EFFECT OF GOVERNMENT PURCHASES ON REAL OUTPUT

– VAR APPROACH –

Seong-Suhn Kim*

CONTENTS

I. Introduction

The effect of government purchases on real output has been extensively considered in the macroeconomic literature.

Keynesian analysis has focused on studying the effect of government purchases through its influence on aggregate demand. Given an increase in government purchases, output expands by a larger amount of the original expenditure change. That is, government purchases have a multiplier effect on output no matter what the composition of the expenditure is. Along with this theoretical analysis, there exist several large scale econometric models that provide estimates for the multiplier of government purchases. The estimates vary depending on the model used, but they are in all cases significantly bigger than one (see Leeuw and Gramlich (1968)).

The evidence of a multiplier effect of government purchases has been questioned by several economists. If government provided goods and services are regarded as close substitutes for private consumption goods, then, as Baily (1971) has pointed out, the multiplier effect vanishes. Barro (1981), focusing on the distinction between temporary versus permanent changes in government purchases, provides emperical evidence that the effect on real output of temporary changes (defense purchases related to wars) is bigger than the effect of permanent changes (military as well as non-military, and state and local purchases). Barro does not find a multiplier effect,

* Fellow of the Institute of Industrial Studies, Department of Foreign Trade, College of Social Science Dankook University.

although in the case of temporary changes a multiplier slightly bigger than one would also be consistent with data.

Not much attention has been placed on the distinction of government purchases by the source and type of expenditure.

My research starts out with an emperical study in Korea case that breaks down government purchases in two components: military purchases, central non-military and local purchases. The dynamic interrelations between the two types of government expenditures and other components of GNP are analyzed. No a priori restrictions on the type of interrelation between variables have been imposed, and all variables chosen to be in the model have treated as endogenous.

Section II presents the emperical results in detail, explaining the choice of variables and the structure of the model that has been estimated. Briefly, a eight-dimensioned vector autoregression of real GNP components, two of them being government purchases, is fitted to the B.O.K. quarterly data after 1970. The components of the vector sum up to GNP which enters in the system as an identity.

Section III describes a class of environments for which government purchases are given exogenously and are a necessary input in the joint production process of private and public goods.

Further research intends to specify forms for the utility and production functions, and generate simulations of the model. The statistical properties of the simulations will then be compared to the ones obtained in the emperical section.

II. Empirical Study

The results presented in this section are based on the analysis of B.O. Korea quarterly data of eight components of GNP: durable consumption, nondurable consumption, residential investment, increase in stocks, net exports, central government military purchases, central government nonmilitary purchases with local government purchases, and investment in producer durables and nonresidential structures. A detailed description of the data is given in the Data Appendix. An unrestricted vector autoregression[1] with a constant term and four lags is estimated for the period 1970, I to 1985, III.

The choice of variables to be included in the system has been done taking into account recent empirical studies about the dynamic interrelations between monetary and real variables.[2] Sims (1982) has suggested that variables determined in financial markets are likely to have a big explanatory power for other variables in the system, even in the case that they simply respond to fluctuations in real variables. Novales (1983) presented equilibrium models where money or the interest rate, although being passive, might appear Granger causally prior.

The purpose of this study being to analyze the interaction between government purchases and real output, and to find out how important that interrelation is, we wanted to avoid interference of the monetary variables capturing most of the explanatory power in the system. Consequently, financial variables were excluded from the estimated vector autoregression. The set of variables included is broad enough to reflect the interactions of different components of GNP other than government purchases. Government purchases enters the system through two components to capture the reactions of the system to different sources of spending.

The components of the system exhaust GNP, and therefore results about the effect of each component on GNP itself can be obtained by appending an identity to the system which is the sum of the eight elements of the original vector.

The estimated model has the form:

$$(1)\quad Y(t) = C + \sum_{s=1}^{m} As\, Y(t\text{-}s) + u(t)$$

where Y is a 8x1 vector of components of GNP, C is a 8x1 vector of constant terms, A is a 8x8 matrix of coefficients for s = 1 to m. The 8 x 1 vector of residuals u is identified by the property that u(t) is uncorrelated with Y(s) for $s < t$. We will often refer to u as the vector of "innovations" in the sense that at each t u(t) is the part of Y(t) that at time t-1 could not be predicted with the information available at t-1. The variance-coveriance matrix of u, Euu', will be denoted by Σ.

Due to the fact that all the equations in the system have the same right hand side variables, the estimation of C and A by OLS is efficient.

