure selected by applying the SC statistic. The Granger statistic shows evidence supporting bidirectional causality (feedback) between nominal government spending and GDP at 1% significance level. On the basis of using nominal per capita measures, the Granger test reveals evidence supporting unidirectional causality running from government spending to nominal income at 5% significance level. On the other hand, the Granger test confirms the existence of unidirectional causality running from real income to real government and also from real per capita income to real government spending per capita, thus supporting the short-run dependence of real government spending on real income.

The lack of long-run equilibrium cointegrating relationship between government spending and income using different measures is consistent with the growth patterns of government spending and income over the entire period studied and over the sub-periods 1972 -1979, 1980-1988, and 1989-2001. Over the entire period studied, the average rates of growth of government spending and income were very much similar in vicinity of 3.9% and 3.0%, respectively. Over the period 1972-1979,

Jordan's economy grew in leaps. The average rate of growth of the economy was 9.01 percent per annum, while government spending growth averaged about 12.67%. The rapid growth in government spending during this period might be attributed to the rapid increase in oil exporting countries financial assistance to Jordan. In the course of time, government spending dropped to an average of 2.61% per annum in the 1980's and 0.77% in the 19990's. The growth rate in real terms also dropped to an average of 5.63% and 2.53%, respectively. With these heterogeneous patterns of growth, the lack of dynamics between these variables may not be surprising. The long-run relationship included in our model addresses, in a formal way, the classic problem of combining long-run 'equilibrium' –ones in which the researcher derives a high degree of confidence from economic theory- with a short-run dynamic structure on which economic theory provides little guidance.

The lack of the long-run relationship between government spending and income measures can be interpreted as follows. First of all, the administrative and protective functions of the government have failed to expand due to the rising complexity of legal relationship and communications. As an example, increased urbanization and concentrations of population require higher public spending on law and order of socioeconomic regulation. Secondly, the income elasticity of demand for public-provided goods such as education ad health is less than unity. And finally, the technological needs of an industrialized society required larger amounts of capital than are forthcoming from the public sector.

Due to financial constraints that resulted from the dramatic drops in foreign grants and rapid increases in public debt services in the last two decades, the government has failed to provide the necessary capital funds to finance large-scale capital expenditure. Therefore, the private sector grew faster than the public sector.

Table 4
First-Difference Granger-Causality

Hypotheses	lags	F	α
LNY does not Granger Cause LNG LNG does not Granger Cause LNY	1	8.83 19.53	0.01 0.00
LNYP does not Granger Cause LNGP LNGP does not Granger Cause LNYP	1	0.60 4.26	0.45 0.05
LRY does not Granger Cause LRG LRG does not Granger Cause LRY	2	6.90 0.79 0.78695	0.00 0.47 0.46711
LRYP does not Granger Cause LRGP LRGP does not Granger Cause LRYP	2	5.04 2.04	0.02 0.15

Conclusions

In this study, four versions of Wagner's law are examined empirically by employing annual Jordanian data over the period 1972-2001. First, the stationarity properties of the data and the order of integration of the data are examined using Augmented Dickey-Fuller tests. The results indicate evidence showing that real measures of government spending and real income turn out to be nonstationary compared to nominal measures. Second, results of cointegration between real government spending and real income using different measures provide no support for the validity of Wagner's law. Third, the standard Granger tests reveal evidence supporting the short-run dependence of real government spending on real income. When these tests are carried using nominal measures, the relationship between nominal government spending and nominal income exhibits feedback effect, and unidirectional causality from government spending per capita to nominal income per capita.

This study suggests a need for careful specification of the model's multivariate stochastic structure. Conducting larger multivariate tests may provide sharp inferences about the existence of a government spending vector in a multivariate system characterized by large number of vectors. Furthermore, Examining the estimated model's stability, and comparing its out-of-sample forecast performance represent important steps towards such an ultimate goal.

References

1- Abizadeh, S. and Gary, J. (1985) 'Wagner's law: a pooled time series cross-section comparison', National Tax Journal, 88: 209-18.

2- Abizadeh, S. and Yousefi, M. (1998) 'An empirical analysis of South Korea's economic development and public expenditures growth', Journal of Socio-Economics, 27 (6): 687-700.

3- Afxentiou, P.C. and Serletis, A. (1996) 'Government expenditures in the European Union: do they converge or follow Wagner's law', International Economic Journal, 10: 33-47.

4- Ahsan, S. M., Kwan, C. C. and Sahni, B. S. (1996) 'Cointegration and Wagner's hypothesis: time series evidence for Canada', Applied Economics, 28, 1055-58.

5- Akaike, H. (1969) 'Fitting autoregressive models for prediction', Annals of the Institute of Statistical Mathematics, 2: 243-7.

6- Anderson, R., Hoffman, D., and Rasche, R. (2000) ' A vector error-correction forecasting model of the U.S. economy', Federal Reserve Bank of ST. Louis, Working Paper Series.

7- Anisul, I. M. (2001) 'Wagner's law revisited: cointegration and exogeneity test for the USA', Applied Economic Letters, 8(8): 509-515.

