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# Monetary and Fiscal Policy as a Stabilization Tool: The Case of Korea and Turkey

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## **Monetary and Fiscal Policy as a Stabilization Tool: The Case of Korea and Turkey**

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The past two decades have witnessed a number of studies assessing the relative effectiveness of monetary and fiscal policy on economic activity in developed countries. In the United States, empirical studies using a reduced form, "St. Louis equation" have shown that monetary actions exert a significant, permanent effect on economic activity while fiscal actions do not have any statistically significant, lasting influence [2, 8, 18]. On the other hand, structural models such as the FRB-MIT model suggest that fiscal, rather than monetary, actions exert the dominant influence on economic activity in the United States [12, 23]. M. W. Keran [21], W. D. Dewald and M. N. Marchon [13] and D. S. Batten and R. W. Hafer [6] have also discussed the relative effectiveness of the two stabilization tools in other developed countries. However, it may be difficult to generalize the results from these studies for developing countries since they have significantly different economic and socio-political structures. Substantially less work has been done in this field for the developing countries.<sup>1</sup>

The aim of this article is to reduce this gap in the literature by testing the relative effectiveness of monetary and fiscal policy variables as stabilization tools in two developing economies, Korea and Turkey. These two countries are selected as, compared to many other developing countries, they have a relatively developed financial and economic structure. Hence, stabilization policies are more likely to influence their aggregate economic activity. Moreover, consistent data series are available for these two countries over the entire sample period. In the empirical analysis, emphasis will be placed on the interaction of the external and internal factors in the growth process. It would be interesting to see if the relative effectiveness of policy variables is sensitive to the degree of openness of the economy.

The initial analysis in this article is based upon four-equation, vector-autoregression models that contain separate equations for income, a monetary and a fiscal policy variable, and a variable representing the foreign trade sector.

The specification of the models provides evidence on the causal relations among the variables of the system. Next, the estimated systems are used to provide estimates of the strength of these relations based upon variance decompositions computed from the system. Moreover, out-of-sample dynamic simulations are also performed.

The article is organized in the following manner. The second section briefly describes the economic structure in Korea and Turkey and reviews the existing literature. The next section explains the estimation procedure. The empirical models are discussed in the following section, while the fifth section contains the results of dynamic simulations. The final section gives a brief summary and draws some conclusions.

#### LITERATURE REVIEW

Korea represents a small open economy that has achieved significant economic growth over the last two decades. Because of its large degree of openness, external factors have played an important role in its economic development. The Korean economy experienced a structural shift since the early 1960s as the share of the manufacturing sector in GNP increased at the expense of the share of the agricultural sector. The real GNP has grown at an annual rate of about 8 percent during the last 20 years. The ratio of investment to GNP and the share of domestic savings to investment have also increased significantly during this time. The Korean government emphasized mainly an export-oriented growth strategy and the average annual growth rate of exports in dollar terms over the last two decades have been around 36 percent. The share of manufacturing goods in total exports increased from about 25 percent in the early 1960s to more than 90 percent in the early 1980s. The economy experienced double-digit inflation during the seventies and early eighties.

In contrast, the label of "small, closed" economy would be more appropriate for Turkey, which for decades has relied on import-substitution-led industrialization. Many authors consider Turkey the epitome of an inward-looking, closed economy until early 1980s, when extensive trade liberalization did occur. Before 1960 economic growth was limited, although the transition toward an industrial economy had begun. During the sixties and early seventies, real GDP growth was stable, averaging about 7 percent a year. The industrial sector grew at an annual average rate of about 8 percent in real terms, while the agricultural sector expanded at an annual average rate of about 4 percent in real terms. Turkey appeared less affected by the rapid rise of oil prices after 1973 and also the recession of 1974–1975 than many countries, partly because of increases in the flow of remittances from Turkish workers abroad and partly because domestic sales and good weather boosted industrial production and agricultural output, respectively. Economic expansion over the years had substantially altered

the structure of the economy. By the early 1980s, the industrial sector was nearly as large as the agricultural sector, although the country was still at an early stage of industrialization.

Foreign trade accounts for a small portion of the GNP in Turkey. Exports, for example, accounted for less than 5 percent of the GNP in 1980. The sharp rise of oil prices, the worldwide recession, and subsequent decline of export markets in the industrialized countries pushed Turkey's imports up and exports down, contributing to the country's balance-of-payment crisis in the late seventies. The costs of the government's social and economic programs and defense usually outstripped revenue sources, historically causing frequent budget deficits. Foreign aid and borrowing from the Central Bank were the customary sources of financing deficits. Turkey experienced double-digit inflation rates in the seventies and early eighties.