Once the coefficients of the autoregressive form (A_s) have been estimated, we can compute the estimated coefficients for the moving average representation (B_s) by successive substitution in equation (1) obtaining:

$$(2)\quad Y(t) = \sum_{s=0}^{\infty} B_s\, u(t\text{-}s) + D$$

As GNP enters the system as an identity, our complete model is a slightly modified version of equation (1). Let us rewrite (1) in the form:

$$(3)\quad Y(t) = A(L)\, Y(t) + C + u(t)$$

where A(L) is a 8x8 matrix whose elements are m^{th} order polynomials in positive powers of the lag operator.

$$\text{Let } Y^*(t) = \begin{bmatrix} Y(t) \\ GNP(t) \end{bmatrix}$$

Then

$$(4)\quad Y^*(t) = \begin{bmatrix} A(L) & 0 \\ i & 0 \end{bmatrix} Y^*(t) + \begin{bmatrix} C \\ 0 \end{bmatrix} + \begin{bmatrix} u(t) \\ 0 \end{bmatrix}$$

where i is a 8-dimensional vector of ones

Let $B^* = \left[I - \begin{pmatrix} A(L) & 0 \\ i & 0 \end{pmatrix} \right]^{-1}$

Then the moving average representation for Y*(t) can be written as;

(5) $Y^*(t) = B^*(L)u(t) + D^*$

or

(6) $Y^*(t) = \sum_{S=0}^{\infty} B^*_S u^*(t-s) + D^*$

where the last row of equation (6) gives GNP as a function of present and past innovations of each component of GNP.

To understand the information embodied in the MA coefificients, it helps to think of the MA representation as resulting from simulations of the model. Let $b^*_{ij}(s)$ be the i^{th} row j^{th} column element of B*. Then $b^*_{ij}(s)$ is the response of Y_i after s periods to an initial condition where all variables are zero except for Y_j which equals one. If the innovations $u_i(t)$ for i = 1 to 8 present strong contemporaneous correlation, it is unrealistic to trace out the response of the system to a shock in one of the elements of u(t) alone. If, say, u_i and u_j have strong contemporaneous correlation, an innovation in variable i is unlikely to occur unless a shock in variable j also occurs. It is more realistic to look at the MA coefficients of a transformed system where residuals are contemporaneously uncorrelated, so that the shocks applied to the system are more like the ones that have occurred historically. We therefore want to replace u, with variance-covariance matrix Σ, by a transformed vector v such that u = SV, $EVV' = I$, and where $SS' = \Sigma$. Then we can rewrite (2) as;

(7) $Y(t) = \sum_{S=1}^{\infty} B_S SS^{-1} u(t-s) + D$

or

(8) $Y(t) = \sum_{S=0}^{\infty} C_S V(t-s) + D$

Then (5) becomes:

(9) $Y^*(t) = B^*(L) S^* \hat{S} u^*(t-s) + D^*$

or

(10) $Y^*(t) = \sum_{S=0}^{\infty} C^*_S V^*(t-s) + D^*$

where S* and $\hat{S}$ are 9 x 9 matrix of the form $S^* = \begin{bmatrix} & S & & 0 \\ & & & 0 \\ & & & \vdots \\ 0 & \cdots & & 0 \end{bmatrix}$

$$\text{and } \hat{S} = \begin{bmatrix} & S^{-1} & 0 \\ & & 0 \\ & & \vdots \\ 0 & \cdots\cdots & 0 \end{bmatrix}$$

There is not a unique way to transform the residuals to orthogonal ones, but if we impose the restriction that S be lower triangualar with positive elements on the diagonal, then the transformation is unique. That is the kind of transformation used in this paper. What the lower triangular transformation does is to let an innovation at t of the first variable in the system affect all other variables at t. However, as we move down in the ordering of the variables, an innovation at t of variable lower in the ordering (i.e., variables j such that $j > i$). Each V_i is a linear combination of u_j for $j < i$ which depends on the contemporaneous correlation of u_i and u_j. The ordering chosen for the transformation is therefore important when the residuals have a strong contemporaneous correlation.

The orthogonal transformation is also very useful when we want to look at how much of the variance of one variable can be explained by each of the variables in the system.

If at time t we make the best linear predictor of Y* for K periods ahead, the prediction error can be written as:

$$(11) \quad \sum_{S=0}^{K-1} B^*_S\, u(t-s) = \sum_{S=0}^{K-1} C^*_S\, V^*(t-s).$$

As the components of V^* are contemporaneously uncorrelated, the variance of the K-step ahead prediction error can be expressed as the sum of eight components, each corresponding to one element of V^*.

$$(12) \quad \text{Var}\left[\sum_{S=0}^{K-1} C^*_S\, V^*(t-s)\right] = \sum_{j=1}^{8}\left[\sum_{S=0}^{K-1} C^*_{Sj}\, V^*_j(t-s)\right].$$

Although the variance of the prediction error is invariant to the ordering chosen for the orthogonalization, the decomposition depends on the particular ordering.

In the eight-dimensional system of components of real GNP that has been estimated, the contemporaneous correlations of the residuals of any of the government purchases components with the other variables residuals are small, although some of them are significantly different from zero. (See Table I).

Table II presents the decomposition of variance of the K-step ahead prediction error for GNP, where K varies from 1 to 24. The orthogonal transformation has been done in the order in which the variables are listed in the table. The percentage of GNP variance accounted for by innovations in total government purchases is as high as 28% for some periods. The percentage accounted for by central and local government purchases increases with the number of periods and for lags exceeding 12 periods (3 years), central and local government purchases represents the greatest contributor to variations in GNP. This result suggests that central and local government purchases have a long-run effect on real output. The impulse response analysis that follows supports this observation. It is also interesting to notice that a high percentage of the variance of government purchase components is accounted for by their own innovations. This fact is particularly true for military purchases, which suggests that other components of GNP do not help much in predicting military expenditures. (See Table III and IV).

