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E-government performance and Economic Growth in OPEC Countries: A cointegrated panel analysis

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Abstract
This paper uses empirical evidence to examine the causality relationship between electricity consumption and economic growth in OPEC countries by using annually data (1980-2011), this paper utilizes the panel cointegration and panel based error correction approach models, framework. Also, this paper uses empirical evidence to examine the adoption of e-Government services in these countries. The superiority of our article is in applying FMOLS estimation method for heterogeneous panels, has stable and consistent coefficients and is also a dynamic model. Moreover, with regard to previous studies, our paper includes more countries which increase the reliability of the results. The results show that in the short-run, the Granger causality runs from economic growth to e-government performance in these countries. However, in the long run there is bi-directional Granger causality relationship for these country.
Keywords: OPEC Countries, ICT industry, e-Government, economic growth, Panel cointegration; Causality.

1. Introduction

Rokhman (2011) stats that "The development of information and communication technology (ICT) has brought impact to human life. Various sectors in people's lives have changed, including in the public service sectors. Government services which have been impressed by rigid bureaucratic and recently by the ICT can be replaced with e-government to be more flexible, and more oriented to user satisfaction. E-government offers the public service can be accessed 24 hours, whenever, and wherever the user is located. E-government also allows the public service to be more efficient since the service should not be conducted by face-to-face communication" (Rokhman, 2001).

Developing Countries such as OPEC countries can more effectively harness information and communication technology (ICT) to increase competitiveness, reduce inequality, and perfect its goals. This case study presents evidence of the importance of leadership and a broadly shared vision in order to drive coordination of e-development policies and programs, leverage local innovations and lessons of experience, and scale up successes for a large, diverse, and democratic country.

Public frustration with crime, corruption, unresponsive political institutions, tortoise-like judicial systems, and lack of economic opportunities is rampant. There is still no real consensus on development strategy among key elites or the public at large.

Nowadays, the information and communication technologies (ICT) have taken the consideration of government and using ICT in government processes leads to e-government concept. E-government interacts with citizens, business and government (De Briune Frans, 2000). E-government means applying information and communication technologies by government agencies to communicate with citizens, business and themselves in order to prepare and deliver services effectively and efficiently. There are three kinds of government services, which are information, interactive and transaction services. While providing information services is easier than the others, they usually appear in the primary steps of e-government implementation, thereby required information are available to the customers of government. If the relation between government and costumers goes beyond transferring information, i.e. the costumers are allowed to ask for services or special objects, then the services become interactive. Transaction services are the advanced e-government relationship, thereby the government communicates with costumers electronically. Preparing this kind of services needs the essential infrastructures and communication tools (Erkki Liikanen, 2001).

E-government enables all government services to be accessible through several access channels like digital TV, call centers and Internet. The e-government structure consists of two main parts: back office and front office. In back office, services and information are prepared to present in front office. Security systems for protecting the government, interoperability, communication standards and one-stop-portal are the essential parts of back office. The structure of e-government has been shown in figure 1.As illustrated in figure 1, for developing e-government some basic essentials must take into consideration including one-stop-portal, interoperability, security and public access (Ahmadi et al, 2009).

Rokhman (2011) examine the E-Government adoption in developing countries; the Case of Indonesia. Results show that how the acceptance of Indonesian Internet users to e-government services, in terms of relative advantage, image, compatibility, and ease to use variables. Online survey has been published and collected 751 respondents. There are more than 93 percent of the respondents who have intention to adopt e-government. Relative advantage and compatibility variable were proven as useful factors to predict intention of use of e-government, otherwise the variable of image and ease to use is not proven. This study provides a trigger for the Indonesian government both central and local governments to develop and implement better e-government since 45 million Indonesian Internet users have been waiting for e-government services.

Picci (2005) propose a quantitative methodology to analyze the economic impact of e-government based on structural modeling, allowing for a careful description of the underlying theoretical assumptions and for an assessment of different policy scenarios. The transparent relation between the theory and the results obtained is an advantage with respect to purely narrative methods. The methodology departs significantly both from studies in the cost benefit analysis tradition and from the analysis of ‘‘e-readiness’’ indexes, whose purpose is a quantification of preconditions for successful policies. An illustration of the method is provided, using data from the Italian region of Tuscany.