H. S. Atesoglu [3] used a simple Friedman-Meiselman-type reduced-form model to analyze the relative effectiveness of monetary and fiscal policy variables in Turkey, while V. Pandit [25] also used a reduced-form model using data for India, Korea, and Taiwan. In India and Taiwan the fiscal policy variable performed better than the monetary policy variable in explaining short-term changes in aggregate economic activity, while in Korea and Turkey they performed equally well. However, even though the reduced-form, single equation approach has been frequently used to analyze the macro effects of stabilization policy, the approach has been subjected to much criticism in recent years.<sup>2</sup>

H. S. Atesoglu and J. A. Tillman [4] recognized one of the problems—possible feedback from output to the policy variables—inherent in these reduced-form models. They employed a causality test proposed by C. A. Sims [26, 27] to investigate the direction of causation among autonomous expenditures, nominal income, and the money supply in Korea. The results suggest that autonomous expenditures cause income, while neither narrow nor broad money supply cause income. Moreover, both narrow and broad money supply are found to be endogenous with respect to income.

The unconstrained estimation technique as proposed by Sims [26, 27] has been found to lead to a potentially serious estimation problem. His procedure allows each variable to influence every other variable in the system with the same lag length. As a result, extending the common lag by one increases the number of parameters by the square of the number of variables. This leads to a conflicting situation. On the one hand, increasing the common lag length quickly exhausts the degrees of freedom. On the other hand, lag lengths must be kept generous in order to avoid under-specifying the lag for one or more variables and, thereby, avoiding biased coefficient estimates. Further, the assumption that the same lag length is appropriate for all variables in each equation is difficult to justify on economic grounds. Hence, an alternative esti-

mation technique suggested by Cheng Hsiao [19, 20] and extended by P. E. Caines, C. W. Keng and S. P. Sethi [7] is employed in this article. This technique, commonly known as the constrained-vector-autoregressive (VAR) approach, allows each variable to be a function of the subset of other variables under consideration. Moreover, each variable that enters an equation is allowed to have different lag lengths.<sup>3</sup>

### ESTIMATION PROCEDURE

The vector autoregressive (VAR) technique consists of a system of regressions with one equation for each variable in the system. Generally, economic theory is used to determine a proper set of variables for analysis. Given the variables, the equations simply express the current value of each of the included variables as dependent on the lagged values of all the variables in the system. This technique is employed rather than a single equation or a structural model approach since it avoids imposing spurious a priori constraints on the model. The VAR technique employed involves the use of the Granger-causality definition in conjunction with Akaike's minimum final prediction error (FPE) criterion to impose restrictions on the estimation of the VAR.<sup>4</sup>

The use of this particular technique is motivated by Stanley Fischer's [15, p. 402] assertion that vector autoregressions are "a convenient way of summarizing empirical regularities and perhaps suggesting the predominant channels through which relations work." The various steps involved in estimating Hsiao's technique are discussed in detail in W. D. McMillin and J. S. Fackler [22]. To conserve space, it is not repeated here.

### EMPIRICAL MODELS<sup>5</sup>

The four-variable models estimated for Korea and Turkey using quarterly data are presented in this section. Five different variables are used in estimating these models. For each country two models are estimated—one using M1 and the other using M2 as the relevant monetary policy variable. GNP is used as a measure of aggregate income. Government expenditures scaled by potential GNP is used as the relevant fiscal policy variable.<sup>6</sup> Total exports are used as the foreign trade variable.<sup>7</sup> The data used in this study are obtained from the various issues of *International Financial Statistics* published by the International Monetary Fund. The sample period runs from 1966:I through 1983:IV. Consistent data series for all variables are not available for periods prior to 1966.

The first step in the VAR model-building is to detrend the data. For this purpose, the stationarity tests described in M. Muktar Ali and Richard Thalheimer [1] are used. There are ten time series—five for each country. In the case of Korea, a first difference of log transformation is required to achieve

stationarity in the income, government expenditures, and exports series, while the M1 and M2 series need a second difference of log transformation. All five series in Turkey require a first difference of log transformation to attain stationarity. Following Hsiao [20], the adequacy of these transformations to stationarity are checked by regressing the transformed variables on a constant and time. In no case is the coefficient on time statistically significant, indicating that the stationarity transformations are adequate.