Graph I & II presents the impulse response of GNP to shocks in central non-military and local, central military government purchases. It also plots the response of each government purchase component to its own shock. The vertical bars are two standard error bands about the estimated MA coefficients. The Monte Carlo method used to estimate the standard error is described in the Statistical Appendix.

The response of GNP to a shock in central and local government purchases is low initially and increases continuously. And it becomes significantly different from zero for most periods, persistent, and higher than the response of the GNP component to its own shock.

The GNP response to military government purchases initially positive and slightly different from zero for first eight quarters. It declines continusouly after two years and becomes near zero after about three years. The military government purchases response to its own shock is positive, persistent, and significant for a few periods, also it is slightly lower than the GNP response for all lags.

We can consider the ratio [GNP response/response to own innovation] as a measure of the multiplier effect of expenditure, and compare its value for the different components of government purchases.

In the case of government military purchases, the ratio is slightly bigger than one for almost every period. When observing central and local government purchases, we get a multiplier distinctively bigger than one for almost all periods except for the first few periods other than the first one. The significance of this multiplier effect might be questioned when observing that the confidence bands for the impulse reponses of GNP and central and local purchases overlap in many periods. Nevertheless, the multiplier remains bigger than one for some periods even when the 99% confidence interval bands are taken into account.

Several orderings have been tried, some with the government purchase components first, some with it last. Also the position of military purchases relative to central and local purchases has been varied, but this had no noticeable effect.

Placing government purchase components first in the ordering rather than at the end causes the percentage of variance of GNP explained by them to be higher in the first few periods, but has no significant effect on the later periods. The pattern of impulse responses is not affected by the ordering changes mentioned here.

Some other components of GNP are more sensitive to the ordering, as might be expected by looking at the correlation coefficients in Table I. In particular the ordering of durable consumption relative to residential investment is relevant, for whichever comes first will explain a large portion of the variables will be greater if that variable comes first in the ordering.

Altering the relative of the consumption and investment components does not change results regarding the dynamic interrelation between government purchases and GNP.

III. Theoretical Model

The emperical results support the idea that there is not a unique effect of government purchases on real output but rather several ones according to the type of government purchases we are considering. The output responses to a shock in local government purchases suggest that they should be treated as a capital component that improves the productivity of the private sector. The composition of central and local government purchases (e.g., highways, education, utilities) confirms this line of argument.

This section presents the outline of a class of environments where the path of government purchases in exogenously given and takes the form of public capital that increases the marginal product of the private production process.

Let us consider an economy with two divisible goods, one is either consumed or allocated in private capital, the other is public capital. The available technology is a joint production process that requires both types of capital, private as well as public.

There is a single infinitely lived representative household that derives utility from consumption. Given the initial private capital stock and the stochastic process for public capital, the household has to allocate resources between consumption and capital for next period's production.

The government sets a stochastic process for the public capital which is known to the household. Draws from this stochastic process generate the public capital sequence.

The social planner problem for this economy is:

$$(1)\quad \max_{\{Ct,\, Kpt+1\}} E_0 \sum_{t=0}^{\infty} \beta^t U(Ct)$$

given Kpo and the stochastic sequence $[Kgt]_{t=0}$ and subject to the constraints:

$$(2)\quad Ct + Kpt+1 \leqslant g(Kpt; Kgt, Kgt+1) + e_t$$

$$Ct, Kpt+1 > 0$$

u(.) is twice continuously differentiable with $u' > o$, $u'' < 0$.

g(.) is twice continuously differentiable and strictly concave on Kpt and Kgt with $g_1 > 0$, $g_2 > 0$, $g_3 < 0$.

e_t is i.i.d. lognormal, and represents a random shock to technology, Kp and Kg are respectively private and government capital, β is the depreciation rate.

The social planner at time t chooses Ct and Kpt+1 given the information set t = $\{C_{t-s-1}, K_{pt-s}, K_{gt-s+1}$ for $s \geqslant 0\}$.

If we assume an interior solution, the necessary conditions for optimality are:

(3) $U'(Ct) = \lambda t$

(4) $\beta E_t \lambda_{t+1}\ [g_1(Kpt+1;\ Kgt+2,\ Kgt+1)] = \lambda t$

(5) $Ct + Kpt+1 = g(Kpt;\ Kgt+1,\ Kgt) + e_t$ for $t = 1, 2, \ldots\ldots\ldots\ldots$

where $\{\lambda t\}$ are stochastic Lagrange multipliers and Et is the expectation conditional on information at t.

We are interested in comparing optimal paths for this economy under alternative setting for the government capital process. In particular we want to analyze how an increase in Kg would affect total output, consumption and private capital path.

If we assume that government capital is chosen below the optimal level,[3] increasing Kg at some point in time provides a bigger production possibilities for this economy. This will result in a higher level of output for some periods and most likely a larger path for consumption.