The purpose of this paper is, therefore, to investigate the causality between e-government performance and economic growth, and to obtain policy implications from the results. The paper is organized in the following fashion. Section 3, describe the e-government performance. Section 3, describe the econometric methodology. Section 4 presents data and empirical study. Final section contains the conclusions.

2- E-government performance

E-government methodologies use data collected through surveys and web monitoring software and administrative data from records. The methodologies themselves include traditional random telephone surveys, web-based pop-up surveys or page-based clickable “opt-in” web surveys, cost-benefit analyses, the basic gathering of performance or benchmarking data, and the e-government specific web tracking methodologies (Stowers, 2004).

Surveys are typically used to measure customer satisfaction and opinion. One type of survey used in this area is the traditional random sample survey conducted via telephone. Traditional random sample surveys have the benefit of being a well-tested methodology—one that is easily understandable to many. However, given the rates of e-government participation at this point, random samples of the general population run the risk of not including adequate numbers of individuals who have had experience with the specific e-government applications (Stowers, 2004).

In the field of e-government, website pop-up surveys can also be used. Pop-up surveys are those short, web-based sets of questions that are programmed to appear for randomly selected users (selected to ensure a specific proportion of users receive the survey). One case highlighted later in this report shows the results of pop-up surveys and a methodology developed by University of

Michigan researchers. The federal government then uses the results in its efforts to measure customer satisfaction with government websites. Studies by these researchers indicate that they are as effective as traditional random sample surveys; have greater response rates than clickable, “opt-in” surveys on the websites being visited; and have fewer response biases built in. These efforts will be reported on later in this report as a best practice (Stowers, 2004).

3. Methodology

3.1. The panel unit roots test

In order to investigate the possibility of panel cointegration, it is first necessary to determine the existence of unit roots in the data series. For this study we have chosen the Im, Pesaran and Shin (IPS), which is based on the well-known Dickey-Fuller procedure. Investigations into the unit root in panel data have recently attracted a lot of attention. Levine and Lin, (1993) proposes a panel-based ADF test that restricts parameters γ_i by keeping them identical across cross-sectional regions as follows:

$$\Delta y_{it} = \alpha_i + \gamma_i y_{it-1} + \sum_{j=1}^{k} \alpha_j \Delta y_{it-j} + \varepsilon_{it} \quad (1)$$

where t =1,. . ., T time periods and i =1,. . .N members of the panel. LL tests the null hypothesis of $\gamma_i = \gamma = 0$ for all i, against the alternate of $\gamma_1 = \gamma_2 \ldots = \gamma < 0$ for all i, with the test based on statistics $t_\gamma = \hat{\gamma}/s.e.(\hat{\gamma})$. One drawback is that c is restricted by being kept identical across regions under both the null and alternative hypotheses (Lee, Chien-Chiang, 2005).

For the above reason, IPS (1997) relax the assumption of the identical first-order autoregressive coefficients of the LL test and allow γ varying across regions under the alternative hypothesis. IPS test the null hypothesis of $\gamma_i = 0$ for all i, against the alternate of $\gamma_i < 0$ for all i. The IPS test is based on the mean-group approach, which uses the average of the t_{γ_i} statistics to perform the following $\bar{Z}$ statistic:

$$\bar{Z} = \sqrt{N}(\bar{t} - E(\bar{t}))/\sqrt{Var(\bar{t})} \quad (2)$$

Where $\bar{t} = (\frac{1}{N}) \sum_{i=1}^{N} t_{\gamma_i}$, the terms E($\bar{t}$) and Var($\bar{t}$) are, respectively, the mean and variance of each t_{γ_i} statistic, and they are generated by simulations and are tabulated in IPS (1997). The $\bar{Z}$ converges to a standard normal distribution. Based on Monte Carlo experiment results, IPS demonstrates that their test has more favorable finite sample properties than the LL test.

Hadri (2000) argues differently that the null should be reversed to be the stationary hypothesis in order to have a stronger power test. Hadri's (2000) Lagrange multiplier (LM) statistic can be written as (Lee, Chien-Chiang, 2005):

$$\widehat{LM} = 1/N \sum_{i=1}^{N} \left(\frac{\frac{1}{T^2} \sum_{t=1}^{T} S_{it}^2}{\hat{\sigma}_\varepsilon^2} \right), \quad S_{it} = \sum_{j=1}^{t} \widehat{\varepsilon_{ij}} \quad (3)$$

Where $\hat{\sigma}_s^2$ is the consistent Newey and West (1987) estimate of the long-run variance of disturbance terms.