Using the estimation procedure mentioned in the last section, the following specifications for the VAR model for the M1 system in Korea is tentatively chosen:

$$(1) \begin{pmatrix} Y \\ MI \\ G \\ E \end{pmatrix} = \begin{pmatrix} a^5_{11}(L) & a^4_{12}(L) & a^1_{13}(L) & a^4_{14}(L) \\ 0 & a^6_{22}(L) & 0 & 0 \\ a^7_{31}(L) & 0 & a^3_{33}(L) & 0 \\ 0 & a^6_{42}(L) & 0 & a^3_{44}(L) \end{pmatrix} \begin{pmatrix} Y \\ MI \\ G \\ E \end{pmatrix} + \begin{pmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{pmatrix} \begin{pmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \end{pmatrix},$$

where  $Y$ ,  $MI$ ,  $G$ , and  $E$  represent the variables income, narrow money stock, government expenditures, and exports, respectively. The  $a^{kij}$  represents the  $k$  lag coefficients on variable  $j$  in equation  $i$ , the  $c_i$  are constants and the  $e_i$  are error terms. This system is estimated using the full-information maximum likelihood (FIML) method.<sup>8</sup>

The adequacy of this model is tested by over- and under-fitting the system and then conducting likelihood ratio tests of the modified systems against system (1). These tests are presented in Table 1 and are interpreted in the following way. Hypotheses (1)–(13) check for the causal implications of system (1). In Hypotheses (1)–(6), the model is simplified by constraining various lag polynomials to be zero. Alternately, the zero restrictions are eased in hypotheses (7)–(13). Hypotheses (14)–(24) investigate whether the models can be simplified by reducing various lag polynomials. Finally, hypotheses (25)–(36) examine whether the model can be improved by extending the lag lengths of the variables in the existing model. The results suggest that the tentative model specification is adequate.<sup>9</sup>

An examination of system (1) reveals the nature of the relationships among the four variables. According to C. W. J. Granger [17], a nonzero off-diagonal element in a system like (1) indicates the presence of direct Granger-causality from one variable to another.<sup>10</sup> The equation for real income ( $Y$ ) contains lagged values of  $MI$ , government expenditures ( $G$ ), and exports ( $E$ ). This implies that income is Granger-caused by all these three variables. The equation for  $MI$  shows that it can be expressed in terms of a univariate autoregressive process. Government expenditures appear to be Granger-caused by income, while exports seem to be caused by the narrow money supply.

Table 1

ASYMPTOTIC LIKELIHOOD RATIO STATISTICS FOR VARIOUS HYPOTHESES TESTS USING SYSTEM (1)  
AS THE MAINTAINED HYPOTHESES

Hypotheses	Likelihood Ratio Statistic	Degrees of Freedom
(1) $a_{12}(L) = 0$	12.86*	4
(2) $a_{13}(L) = 0$	6.72**	1
(3) $a_{14}(L) = 0$	15.22***	4
(4) $a_{12}(L) = a_{13}(L) = a_{14}(L) = 0$	22.94**	9
(5) $a_{31}(L) = 0$	16.74*	7
(6) $a_{42}(L) = 0$	20.54***	6
(7) $a_{21}^4(L)$	2.58	4
(8) $a_{23}^4(L)$	1.34	4
(9) $a_{24}^4(L)$	0.84	4
(10) $a_{32}^4(L)$	1.74	4
(11) $a_{34}^4(L)$	1.12	4
(12) $a_{41}^4(L)$	2.30	4
(13) $a_{43}^4(L)$	1.88	4
(14) $a_{11}^3(L)$	8.84***	3
(15) $a_{12}^2(L)$	8.26*	2
(16) $a_{14}^2(L)$	9.86**	2
(17) $a_{11}^3(L), a_{12}^2(L), a_{14}^2(L)$	21.02***	7
(18) $a_{22}^4(L)$	9.66**	2
(19) $a_{31}^5(L)$	8.08**	2
(20) $a_{33}^4(L)$	8.40***	2
(21) $a_{31}^5(L), a_{33}^4(L)$	12.66*	4
(22) $a_{42}^4(L)$	9.58**	2
(23) $a_{44}^4(L)$	9.40**	2
(24) $a_{42}^4(L), a_{44}^4(L)$	12.90*	4
(25) $a_{11}^7(L)$	2.12	2
(26) $a_{12}^6(L)$	1.86	2
(27) $a_{13}^3(L)$	2.04	2
(28) $a_{14}^6(L)$	1.12	2
(29) $a_{11}^7(L), a_{12}^6(L), a_{13}^3(L), a_{14}^6(L)$	3.98	8
(30) $a_{22}^8(L)$	0.96	2
(31) $a_{31}^9(L)$	0.44	2
(32) $a_{33}^5(L)$	1.32	2
(33) $a_{31}^9(L), a_{33}^5(L)$	2.16	4
(34) $a_{42}^8(L)$	1.90	2
(35) $a_{44}^5(L)$	2.70	2
(36) $a_{42}^8(L), a_{44}^5(L)$	3.68	4