Considering that empirical results show a positive and persistent response of government purchases to their own shock, if Kg increases at T it is likely that we also observe increases in periods than T. This pattern of changes for Kg would contribute to get larger and more persistent changes on output and consumption.

The model outlined above is the starting point for the theoretical part of the present research. We want to specify a from for g(.) and u(.) to get solution paths for output, consumption and capital and contrast its statistical properties with the ones found in the empirical section of this paper.

To generate solution paths for this model presents some difficulties due to the fact that the model yields nonlinear conditions that involve expectations of future endogenous variables. To get around this problem we intend to use an indirect solution method developed by Novales (1983).

IV. Concluding Remarks

The main results can be summarized as follows:

– Government purchase innovations account for a substantial part of the variance of GNP, with central and local government purchases increasing their percentage of explanation as the number of steps ahead increases.

– The response of GNP to an innovation in central and local government purchases is positive, persistent and much larger than the response of central and local government purchases to themselves. This multiplier effect is not observed as such in the response of GNP to an innovation in government military purchases, which is slightly bigger than the response of military purchases to themselves.

The above empirical results suggest that a model that treats government purchases as a single expenditure component is not adequate.

To capture the effect of central and local government purchases on real output it seems more appropriate to treat this kind of purchases as public capital that increases the marginal product of the private production process.

< Data and Statistical Appendix >

The Korea Quarterly Data is from the B.O.K. data base, from 1970. I to 1983. III.

All variables have been deflated by their own implicit price deflator (1980 base) when it was available for the whole period considered. Implicit price deflators for central military purchases and central non-military purchases were not available from 1970. I on, and therefore the price deflator for Administration and defenses expenditure has been used for both components.

Durable Consumption (DC): Personal comsumption expenditures in durable goods (1980 constant prices base for durable goods.)

Nondurable Consumption (NDC): Personal consumption expenditures, nondurable goods (1980 constant prices for nondurable goods.) + Personal consumption expenditures in services (1980 constant prices for service).

Residential Investment (IR): Gross private domestic fixed investment, residential (1980 constant prices for private residential structures).

Increase in stocks (IST): Gross private domestic investment, change in business inventories in 1980 constant prices.

Net Exports (NX): Exports of goods and services (1980 constant prices) – Imports of goods and services (1980 constant prices).

Government Military Purchases (GM): Government purchases of goods and services: national defense (1980 constant prices: central government purchases of goods and services).

Government Non-military Purchases (GNM): Central government purchases other than national defense (1980 constant prices: central government purchases of goods and services) + Local Government Purchases of goods and services (1980 constant prices).

Investment in Producer Durables and Nonresidential Structures (INV): Gross private domestic fixed investment: nonresidential structures (1980 constant prices) + Producers' durable equipment (1980 constant prices).

Gross National Product (GNP): DC+NDC+IR+IST+NX+GM+GNM+INV.

The results presented in Section II correspond to data that has not been detrended or transformed in any way. Korea data does not seem to present a constant trend. Nevertheless, detrending has been tried, and a VAR of the detrended data. The main results about the dynamic interrelations between government purchases and real output do not change substantially.

Detrending was done taking logarithmic transformation of the data first, and then fitting a linear trend to each component of GNP (for change in business inventories, the estimate for GNP was used). Let a_i be the coefficient for the trend in the linear regression for variable i. Then, each variable was detrended by dividing its original value at t by exp $(t \cdot a_j)$.

The estimated VAR has four lags. Systems with lag length varying from four to nine were estimated. The four lag model performed better when comparing the Durbin-Watson, Box-Pierce Q-statistic and standard error of estimated residuals.

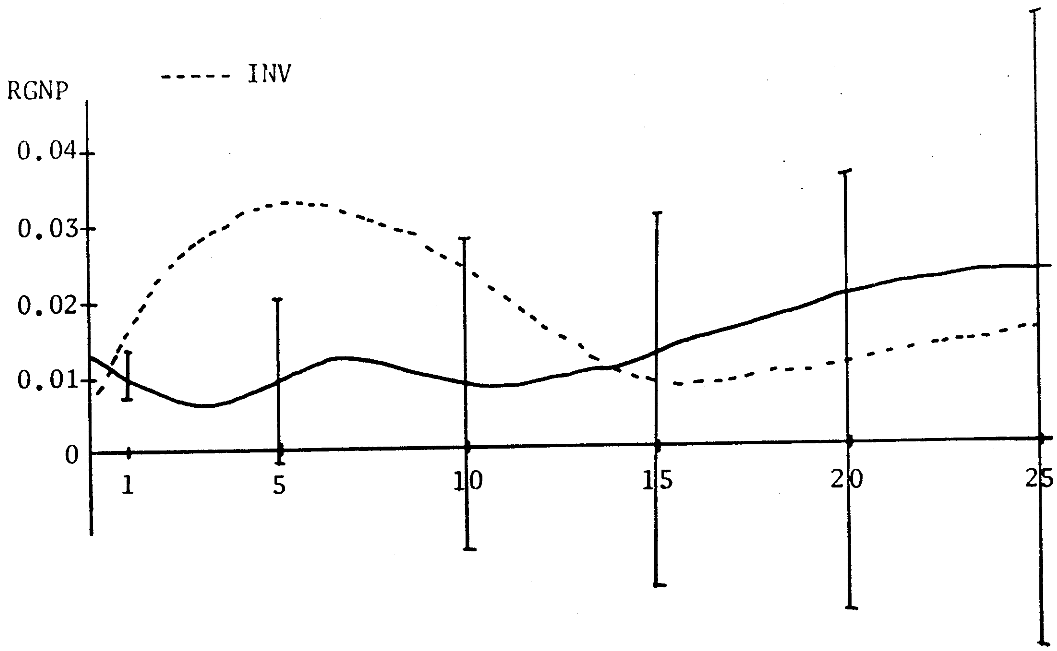
The standard errors for the coefficients of the MA representation have been estimated following the Monte Carlo Integration Method described by Kloeck and Van Dijk(1978). Draws are made from the normalized likelihood, which is like th posterior distribution of the VAR coefficients with a flat prior. Doan and Litterman (1986) have implemented this Monte Carlo method in their RATS program, which has been used to compute the estimates for this paper. The experiment has been conducted with 100 draws.