The next step is to test for the existence of a long-run cointegration among GDP and the independent variables using panel cointegration tests suggested by Pedroni (1999 and 2004). The panel cointegration tests Pedroni (1999) considers the following time series panel regression

$$y_{it} = \alpha_{it} + \delta_{it} t + X_i B_i + \varepsilon_{it} \quad (4)$$

Where y_{it} and X_{it} are the observable variables with dimension of $(N * T) \times 1$ and $(N * T) \times m$, respectively. He develops asymptotic and finite-sample properties of testing statistics to examine the null hypothesis of non-cointegration in the panel. The tests allow for heterogeneity among individual members of the panel, including heterogeneity in both the long-run cointegrating vectors and in the dynamics, since there is no reason to believe that all parameters are the same across countries (Lee, Chien-Chiang, 2005).

Two types of tests are suggested by Pedroni. The first type is based on the within dimension approach, which includes four statistics. They are panel υ-statistic, panel ρ statistic, panel PP-statistic, and panel ADF-statistic. These statistics pool the autoregressive coefficients across different members for the unit root tests on the estimated residuals.

The second test by Pedroni is based on the between-dimension approach, which includes three statistics. They are group ρ statistic, group PP-statistic, and group ADF-statistic. These statistics are based on estimators that simply average the individually estimated coefficients for each member. Following Pedroni (1999), the heterogeneous panel and heterogeneous group mean panel cointegration statistics are calculated as follows (Lee, Chien-Chiang, 2005).

Panel υ-statistic:

$$Z_v = \left(\sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^{-2}\, \hat{e}_{it-1}^{2}\right)^{-1}$$

Panel ρ-statistic:

$$Z_\rho = \left(\hat{\sigma}^2 \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^{-2}\, \hat{e}_{it-1}^{2}\right)^{-1/2} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^{-2}\, (\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Panel ADF-statistic:

$$Z_t^* = \left(\hat{s}^{*2} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^{-2}\, \hat{e}_{it-1}^{*2}\right)^{-1/2} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^{-2}\, \hat{e}_{it-1}^{*}\Delta\hat{e}_{it}^{*}$$

Group ρ-statistic:

$$\tilde{Z}_\rho = \sum_{i=1}^{N}\left(\sum_{t=1}^{T} \hat{e}_{it-1}^{2}\right)^{-1} \sum_{t=1}^{T} (\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Group PP-statistic:

$$\tilde{Z}_t = \sum_{i=1}^{N}\left(\hat{\sigma}^2 \sum_{t=1}^{T} \hat{e}_{it-1}^{2}\right)^{-1/2} \sum_{t=1}^{T} (\hat{e}_{it-1}\Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Group ADF-statistic:

$$\tilde{Z}_t^* = \sum_{i=1}^{N}\left(\sum_{t=1}^{T} \hat{s}_i^{2}\, \hat{e}_{it-1}^{*2}\right)^{-1/2} \sum_{t=1}^{T} (\hat{e}_{it-1}^{*}\Delta\hat{e}_{it}^{*})$$

Here, $\hat{e}_{it}$ is the estimated residual from Eq. (4) and $\hat{L}_{11i}^{2}$ is the estimated long-run covariance matrix for $\Delta\hat{e}_{it}$. Similarly, $\hat{\sigma}_i^{\,2}$ and $\hat{s}_i^{\,2}$ ($\hat{s}_i^{*2}$) are, respectively, the long-run and contemporaneous variances for individual i. The other terms are properly defined in Pedroni (1999) with the appropriate lag length determined by the Newey–West method. All seven tests are distributed as being standard normal asymptotically. This requires a standardisation based on the moments of the underlying Brownian motion function. The panel m-statistic is a one-sided test where large positive values reject the null of no cointegration. The remaining statistics diverge to negative infinitely, which means that large negative values reject the null. The critical values are also tabulated by Pedroni (1999) (Lee, Chien-Chiang, 2005).