\* significant at .025 level

\*\* significant at .010 level

\*\*\* significant at .005 level

A number of substantive points can be made about these results. First, unidirectional causality exists from  $MI$  to  $Y$ , while there is feedback between  $G$  and  $Y$ . A well-known desirable property of an effective stabilization tool is that it should be free from feedback from nonpolicy variables. Hence, it can be argued that in Korea the monetary policy variable appears to be more effective as a stabilization tool than the fiscal policy variable. Second, there appears to be no

direct causal relationship between the monetary and fiscal policy variable ( $a_{23}(L) = a_{32}(L) = 0$ ). However, the possibility of an indirect causality from  $M1$  to  $G$  cannot be ruled out since  $M1$  causes  $Y$ , which, in turn, causes  $G$ . Third, the foreign trade sector appears to play an important role in economic activity in Korea. Since the ratio of exports to GNP has been so high (for example, 48 percent in 1980), fluctuations in exports have had a major impact on the growth of output. Hence, any study trying to explain changes in short-term economic activity in Korea should include a variable representing the foreign trade sector. Finally, in addition to the direct effect on income,  $M1$  also influences income through its effect on exports and exports' effect on income.

The specifications of the VAR models for the M2 system in Korea and both the M1 and M2 system in Turkey are presented in Table 2.<sup>11</sup> A number of interesting points can be made about the economic implications of the results in Table 2. The causality implications of the M2 system in Korea are similar

Table 2

## FOUR-VARIABLE VAR MODELS FOR KOREA AND TURKEY

Country	System	Nonzero Elements
2. Korea	$YM2, G, E$	$a^5_{11}, a^1_{12}, a^2_{13}, a^7_{14}, a^2_{22},$ $a^5_{33}, a^3_{41}, a^6_{42}, a^4_{44}$
3. Turkey	$Y, M1, G, E$	$a^8_{11}, a^3_{12}, a^6_{13}, a^2_{21}, a^4_{22},$ $a^5_{23}, a^7_{33}, a^2_{43}, a^1_{44}$
4. Turkey	$Y, M2, G, E$	$a^2_{11}, a^3_{12}, a^1_{13}, a^5_{22}, a^4_{23},$ $a^3_{32}, a^2_{33}, a^6_{41}, a^2_{43}, a^5_{44}$

\* $Y$  = GNP

$M1, M2$  = monetary policy variable

$G$  = fiscal policy variable

$E$  = exports

$a^k_{ij}$  represents the  $k$  lag coefficients on variable  $j$  in equation  $i$ . Thus in system (2),  $a^1_{12}$  indicates that in Korea the lag on the monetary policy variable in the income equation is 1 quarter.

to the causality implications of the M1 system with two exceptions. Unidirectional causality exists from  $G$  to  $Y$ . This is in sharp contrast to the M1 system where feedback exists between these two variables. This implies that, in the presence of M2, the fiscal policy variable possesses one of the characteristics of an effective stabilization tool. Moreover, there is feedback between  $Y$  and  $E$ . Although no direct Granger-causality from  $G$  to  $E$  exists, the possibility of an indirect causality from  $G$  to  $E$  cannot be ruled out since  $G$  causes  $Y$ , which, in turn, causes  $E$ .

The M1 system in Turkey shows that feedback exists between  $M1$  and  $Y$ , while there is unidirectional causality from  $G$  to  $Y$ . Unidirectional causality also exists from  $G$  to both  $M1$  and  $E$ . Moreover,  $Y$  and  $E$  appear to be independent of one another. This implies that foreign trade does not play a pivotal role in the Turkish economy. This result provides support to the widespread belief that



Turkey can be considered the epitome of an inward-looking, closed economy that had relied on import-substitution-led industrialization for decades. It was not until the early eighties when extensive trade liberalization did occur. During the sample period, exports accounted for only 5 percent of the GNP in Turkey, compared with 48 percent in Korea.