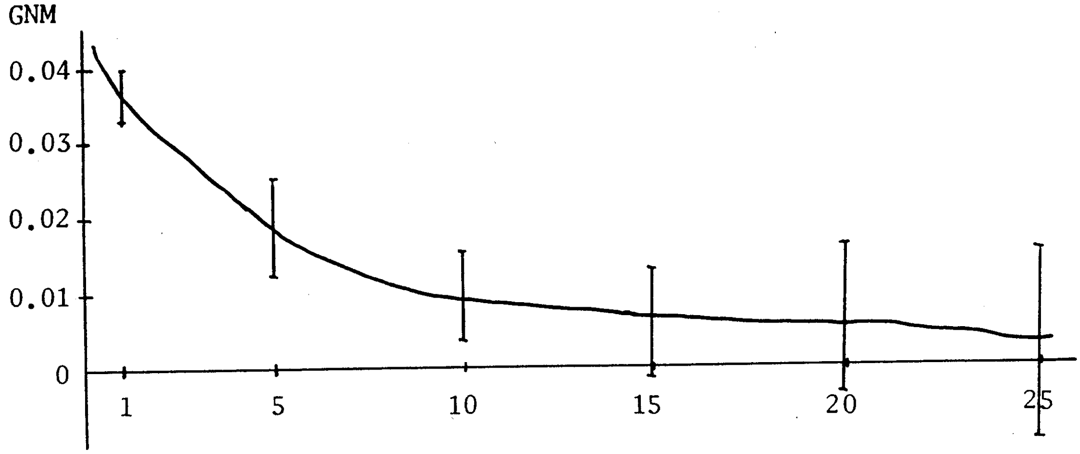
<Footnotes>

1. A detailed description of the VAR technique can be found in Sims (1980a).
2. Money was found to be Granger causally prior to output in a system which includes money, output and the price level. When interest rate is included in the system money is no longer Granger causally prior and interest rate captures a high percentage of the explanation of output variance. For this result, see Sims (1980b) and Litterman and Weiss (1986).
3. Work by Hulten and Peterson (1984) illustrate the fact that to set state and local government purchases below optimal level is a reasonable assumption.

GRAPH I (FIGURES AND TABLES)