In the presence of unit root variables, the effect of superconsistency may not dominate the endogeneity effect of the regressors if OLS is employed. Pedroni (2000) shows how FMOLS can be modified to make an inference in being cointegrated with the heterogeneous dynamic. In the FMOLS setting, non-parametric techniques are exploited to transform the residuals from the cointegration regression and can get rid of nuisance parameters (Lee, Chien-Chiang, 2005).

3.2. Granger Non-Causality Test

The existence of cointegration relationships indicates that there are long-run relationships among the variables, and thereby Granger causality among them in at least one direction. The ECM was introduced by Sargan (1964), and later popularized by Engle and Granger (1981). It is used for correcting disequilibrium and testing for long and short run causality among cointegrated variables. The ECM used in this paper is specified as follows:

$$\Delta y_{it} = \alpha_{1i} + \sum_{j=1}^{q_1} \beta_{1j}\Delta y_{it-j} + \sum_{j=1}^{q_2} \delta_{1j}\Delta EGOV_{it-j} + \lambda_1 ECT_{it-1}^{y} + \varepsilon_{1it} \quad (5)$$

$$\Delta EGOV_{it} = \alpha_{2i} + \sum_{j=1}^{p_1} \beta_{2j}\Delta y_{it-j} + \sum_{j=1}^{p_2} \delta_{2j}\Delta y_{it-j} + \lambda_2 ECT_{it-1}^{x} + \varepsilon_{2it} \quad (6)$$

Where ECM_{t-i} = the lagged error-correction term obtained from the long-run equilibrium relationship.

Although the existence of a long-run relationship between EGOV and y/N suggests that there must be Granger-causality in at least one direction, it does not indicate the direction of temporal causality between the variables. The direction of the causality in this case can only be determined by the F-statistic and the lagged error-correction term. It should, however, be noted that even though the error-correction term has been incorporated in

all the equations (5) – (6), only equations where the null hypothesis of no cointegration is rejected will be estimated with an error-correction term (Odhiambo, 2010).

In each equation, change in the endogenous variable is caused not only by their lags, but also by the previous period's disequilibrium in level. Given such a specification, the presence of short and long-run causality could be tested (Aktaş, Cengiz and Yılmaz, Veysel., 2008).

4. Empirical results and discussion

4.1. Panel nit root test and panel cointegration test

The data used in this study consist of annual time series of GDP and e-government performance for OPEC countries 1980 to 2011. Annual time series data were utilized in this study, the data are obtained from *word bank data base*. The empirical period depends on the availability of data, where the time period used is 1980–2011. All variables used are in natural logarithms.
GDP: Gross Domestic Product (1.000.000$),

EGOV: e-government performance in economy and financial system.

Table 1 presents the panel unit root tests. At a 5% significance level, all statistic of the level model confirm that three series have a panel unit root. Using these results, we proceed to test GDP and EGOV for cointegration in order to determine if there is a long-run relationship to control for in the econometric specification. Based on the results from the panel unit roots we conclude for all 3 variables, the null of a unit root cannot be rejected in their levels. At first differences, however, the null is strongly rejected in all cases. We conclude that all series are integrated of order one *I*(1) in the constant plus time trend of the panel unit root regression. Therefore, we can conclude that all of the variables are non-stationary in with and without time trend specifications at level by applying the Panel unit root test which is also applied for heterogeneous panel to test the series for the presence of a unit root. The results of the panel unit root tests confirm that the variables are non-stationary at level.

Table 1 – Panel unit root tests

Variable	Levin, Lin & Chut		Im, Pesaran and Shin (IPS)		Hadri	
	No time effects	Time fixed effects	No time effects	Time fixed effects	No time effects	Time fixed effects
GDP	-2.23	1.34	-2.11	-2.18	2.23	3.16
EGOV	-2.54	-2.67	-2.45	-2.32	3.47	2.67
ΔGDP	-6.76	-7.99	-6.47	-7.35	6.58	4.69
ΔEGOV	-7.34	-6.68	-7.44	-7.77	5.45	9.94

Δ denotes first differences. All variables are in natural logarithms.
Data Source: World Development Indicators (2013)

We can conclude that the results of panel unit root tests reported in Table1 support the hypothesis of a unit root in all variables across countries, as well as the hypothesis of zero order integration in first differences. Given the results of IPS test, it is possible to apply panel cointegration method in order to test for the existence of the stable long-run relation among the variables. Having established that the variables are I(1), we proceed to test whether a long-run relationship might exist between them.
Table 2 reports the panel cointegration estimation results. For the all statistics significantly we can reject the null of no cointegration. Thus, it can be seen that the GDP and EGOV move together in the long run. That is, there is a long-run steady state relationship between e-government performance in economy and financial system and GDP for a cross-section of countries. The next step is an estimation of such a relationship.