The  $M2$  system in Turkey shows that there is a one-way causality from both  $M2$  and  $G$  to  $Y$ . Moreover, a feedback exists between the two policy variables suggesting that the monetary and the fiscal authorities influence each other's decisions. The presence of causality from  $G$  to both  $M1$  and  $M2$  can be explained by the fact that borrowing from the Central Bank has been one of the major sources of financing frequent budget deficits by the Turkish government. Income still appears to be largely unresponsive to changes in foreign trade.

A comparison of the economic implications of the causality results in these models suggest that the monetary policy variables, both  $M1$  and  $M2$ , are free of reverse causation from income in Korea, while only  $M2$  is free of such reverse causation in Turkey. In contrast, the fiscal policy variable is free of any such reverse causation from income in Turkey, while in Korea it is exogenous to income only in the presence of  $M2$ . As explained earlier, a policy variable, in order to be effective, should be free from feedback from nonpolicy variables. If not, it is uncertain whether movements in the variable are the results of policy actions or of economic forces beyond the authorities' control. Hence, the results suggest that monetary policy can be used as an effective stabilization tool in Korea, while the use of fiscal policy as a stabilization tool will be more effective in Turkey. However, it should also be noted that  $M2$  is exogenous to  $Y$  in Turkey, while, in the presence of  $M2$ ,  $G$  is exogenous to income in Korea. These results are in sharp contrast to the findings of Atesoglu [3], Atesoglu and Tillman [4] and Pandit [25]. Atesoglu and Tillman [4] found strong evidence of unidirectional causality from autonomous expenditures to income in Korea. They also found evidence of a feedback between  $M1$  and income and a unidirectional causality from income to  $M2$ . Pandit [25] found that in Korea autonomous expenditures performed as well as the money supply in explaining aggregate economic activity.<sup>12</sup> Similarly to this article, Pandit's study [25] also concluded that the use of  $M1$  or  $M2$  did not substantially change the results in Korea.

It is interesting to note that in Turkey a feedback exists between  $M1$  and  $Y$ , while there is a unidirectional causality from  $M2$  to  $Y$ . An intuitive explanation may be that increases in income raises the interest rates by increasing the transaction demand for money. Fear of instability in the financial market may discourage potential investors from investing in various financial assets and taking advantage of the higher interest rates.<sup>13</sup> As a substitute, economic agents may be induced to transfer funds from noninterest-earning demand deposits to interest-earning savings accounts. These transfers may affect  $M1$ , which include demand deposits, but not the total volume of  $M2$ , which includes both demand and savings deposits.<sup>14</sup>

### FURTHER IMPLICATIONS

The dynamic characteristics of the system can be estimated in various ways. One way is by computing variance decompositions (VDCs). Sims [28] has argued that the strength of the Granger-causal relations can be measured from VDCs. The VDCs show what proportion of the variation in each of the variables in the VAR system is attributable to its own innovations and to shocks to the other system variables. Variance decompositions for the four systems are computed in the manner described in Sims [26]. The orderings of the variables is important due to nonzero, contemporaneous, cross-equation residual correlation. Here the decomposition results corresponding to two orderings are reported. The orderings are (1)  $M, Y, E, G$  and (2)  $G, Y, E, M$ . These two orderings are used in order to see how innovations in the policy variables affect income. The VDCs are computed for a 12-quarter horizon in order to allow for as complete an impact of the disturbances as possible.<sup>15</sup> The results are shown in Table 3.

It is interesting to note that for each country the results in general seem to be insensitive to changes in ordering. This can be explained by low cross-equation residual correlations. In Korea, for the  $M1$  system, money innovations account for 28 percent of the variation in  $Y$  in the first ordering (Table 3, 1.A), while in the second ordering (Table 3, 2.B) they account for 24.3 percent of the variation in  $Y$ . In comparison, innovations in the fiscal policy variable account for only 6.6 percent of the variation in  $Y$  in the first ordering and 8.8 percent in the second ordering. Sims [28] has argued that each element in the VDC table shows the strength of Granger-causality from the input to the output variable. Such interpretations indicate that there is a strong causal relationship from the monetary policy to income. If an innovation throws  $M1$  off its growth path,  $Y$  is expected to be affected. On the other hand, there appears to be a weak causality from  $G$  to  $Y$ . Hence, in terms of magnitude, the monetary policy variable appears to have a more significant impact on income than the fiscal policy variable. The same results are found when  $M2$ , instead of  $M1$ , is used as the relevant monetary policy variable. (Table 3, 2.A and 3, 2.B). Irrespective of the ordering, innovations in  $M2$  explain at least 27 percent of the variation in income, while innovations in  $G$  explain at most 10 percent of the variation in income. This is in sharp contrast to the findings of Atesoglu and Tillman [4] and Pandit [25] for Korea and A. F. Darrat [11] for five Latin American countries.<sup>16</sup>