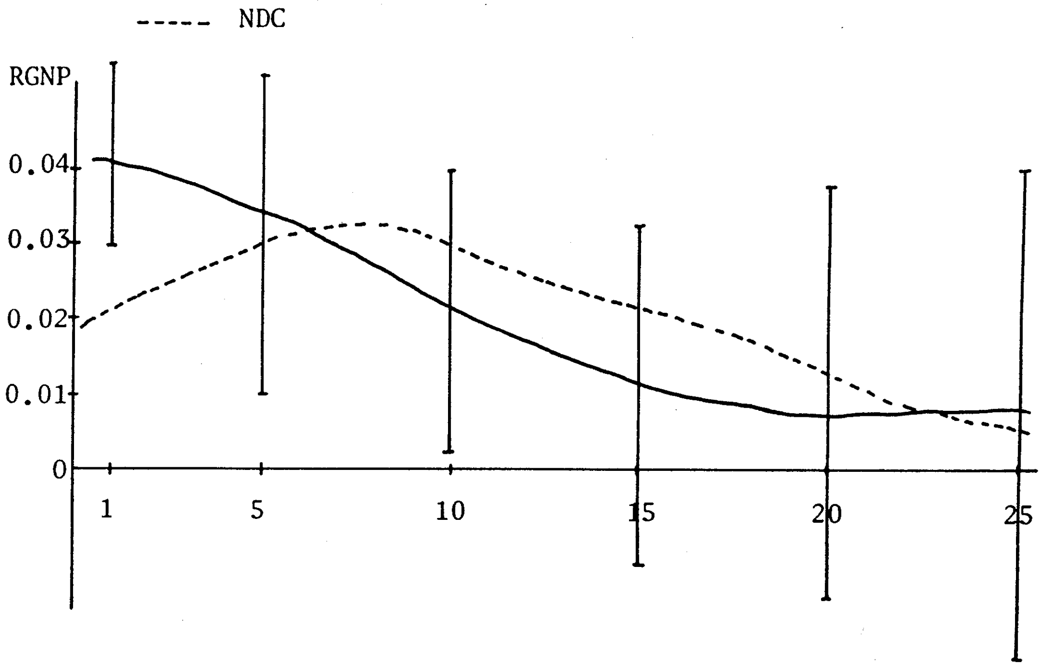
IMPULSE RESPONSES TO ONE STANDARD DEVIATION SHOCK IN GNM





GRAPH II

IMPLUSE RESPONSES TO ONE STANDARD DEVIATION SHOCK IN GM



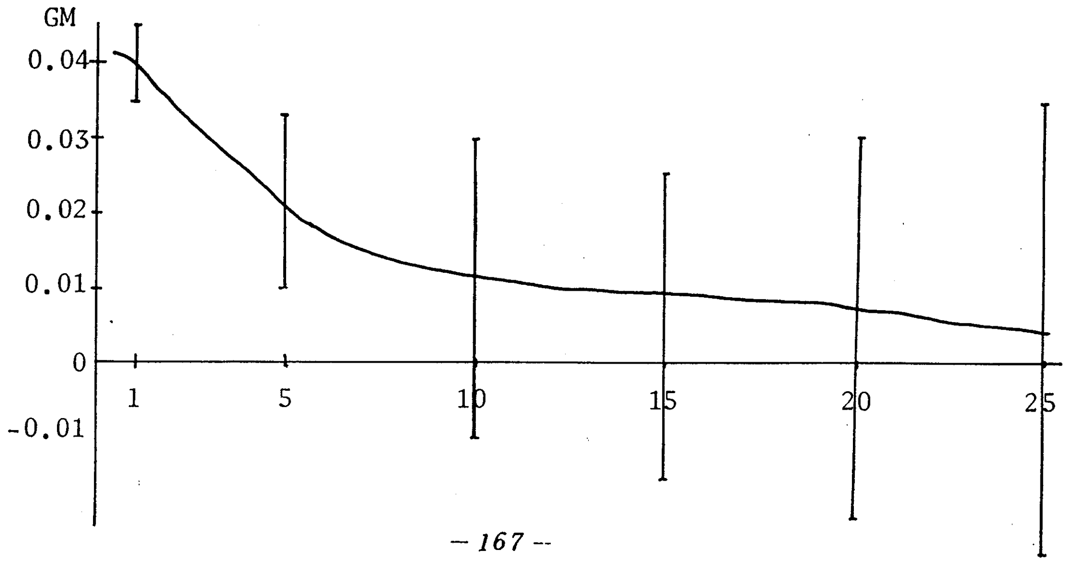


Table I. Contemporaneous correlations of the residuals from the estimated variables.

	DC	NDC	IR	INV	NX	GM	GNM	IST
DC	1.00	-.13	.49	.31	-.15	-.13	.29	-.17
NDC	-.13	1.00	.24	.20	-.02	.22	-.12	.13
IR	.49	.24	1.00	.41	-.12	-.13	.39	-.02
INV	.31	.20	.41	1.00	-.46	.30	.30	-.25
NX	-.15	-.02	-.12	-.46	1.00	-.11	-.05	.10
GM	-.13	.22	-.13	.30	-.11	1.00	-.05	-.32
GNM	.29	-.12	.39	.30	-.05	-.05	1.00	.05
IST	-.17	-.13	-.02	-.25	.10	-.32	.05	1.00

* $\text{Corr}(Xi, Xj) = \dfrac{\text{COV}(Xi, Xj)}{\sqrt{\text{Var}(Xi)\,\text{Var}(Xj)}}$

Table II. Percentage of k-step ahead forecast error variance in GNP accounted for by each innvation.