Table 2- Panel cointegration tests

	No time effects	Time fixed effects
Panel variance	1.23	1.38
Panel ρ	-1.24	-1.63
Panel PP	-1.65	-1.45
Panel ADF	-2.18	-2.25
Group ρ	-1.10	-1.32
Group PP	-1.32	-1.24
Group ADF	-2.16	-2.21

Statistics are asymptotically distributed as normal. The variance ratio test is right-sided, while the others are left-sided.

The next step is to test whether the variables are cointegrated using Pedroni's (1999, 2001, and 2004). This is to investigate whether long-run steady state or cointegration exist among the variables. Since the variables are found to be integrated in the same order *I*(1), we continue with the panel cointegration tests proposed by Pedroni (1999, 2001, and 2004). Cointegration are carried out for constant and constant plus time trend and the summary of the results of cointegration analyses are presented in Table 2.

Table 3 reports the results of the individual and panel FMOLS. The panel estimators with and without common time dummies are shown at the bottom of the table. The coefficient of EGOV (e-government performance in economy and financial system) are statistically significant at the 5% level that is positive as expected by the theory. The elasticity of electricity consumption and trade activity with respect to GDP are significantly smaller than 1.

The FMOLS estimates of the elasticity of e-government performance in economy and financial system with respect to GDP range from 0.20 (Angola) to 0.50 (Qatar) this coefficients are statistically significant at the 5% level for many of this countries.

Table 3- Full modified OLS estimates (dependent variable is GDP)

Country groupings	E-government performance (EGOV)
Iran	0.35 (2.78)
Iraq	0.24 (3.27)
Saudi Arabia	0.32 (4.28)
UAE	0.45 (2.67)
Oman	0.22 (1.99)
Qatar	0.50 (3.72)
Kuwait	0.23 (2.54)
Angola	0.20 (1.98)
Algeria	0.26 (4.83)
Nigeria	0.31 (2.98)
Venezuela	0.33 (3.87)
Ecuador	0.28 (3.82)
Panel (without time dummies)	0.38 (5.36)
Panel (with time dummies)	0.36 (2.47)

Data Source: World Development Indicators (2013), t-statistics are in parentheses.

Once the three variables are cointegrated, the next step is to implement the Granger causality test. We use a panel-based error correction model to account for the long- run relationship using the two-step procedure from Engle and Granger (1987).

4.2. Panel causality tests

Finally, panel causality test between GDP and e-government performance in economy and financial system results are shown in Table 4. The optimal lag structure chosen using the SIC (Schwartz criterion information) is a two-year lag. We find that the e-government performance in economy and financial system equations are significant at the 5% level, implying a long- run and causalities. Moreover, the error correction term is statistically significant at the 5% level also denoting a relative slow speed of adjustment to long-run equilibrium.

Table 4- Panel causality tests

Dependent variable	Source of causation (independent variable)				
	Short run		Long run		
	ΔGDP	ΔEGOV	ε	$\varepsilon/\Delta GDP$	$\varepsilon/\Delta EGOV$
ΔGDP	-	1.78 (0.00)	0.44 (0.09)	-	1.07 (0.02)
ΔEGOV	2.01 (0.00)	-	0.52 (0.04)	1.65 (0.02)	-

P-value in parenthesis.
Data Source: World Development Indicators (2013).

5. Conclusions

This study have very useful findings for the development of e-government of OPEC countries. Although the global ranking of e-government readiness is in intermediate level, but expectation of Internet users toward e-government is very big, evidenced by the existence of results show that direct relationship between economic growth and improve in e-government performance that cause increase in welfare in society. The study of the causal relationship between e-government performance in economy and financial system and economic growth is of interest in terms of designing appropriate ICT policies in different countries. This paper employs data on OPEC countries from 1980 to 2011 to examine the causal relationship between GDP and e-government performance in economy and financial system. The panel cointegration and the resulting panel-based error correction models are conducted to answer the question. The full-modified OLS deals with the problem of endogeneity. Our evidence shows results suggesting that there is a short run steady-state relationship between e-government performance in economy and financial system to economic growth for a cross-section of countries. Based on results GDP has a positive and statistically significant effect on e-government performance in economy and financial system in the long run.