Some of the other interesting results for Korea include the following. First, innovations in exports explain a significant portion of the variation in income. Regardless of the ordering or the variables used, innovations in exports explain anywhere between 13–17 percent of the variation in income. This further reinforces the earlier assertion that failure to include a foreign trade variable in explaining short-term changes in economic activity in Korea may lead to bias

Table 3

## VARIANCE DECOMPOSITIONS—FOUR VARIABLE SYSTEMS TWELVE QUARTER HORIZONS

## 1. Country: Korea

## A. Ordering: M1, Y, E, G

Relative Variation in	Explained by			
	M1	Y	E	G
M1	90.3	3.6	4.7	1.4
Y	28.0	50.7	14.7	6.6
E	18.7	8.6	65.4	7.3
G	0.5	20.2	1.0	78.3

## B. Ordering: G, Y, E, M1

Relative Variation in	Explained by			
	G	Y	E	M1
G	83.0	14.8	1.8	0.4
Y	8.8	50.1	16.8	24.3
E	8.0	3.9	71.9	16.2
M1	5.9	4.8	3.7	85.6

## 3. Country: Turkey

## A. Ordering: M1, Y, E, G

Relative Variation in	Explained by			
	M1	Y	E	G
M1	58.6	30.7	0.1	10.6
Y	8.5	66.0	1.7	23.8
E	0.7	2.0	80.5	16.8
G	1.7	3.6	0.6	94.1

## B. Ordering: G, Y, E, M1

Relative Variation in	Explained by			
	G	Y	E	M1
G	97.7	1.2	0.9	0.2
Y	28.0	63.1	2.6	6.3
E	20.8	1.0	77.6	0.6
M1	13.5	30.1	1.2	55.2

## 2. Country: Korea

## A. Ordering: M2, Y, E, G

Relative Variation in	Explained by			
	M2	Y	E	G
M2	96.5	0.5	1.8	1.2
Y	30.2	48.4	13.0	8.4
E	3.7	18.4	68.5	9.4
G	0.9	4.3	0.5	94.3

## B. Ordering: G, Y, E, M2

Relative Variation in	Explained by			
	G	Y	E	M2
G	96.2	1.4	0.3	2.1
Y	10.4	46.7	15.3	27.6
E	12.1	15.7	70.2	2.0
M2	2.0	1.9	1.9	94.2

## 4. Country: Turkey

## A. Ordering: M2, Y, E, G

Relative Variation in	Explained by			
	M2	Y	E	G
M2	79.7	1.7	0.3	18.3
Y1	10.7	56.2	2.9	30.2
E	1.7	7.3	76.5	14.5
G	8.1	2.4	0.3	89.2

## B. Ordering: G, Y, E, M2

Relative Variation in	Explained by			
	G	Y	E	M2
G	92.4	1.1	0	6.5
Y	34.8	58.3	1.3	5.6
E	18.9	10.0	70.8	0.3
M2	21.3	2.8	0.7	75.2

due to an omitted variable. Second, variations in the monetary and fiscal policy variables are mostly explained by their own innovations. However, in the M1 system, innovations in  $Y$  explain a considerable portion of the variation in  $G$ . Interestingly, the results indicate that causality running from  $Y$  to  $G$  appears to be stronger than the reverse causality running from  $G$  to  $Y$ . This can be explained by the presence of various automatic stabilizers in the Korean economy.

In Turkey, money innovations hardly have any effect on income. In the M1 system, money innovations do not explain more than 9 percent of the variation in income. On the other hand, regardless of the ordering, fiscal innovations explain at least 24 percent of the variation in income. The same trend is evident in the M2 system. The results clearly indicate the dominant influence of fiscal policy in stabilizing income in Turkey. This is in sharp contrast to the findings in Korea and confirm Atesoglu's [3] findings for Turkey. Among the other notable results are the following. First, innovations in  $Y$  explain about 30 percent of the variation in  $M1$ . This is much higher than the variation in  $Y$  explained by money innovations. This suggests that the direction of causality is stronger from  $Y$  to  $M1$  than from  $M1$  to  $Y$ . Second, foreign trade does not appear to have a significant impact on economic activity in Turkey. Third, variations in the fiscal policy variable are mostly explained by its own innovations. The results from innovation accounting thus reinforce the causality implication of the VAR models. Monetary policy appears to dominate fiscal policy in influencing economic activity in Korea, while the reverse seems to be true in Turkey.