8- Aschauer, D. A. (1988) 'The equilibrium approach to fiscal policy', Journal of Money, Credit, and Banking, 20: 41-62.

9- Aschauer, D. A. (1989) 'Is public expenditure productive?', Journal of Monetary Economics, 23, 117-200.

10- Asseery, A. A. Law, D. and Perdikis, N. (1999) 'Wagner's law and public expenditure in Iraq: a test using disaggregated data', Applied Economics Letters, 6(1): 39-45.

11- Bairam, E. I. (1995) 'Level of aggregation, variable elasticity, and Wagner's law', Economics Letters, 48: 341- 44.

12- Burney, N. (2002) 'Wagner's hypothesis: evidence from Kuwait using cointegration tests', Applied economics, 34: 49-57.

13- Chang, T. (2002) 'An econometric test of Wagner's law for six countries based on cointegration and error-correction modeling techniques', Applied Economics, 34: 1157-1169.

14- Chletsos, M. and Kollias, C. (1997) 'Testing Wagner's law using disaggregated public expenditure data in the case of Greece: 1958-93', Applied Economics, 29: 371-377.

15- Dickey, D. A. and Fuller. W. A. (1981) 'Likelihood ratio statistics

for autoregressive time series with a unit root', Econometrica 49: 1057-1072.

16- Dickey, D. A., Bell, W. R. and Miller, R. B. (1986) 'Unit roots in time series models: tests and implication', The American Statistician, 40: 12-26.

17- Engle, R. F. and Granger, C. W. J. (1987) 'Co-integration and error-correction: representation, estimation and testing', Econometrica, 55: 251-76.

18- Evans, P. and Karras, G. (1994a) 'Are government activities productive? Evidence from a panel of US states', Review of Economics and Statistics, 76: 1-11.

19- Evans, P. and Karras, G. (1994b) 'Is government capital productive? Evidence from a panel of seven countries', Journal of Macroeconomics, 16, 271-80.

20- Ghamdi, A. M. A. (1991) 'Growth of public expenditures in the Gulf Cooperation Council Countries: a test of Wagner's law and the possible spill in effect', Studi Economici, 43(1): 161-82.

21- Giles, D. E. A., Giles, J. and McCann, E. (1993) 'Causality, unit roots and export led growth: the New Zealand experience', Journal of International Trade and Economic Development, 1: 195-218.

22- Hendry, D. and Juselius, K. (2000) 'Explaining cointegration analysis: Part 1', The Energy Journal, 21(1): 1- 42.

23- Henrekson, M. (1993) 'Wagner's law - a spurious relationship?', Public Finance, 48(2): 406-15.

24- International Financial statistics Yearbook 2002, 55.

25- Johansen, S. (1988) 'Statistical analysis of cointegration vectors', Journal of Economics Dynamic and Control, 12: 231-54.

26- Johansen, S. and Juselius K. (1990) 'Maximum likelihood estimation and inference on cointegration – with applications to the demand for money', Oxford Bulletin of Economics and Statistics, 52: 169-210.

27- Karras, G. (1993) 'Employment and output effects of government spending: is government size important?', Economic Inquiry, 31(3): 354-69.

28- Karras, G. (1996) 'The optimal government size: further international evidence', Economic Inquiry, 34 (2), 193-203.

29- Kolluri, B. R., Panik, M. J., and Wahab, M. S. (2000) 'Government expenditure and economic growth: evidence from G7 countries',

Applied Economics, 32 (8): 1059-1068.

30- Miller, S. M. and Russek, F. S. (1990) 'Cointegration and error-correction models: temporal causality between government taxes and spending', Southern Economic Journal, 57: 33-51.

31- Modigliani, F. and Sterling, A. (1986) 'Government debt, government spending, and private sector behavior: a comment', American Economic Review, 76: 1168-79.

32- Oxley, L. (1994) 'Cointegration, causality and Wagner's law: a test for Britain 1870-1913', Scottish Journal of Political Economy, 41(3): 286-298.

33- Ram, R. (1987) 'Wagner's hypothesis in time-series and cross-section perspectives: evidence from real data for 115 countries', Review of Economics and Statistics, 62, 194-204.

34- Schwarz, G. (1978) 'Estimating the dimension of a model', The Annals of Statistics, 6: 461-464.

35- Tan , H. and Baharumshah, A. (1999) ' Dynamic causal chain of money, output, interest rate and prices in Malaysia: evidence based on vector error-correction modeling analysis', International Economic Journal, 13(1): 103-120.

36- Thornton, J. (1999) 'Cointegration, causality and Wagner's law in 19th century Europe', Applied Economics Letters, 6(7): 413-16.

37- Vasudeva, M. N. R. (1993) 'Further evidence of Wagner's law for Mexico: an application of cointegration analysis', Public Finance, 48(1): 92-96.

38- Wagner, A. (1883, 1890) Finanzwissenschaft (2nd and 3rd ed.), partly reprinted in classic in the Theory of Public Finance (Eds) R. A. Musgrave and A. T. Peacock, Macmillan, London (1958).

39- Wagner, R. E. and Weber, W. E. (1977) 'Wagner's law, fiscal institution and the growth of government', National Tax Journal, 30: 59-68.