This paper applies the new heterogeneous panel cointegration technique to investigate the relationship between e-government performance in economy and financial system and GDP across these countries.

GDP is found to Granger cause e-government performance in economy and financial system. The results of a unidirectional short-run causal relationship from GDP to e-government performance in economy and financial system show that GDP leads e-government performance in economy and financial system and results verify that both direct and indirect Granger causality show a long run effect of e-government performance on economic growth. That is, our research reveals that e-government performance lead to economic growth. It is very important for low income countries to adopt appropriate information communication technology policy in order to promote economic growth. Since these countries have a high efficiency use of internet and electronic performance technology for government performance could be good policy measures.

References

Ahamdi, Abbas, Ghazanfari, Mehdi, Aliahmadi, Alireza, Mohebi, Azadeh (2009), "Strategic Planning For Implementing E-Government in Iran: Formulating the Strategies", 1st International Conference on Information and Knowledge Technology.

Aktaş, Cengiz and Yılmaz, Veysel. (2008) "Causal relationship between oil consumption and economic growth in Turkey", Kocaeli Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, Vol. 15, pp. 45-55.

Chang, T. Fang, W and Wen, L.F. (2001) "Energy consumption, employment, output, and temporal causality: evidence from Taiwan based on cointegration and error-correction modelling techniques", Applied Economics, Vol. 33, pp. 1045-1056.

Dickey, D.A. and Fuller, W.A. (1981) "Likelihood ratio statistics for autoregressive time series with a unit root", Econometrica, Vol. 49, pp. 1057-1072.

Engle, R.E., Granger, C.W.J. (1981) "Cointegration and error-correction: representation, estimation and testing", Econometrica, Vol. 55, pp. 251-276.

Erkki Liikanen, (2001), "eGovernment- Providing better public services and wider participation for citizens", IDEA, Democracy forum 2001: Democracy and the Information Revolution, Stockholm, 29 June.

Granger, C. and Newbold, P. (1974) "Spurious regressions in econometrics", J. Econometrics, Vol. 2, pp. 111-120.

Johansen, S., Juselius, K. (1990) "Maximum likelihood estimation and inferences on cointegration with approach", Oxford Bulletin of Economics and Statistics, Vol. 52, pp. 169-209.

Johansen, S. (1988) "Statistical analysis of cointegrating vectors", Journal of Economic Dynamics and Control, Vol. 12, pp. 231-254.

Nelson, C. R. and Plosser, C. I. (1982) "Trends and random walks in macroeconomic time series some evidence and implications", Journal of Monetary Economics, Vol. 10, pp. 139- 162.

Odhiambo. M. N. (2010) "Oil prices and economic growth in South Africa: an ARDL testing approach", A paper presented at the 4th World Conference of the Spatial Econometrics Association, Chicago, USA.

Pesaran, M., Pesaran, B. (1997) "Working with microfit 4.0: interactive economic analysis", Oxford University Press, Oxford.

Pesaran, M., Shin, Y. (1999) "An autoregressive distributed lag modeling approach to cointegration analysis" in S. Strom, (ed) Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch centennial Symposium, Cambidge University Press, Cambridge.

Pesaran, M., Shin, Y., Smith, R. (2001) "Bounds testing approaches to the analysis of level relationships", Journal of Applied Econometrics, Vol. 16, pp. 289-326.

Rokman, Ali (2011), 'E-Government Adoption in Developing Countries; the Case of Indonesia", Journal of Emerging Trends in Computing and Information Sciences, Vol. 2 (5), pp. 228-236.

Sargan JD. (1964) "Wages and prices in the United Kingdom: A study in econometric methodology", In Econometric Analysis for National Economic Planning, Hart PE, Mills G, Whitaker JK (eds). Butterworth and Co.: London (1964); pp. 25–54.

Sims, C.A. (1972) "Money, income and causality", American Economic Review, Vol. 62, pp. 540-552.

Stowers, Genie N. L (2004), "Measuring the Performance of E-Government", the IBM Center for the Business of Government.