An alternative way to explain the dynamics of the system is to derive the impulse response functions (IRFs). Fischer [15] has described IRFs as a type of dynamic multiplier that gives the current and subsequent effects on each variable of a shock to one of those variables. These functions are of interest to policymakers because they show the effects and timing of policy variables on the variables of ultimate concern. IRFs have been computed for those models in which neither of the policy variables are subject to reverse causation from income (in our case, the M2 system for Korea and Turkey). The IRFs are reported in Table 4.<sup>17</sup> The figures in each column represent the responses in

Table 4

IMPULSE RESPONSE FUNCTIONS FOR GNP<sup>a</sup>

Period	Korea		Turkey	
	M2	G	M2	G
1	.68	.12	.28	.46
4	.44	.18	.26	.58
8	.48	.06	.15	.41
12	.32	.08	.05	.30

<sup>a</sup> Each element in the table shows the response of GNP in Korea and Turkey to a one-standard-deviation shock given in period one to their respective monetary and fiscal policy variables.

income to a one-standard-deviation shock to the shocked variable. The responses are expressed in percent of changes. A shock to  $M2$  in Korea raises income growth by 1.12 percent at the end of a year. The peak effect occurs in the first quarter. After the fourth quarter, the effect in individual periods slightly increases and then declines over the next two years. The long-run effect (effect in quarter 12) appears to be quite significant. In contrast, fiscal policy shocks have a small effect on income in Korea. In no period does a 1 percent shock to  $G$  raise  $Y$  by more than 0.2 percent. The long-run effect is also very small. At the end of the third year, monetary policy shocks raise income growth by more than four times than the fiscal policy shocks.

In Turkey, the peak effect of a shock to  $M2$  is reached instantaneously when a 1 percent shock to  $M2$  raises income growth by 0.28 percent. The effect gradually declines over the next two years and becomes negligible at the end of the third year. In contrast, a shock to the fiscal policy variable has a more significant and lasting influence on the growth of income in Turkey. A 1 percent shock to  $G$  raises  $Y$  by 0.46 percent in the first quarter. The peak effect occurs in the fourth quarter. The long-run effect is also highly significant. The results of the IRFs support the earlier findings of the study.

For purposes of comparison, the estimated VAR systems are compared with a reduced-form single equation approach on the basis of out-of-sample forecasting performances. Reduced-form St. Louis equations, as modified by Batten and Hafer [6], are estimated for each of the four models.<sup>18</sup> The VAR models are dynamically simulated over a four-quarter period running from 1984:I through 1984:IV. Similarly, out-of-sample forecasts for the same four-quarter period are generated using the St. Louis equation. The respective root mean square errors are reported in Table 5. The results show that in each case the

Table 5

ROOT MEAN SQUARE ERROR FOR GNP GROWTH

Country	System	VAR Models	Batten-Hafer Equation
Korea	$Y, M1, G, E$	.066	.074
	$Y, M2, G, E$	.045	.056
Turkey	$Y, M1, G, E$	.130	.144
	$Y, M2, G, E$	.186	.195

quality of the St. Louis equation forecast in terms of the root mean square error is much poorer than for the VAR systems. Hence, the choice of the VAR technique for this study seems to be appropriate.

#### SUMMARY AND CONCLUSION

The aim of this article has been to test the comparative effectiveness of monetary and fiscal policy as a stabilization tool in Korea and Turkey. A

reduced-form methodology, vector autoregression, is used in the empirical analysis. This technique is employed rather than a single equation or a structural model approach since it avoids imposing potentially spurious a priori constraints on the model.

A four-variable vector autoregressive model is initially estimated for each country. The variables include income, exports, a monetary, and a fiscal policy variable. The dynamic characteristics of the models are analyzed by estimating variance decompositions and impulse response functions. Finally, the vector autoregressive systems are compared with a modified version of the St. Louis equation on the basis of out-of-sample forecasting performances. The results suggest that monetary actions exert a significant, permanent effect on economic activity in Korea while fiscal actions have no statistically significant, lasting influence. On the other hand, fiscal rather than monetary actions exert the dominant influence on economic activity in Turkey.