	Innovation in							
k	DC	NDC	IR	IST	NX	GM	GNM	INV
1	2.23	.29	64.13	.00	.02	12.12	13.97	7.19
2	1.68	2.70	62.99	.65	.87	8.28	13.62	9.16
3	1.98	2.36	57.05	2.89	2.11	6.70	10.25	16.62
4	4.73	3.03	52.94	3.88	6.15	5.50	8.28	15.45
5	3.92	3.83	50.63	3.61	5.57	6.42	10.72	15.27
6	5.49	4.18	48.21	3.93	5.23	7.70	10.70	14.53
7	5.19	3.90	45.57	4.67	7.91	9.07	10.07	13.57
8	4.95	4.31	43.49	5.50	7.53	11.00	9.75	13.44
9	6.39	4.44	37.83	4.83	6.83	14.36	13.29	11.99
10	6.16	4.76	37.13	5.07	6.58	14.91	12.87	12.49
11	7.09	4.63	36.63	5.57	6.42	14.75	12.70	12.18
12	7.29	4.89	35.84	5.73	6.32	14.65	12.42	12.81
13	7.07	4.89	35.34	5.63	6.42	14.74	13.33	12.53
14	7.51	5.42	34.76	5.72	6.26	14.03	13.88	12.38
15	7.49	5.38	34.73	5.74	6.23	13.92	13.83	12.64
16	8.19	5.49	33.87	5.69	7.30	13.57	13.48	12.38
17	7.86	5.53	33.10	5.68	7.16	13.50	14.26	12.87
18	7.76	5.60	32.20	6.22	8.17	13.13	14.35	12.52
19	7.70	5.58	31.93	6.21	8.69	13.19	14.24	12.41
20	7.71	5.61	31.52	6.45	9.12	13.10	14.11	12.34
21	8.77	5.59	30.02	6.46	8.96	13.46	15.01	11.67
22	8.68	5.74	29.56	6.89	9.10	13.32	15.00	11.66
23	8.61	5.68	29.50	6.95	9.50	13.25	14.87	11.60
24	8.58	5.70	29.41	7.08	9.48	13.21	14.83	11.67

Table III. Percentage of k-step ahead forecast error variance in non-military purchases accounted for by each innovation.

Innovation in

K	DC	NDC	IR	IST	NX	GM	GNM	INV
1	.03	3.42	10.01	7.48	.35	4.91	73.76	.00
2	.23	2.90	8.27	12.58	9.16	5.81	60.80	.22
3	.22	3.82	11.10	11.03	8.06	5.42	55.24	5.08
4	2.65	7.42	11.17	10.46	7.53	5.08	49.35	6.28
5	1.85	6.40	10.79	16.25	5.25	3.86	46.57	8.99
6	2.63	6.00	10.13	19.05	5.11	3.61	44.87	8.55
7	3.64	5.75	11.87	18.68	5.94	3.47	42.48	8.13
8	3.84	5.61	12.32	18.23	5.75	5.06	41.29	7.86
9	3.94	5.79	10.99	22.49	6.47	4.89	38.35	7.04
10	3.96	6.22	10.87	22.36	6.51	5.02	38.00	7.01
11	4.61	6.11	11.13	21.63	7.53	4.94	37.22	6.79
12	4.60	6.23	11.60	21.37	7.56	5.03	36.77	6.80
13	4.38	6.12	10.99	24.29	7.61	4.81	35.04	6.72
14	4.38	6.41	10.91	24.13	7.81	4.78	34.87	6.67
15	4.37	6.31	10.91	23.61	8.09	4.91	35.23	6.53
16	4.62	5.37	11.32	23.38	8.01	4.88	34.89	6.49
17	4.51	6.25	11.02	24.49	9.11	4.77	34.33	6.41
18	4.65	6.57	10.92	24.33	8.49	4.74	33.95	6.32
19	4.60	6.55	10.83	24.10	8.52	4.87	34.23	6.24
20	4.89	6.61	10.93	23.99	8.46	4.87	33.92	6.30
21	4.83	6.53	10.86	24.45	8.41	4.87	33.76	6.25
22	4.85	6.73	10.75	24.45	8.85	4.86	33.31	6.16
23	4.83	6.69	10.66	24.42	8.79	5.08	33.37	6.11
24	5.11	6.79	10.62	24.33	8.77	5.06	33.12	6.15

Table IV. Percentage of k-step ahead forecast error variance in military purchases accounted for by each innovation.

	Innovation in							
K	DC	NDC	IR	IST	NX	GM	GNM	INV
1	.00	.00	.00	.00	.00	100.00	.00	.00
2	2.64	.66	2.61	2.01	3.64	76.91	11.02	.47
3	2.85	.83	7.01	2.93	4.66	70.69	10.55	.43
4	2.67	.77	6.76	4.07	4.90	67.55	10.55	2.49
5	5.13	1.84	6.42	4.81	3.87	65.46	8.59	3.85
6	5.58	2.55	6.52	9.98	3.86	57.81	7.59	6.07
7	5.33	2.48	6.72	10.67	4.04	55.22	8.31	7.19
8	5.51	2.24	6.13	9.85	4.01	56.43	8.09	7.69
9	5.92	5.12	5.87	9.47	4.17	54.18	7.87	7.36
10	5.80	5.13	6.11	9.91	4.70	52.95	7.97	7.38
11	6.05	5.14	6.02	9.93	4.63	52.92	7.85	7.41
12	5.98	5.11	5.94	9.97	5.08	52.68	7.86	7.34
13	6.36	6.70	5.93	9.73	5.34	51.22	7.49	7.18
14	6.27	6.64	5.86	10.29	5.83	50.34	7.66	7.06
15	6.93	6.72	6.14	10.11	5.73	49.92	7.51	6.91
16	6.87	6.70	6.20	10.08	5.88	49.74	7.63	6.85
17	6.91	7.59	6.28	10.33	6.05	48.79	7.38	6.63
18	6.78	7.50	6.23	11.22	6.53	47.88	7.24	6.57
19	6.97	7.53	6.30	11.36	6.51	47.43	7.23	6.63
20	6.87	7.44	6.22	11.26	6.65	47.43	7.53	6.56
21	6.82	8.27	6.08	11.54	6.88	46.61	7.35	6.40
22	6.73	8.20	6.00	12.29	7.22	45.95	7.25	6.33
23	6.88	8.16	6.01	12.46	7.23	45.63	7.27	6.32
24	6.81	8.14	5.96	12.35	7.28	45.61	7.55	6.25

< References >

1. Barro, Robert J., Output Effects of Government Purchases , Journal of Political Economy, Vol. 89, no. 6 (December 1981), pp. 1086-1121.
2. Bailey, Martin J., National Income and the Price Level: A Study in Macroeconomic Theory, (New York: McGraw-Hill), 1971.
3. Bank of Korea, Economic Statistical Yearbook, 1975-1987.
4. __________, National Accounts, 1987.
5. Doan, Thomas A. and Robert B. Litterman, RATS, User's Manual , VAR Econometrics, 1986.
6. Hulten, Charles R. and George E. Peterson, The Public Capital Stock; Needs and Performance , The American Economic Review, Papers and Proceedings, May 1984, pp. 166-173.
7. Kloek, T., and H.K. Van Dijk, Bayesian Estimates of Equation System Parameters An Application of Integration by Monte Carlo , Econometrica, Vol. 46, pp. 1-20.
8. Leew, Frank and Edward Gramlich, The Federal Reserve-MIT Econometric Model , Federal Reserve Bulletin, January 1968.
9. Litterman, Robert B. and Lawrence Weiss, Money, Real of Interest and Output , Working Paper #179, Federal Reserve Bank of Minneapolis, September 1981.
10. Novales, Alfonso, Some Stochastic Equilibrium Models of the Interest Rate , Ph.D. Dissertation (submitted to the University of Minnesota, July 1983).
11. Nelson, Charles R. and Charles I. Plosser, Trends and Random Walks in Macroeconomic Time Series , Journal of Monetary Economics, Vol. 10 (1982), pp. 139-162.
12. Sims, Christopher A., Macroeconomics and Reality , Econometrica, Vol. 48 (January 1980a), pp. 1-48.
13. Sims, Christopher A., Comparison of Interwar and Postwar Business Cycles: Monetarism Reconsidered, American Economic Review, Papers and Proceedings, (May 1980b), pp. 250-257.
14. Sims, Christopher A., Policy Analysis with Econometric Models , Brookings Papers on Economic Activity, Vol. (1982), pp. 107-164.
15. Sims, Christopher A., Is There a Monetary Business Cycle? , American Economic Review, Papers and Proceedings (May 1983), pp. 228-233.
16. Sung, Chae-Key, A Comparative Multiplier Analysis of Korea's Public Expenditures through a Macroeconomic Model , MA thesis, Seoul National University, 1984.
17. Zellner, Arnold, An Introduction to Bayesian Inference in Econometrics , John Wiley & Sons, Inc:, 1971.

〈國文要約〉

政府支出의 實質所得에 대한 效果分析

金誠恂

本 研究는 최근 많이 使用되고 있는 벡터自己回歸模型分析方法(VAR)을 이용하여 韓國의 政府部門支出을 國防支出과 非國防支出로 區分했을 때 各部門의 實質國民 所得에 대한 影響은 比較分析한 것이다. 이는 이 政府支出과 GNP의 他部門支出間의 動態的 相互關係를 살펴볼 수 있으며, 이러한 變數들간의 相互關係形態에 관한 先驗的制約없이 이 모형에서 選擇된 變數들을 모두 內生變數化한다.

VAR의 推定結果를 간편하게 要約하는 方法으로 impulse 反應函數와 分散分解(Variance Decomposition) 方法이 있는데, 이는 각 부문의 外生的衝擊이 時間의 흐름에 따라 어떤 經路로 反應하는가를 보며, 각 부문의 豫測誤差에 대한 影響力을 比較分析하는 것이다. 이를 綜合하여 各部門의 乘數效果를 論하고, 이 實證的分析을 理論的으로 模型化하는 作業을 試圖하였다.

그 實證的結果는 1) 政府支出은 예측단계를 높일수록 說明力이 증가함으로써 정부지출의 innovation이 GNP의 分散에 상당한 影響을 보여준다. 2) 中央 및 地方政府의 innovation에 대한 GNP 反應은 중앙·지방정부 그 自體의 反應보다 훨씬 크며 지속적이다. 이러한 乘數效果는 政府國防支出의 innovation에 대한 GNP의 反應이 國防支出 그 自體보다 약간 큼으로써 乘數效果가 상대적으로 과히 크지 않음을 보였다. 3) 위의 結果는 國民所得模型上에 政府支出을 單一支出要素로 취급하는 것이 적절치 않음을 示唆한다.

中央 및 地方政府支出의 實質產出量에 대한 影響은 民間生產過程의 限界生產을 增大시키는 公共資本으로 취급하는 것이 보다 적절하리라 思料된다.