The variation in results can be attributed to the differences in the priorities of the policymakers and in the underlying institutional framework in these two countries. Turkey has been under a military rule during most of the period under study. As with other military governments, the Turkish government also exercised direct control over various administrative as well as socio-economic decisions. The Central Bank did not have much independence with regard to its decision-making process. This is reflected in the fact that the fiscal policy, which is directly formulated and implemented by the military government, dominates monetary policy in its role as a stabilization tool. In contrast, the Korean economy is more developed and open. The capital and financial markets are highly stable as well as homogenous. Consequently, the Central Bank is able to conduct a policy that is more effective in stabilizing the economy than the spending and tax policy of the government.

## NOTES

\* The author is grateful to Douglas McMillin, Lawrence Davidson, and an anonymous referee for helpful suggestions. All remaining errors are mine.

1. Three exceptions are Atesoglu [3] for the case of Turkey, Pandit [25] for three countries, and Darrat [11] for the case of five Latin American countries. My approach differs from these in that I use a vector-autoregressive model rather than a "reduced-form" St. Louis model or naive Friedman-Meiselman's earlier framework and I compare out-of-sample forecasting performance for two models.

2. For a detailed discussion, see [12, 16, 23].

3. This alternative approach has also come to be known as "atheoretical macroeconometrics" and has been used in several studies. See, for example, Chowdhury, Fackler and McMillin [9], Fackler [14], McMillin and Fackler [22] and Myatt [24]. The positive attributes of this technique have been discussed in Backus [5] and Fischer [15]. For an opposing view, see Cooley and Leroy [10].

4. An exhaustive study by Thornton and Batten [29] advocates using the minimum final prediction error (FPE) criteria for choosing lag lengths. They compared the FPE

criteria with Bayesian estimation and the Pagano-Hartley criteria and concluded that the FPE criteria are superior to the other two.

5. This section is primarily based on Chowdhury, Fackler and McMillin [9].

6. Potential GNP is the vector of fitted values from a regression of real GNP on a constant and time over the estimation period. Several studies have used a similar variable to measure the stance of fiscal policy. However, it should be noted that unavailability of data precluded the use of a more preferred measure of discretionary fiscal policy, such as cyclically adjusted government expenditures.

7. Batten and Hafer [6], Dewald and Marchon [13], and Darrat [11] have also used exports in their estimated equations. The use of imports have been avoided in order to reduce the possibility of simultaneity bias. For a detailed discussion, see Darrat [11].

8. According to Sims [26], the interpretation of the individual autoregressive coefficients is difficult due to the reduced form nature of the model. To conserve space, these coefficients are not presented here but are available from the author upon request.

9. To further investigate model adequacy, the cross correlation matrixes of residuals from system (1) are computed for 16 lags. These matrixes reveal that there is only one significant positive coefficient at the lag-6 correlation matrix. All other coefficients are insignificant. Thus, one may conclude that the residuals are white noise and, hence, the model is adequate.

10. The "Granger-causality" concept is employed throughout this article. This notion of causality states that  $Y$  "causes"  $X$  if the past history of  $Y$  can be used to predict  $X$  more accurately than simply using the past history of  $X$ . This concept is used with the usual misgivings, see, for example, Zellner [30].

11. Due to space limitations, the results of the tests of model adequacy are not reported here but are available on request. Based on these tests, each model is judged adequate.

12. Pandit [25] defined autonomous expenditures to include gross investment, government consumption, and net exports.

13. Additional justification can be derived from the fact that the number of financial instruments in existence is small and quite heterogeneous and that each sector only supplies or holds a few of these claims.

14. Similar behavior is not experienced in Korea because the capital and financial market in Korea is much more stable and developed. Hence, higher interest rates induce investors to invest in financial assets rather than transfer funds from demand to savings deposits. Moreover, interest rates in Turkey have fluctuated significantly while the rates in Korea have remained relatively stable.

15. Variance decompositions are computed for both 8 and 12 quarters. Since the results do not significantly differ, only the results using the 12-quarter horizon are reported and discussed. All exercises in this section are performed after transforming all variables to first differences of logs. This is done because the literature focuses on the effects of the rates of growth of the policy variables.

16. Darrat [1] used the monetary base as the monetary policy variable.

17. In calculating the IRFs, a one-standard-deviation shock is given in period one to the impulse variable and its effects on the subsequent values of income are studied. As in the case of VDCs, the ordering of the variables is important. Since disturbances are correlated, changes in variables higher in the ordering cause changes in variables lower in the ordering.

18. The Batten and Hafer modification of the St. Louis equation is used because their study includes the same variables for explaining income as in the present study and they use unconstrained ordinary least squares (OLS) for estimation purpose instead of subjecting the data to potentially invalid polynomial restrictions.

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