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Table 4: Granger Causality test

Null Hypothesis: H_0	F-statistic	Probability	Decision
m1 does not Granger cause y	14.1251	0.00074	Reject H_0
Log(m1) does not Granger cause log(y)	4.82526	0.03591	Reject H_0
g does not Granger cause y	6.04696	0.01992	Reject H_0
Log(g) does not Granger cause log(y)	3.50843	0.07083	Reject H_0

The results show that each of both independent variables, the money supply (m1) and government expenditures (g), with levels and log forms, Granger-causes the output level (y). Replacing the narrow definition of money supply (M1) by the broad definition (M2) has not changed the results too much.

V. Concluding Remarks:

This paper analyzes the output effects of monetary and fiscal policies using time series techniques, in particular unit root tests, cointegration test, and an error correction model. The findings of the study are that fiscal policy proxied by government expenditures has much stronger effects on output than monetary policy. The coefficient of the growth rate of government expenditures (0.4976) is almost twice as the coefficient of the growth rate of money supply (0.2989). The coefficient of the ECM term shows that the system corrects its last period disequilibrium by 16% a year. The results are statistically significant. This implies that over the foreseeable future stabilization policy could be carried out by fiscal policy in the Jordanian economy. It seems that, fiscal policies might be more potent in developing countries comparing to developed ones in affecting economic activity, this results may be due to the fact that developing economies usually operate with under-developed financial markets, and that the importance of Centrals banks in these countries is confined to finance government deficits. It can be also concluded that a particular economic philosophy cannot be generalized for developing and developed countries, or even for developing countries themselves.

coefficient of the growth rate of money supply (0.2989) and both of them are positive and statistically significant. The growth rate in this context is defined to be the first difference of the logarithm; in other words, the growth rate of variable x equals log(x)-log(x(1)), where x(1) is the first lag of x). The coefficient of the ECM term shows that the system corrects its last period disequilibrium (the speed of adjustment to restore equilibrium in the dynamic model) by 16% a year, but it is not highly statistically significant. R^2 is not high enough since differencing may result in a loss of information about the long-run relationship among variables (Pindyck and Rubinfeld, 1991). The Jarque-Bera (JB) test for normality of residuals was performed, the JB value of (0.902351) with probability (0.636879) indicates that we can't reject the normality assumption of the OLS residuals. The ARCH LM test for autocorrelation in the error variance was conducted and showed that $\chi^2_5 = 8.593293$ with p-value (o.126428), which suggests that the error variance is serially uncorrelated; i.e. the residuals don't contain significant ARCH effects. The results of other tests, such as CUSUM statistic and CUSUM of Squares (CUSUMQ statistic), gave impressive results, where the residuals inside plus and minus two standard errors bands suggest stability in the parameters of the equation, which implies that we accept the null hypothesis of constant parameters. Also the results of the Ramsey RESET test (regression specification error test) for functional form misspecification, showed that the computed F is (2.3587715), which is insignificant at 5% level, and that implies that we cannot accept the hypothesis that the model is misspecified.

To support the choice of the policy variables in the St. Louis equation model, pairwise Granger Causality test was implemented for both independent variables, and it is found that both variables Granger-cause the output level in Jordan, the results are reported in table (4) below.

Table 2: Johansen Cointegration test

Eigenvalue	Likelihood Ratio	5% critical value	1% critical value	Number of cointegrating equations
0.4714	33.837	29.68	35.65	None
0.2746	13.437	15.41	20.04	At most 1
0.0941	3.163	3.76	6.65	At most 2

The results of the liklelihood ratio indicate that there exists one cointegrating equation at 5% significance level. This cointegrating vector, normalized on y, is: [y, m1, g] = [-1.000, 1.4188, -1.9274]. The results of both the unit root test and cointegration test indicate that there is some long-run relationship between the variables in the system, which allow us to utilize an error correction model (ECM). There is a very close relationship between cointegration and error correction models. Engle and Granger (1987) defined error correction as "a proportion of the disequilibrium from one period that is corrected in the next period". An error correction model relates the change in one variable to past equilibrium errors. In fact, error correction models provide a way of combining both the dynamics of the short-run (changes) and long-run (levels) adjustment processes simultaneously (Lim and Mcaleer, 2001). The ECM estimates are given in table (3) below:

Table 3: Error Correction Estimates Dependent Variable Δy

Independent Variable	Estimated Coefficient	Std. Error	t- statistic	Probability
Constant	0.0599	0.0130	4.6076	0.0001
$\Delta m1$	0.2989	0.1456	2.0525	0.0489
Δg	0.4976	0.1269	3.9205	0.0005
ECM_{t-1}	- 0.1623	0.0913	- 1.7781	0.0855

R^2 = 0.5541, Adjusted R^2 = 0.5541, D-w= 1.7660, S.E. of regression= 0.04747, F-statistic= 12.001354,
Prob(F-statistic) = 0.000028.

The results indicate that fiscal policy dominates monetary policy in the Jordanian economy. The coefficient of the growth rate of government expenditures (0.4976) is almost twice as the

IV. Empirical Results:

The empirical results reported in this paper are based on annual observations for the 1970-2003 period. All the data are expressed in logarithms (lowercase letters denote logarithms of the variables).

The three variables of equation (1) and their first differences were subjected to the Augmented Dickey-Fuller (ADF) tests for unit roots. The integration results reported in table (1) along with their 5 percent significance levels. It is very clear that all the variables are integrated of order 1, i.e. I(1), which implies that their levels are nonstationary, while their first differences are stationary.

Table 1: Results of ADF unit root tests

Variables	Lags	D-W	Calculated ADF value	5% Critical value
Y	1	2.35	- 1.22	- 2.956
M1	1	2.18	- 1.99	- 2.956
G	1	2.13	- 1.92	- 2.956
Δy	1	1.91	- 3.27	- 2.959
$\Delta m1$	1	1.86	- 3.22	- 2.959
Δg	1	2.09	- 4.72	- 2.959

Notes: Lags stands for the number of lagged first differences of the variable used in the ADF equation to get white noise residuals. D-W is the Durbin-Watson values for the residuals in the ADF equation. All the variables on log forms. The Akaike Information Criterion (AIC) and the Schwarts Bayesian Criterion (SBC) yield smaller values for the first lag length.

Since the variables are all I(1), they may also be cointegrated if there exists one or more linear combinations among them which is stationary. If these variables are cointegrated, then there is a stable long-run equilibrium linear relationship among them. The Johansen (1988) maximum liklelihood method can be utilized to check if these variables are cointegrated. The results of the Johansen cointegration test are shown in table (2).

are measured by changes in high employment federal expenditures. Statistical constraints are imposed upon the equation for the purpose of estimation. These constraints include: 1) the independent variables has the same lag length, 2) the distributed lag weights are estimated by a fourth degree polynomial by the Almon technique with both endpoints constrained to zero. The estimation results show that only money matters (Koot, 1977).

When the statistical constraints were removed by Schmidt and Waud (1973), the estimation results of the St. Louis equation have shown that both fiscal and monetary policies matter.

Lombra and Torto (1974) find that, if the monetary variable is adjusted to account for "reverse-causation," the estimation results of the St. Louis equation show that both monetary and fiscal policies still matter. In spite of these criticisms, the St. Louis equation continues to be used in its original form (Koot, 1977 and Carison, 1975).

Following the Saint Louis equation model and the other common practice for gauging the relative impact of monetary and fiscal policies, the most frequently used measures of economic activity, monetary actions and fiscal actions are selected. The gross domestic product (Y) is used in this paper as the measure of economic activity. The money stock (M1: the narrow definition of money supply) is used as a monetary variable, and the influence of fiscal actions on economic activity is frequently measured by the government spending (G). Then, the output level to be estimated has the following log-linear form:

$$y_t = \alpha_0 + \alpha_1 m1_t + \alpha_2 g_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where α_0 is a constant, y is ln(Y), m1 is ln(M1), g is ln(G), and ε is a random error term.

According to Engle and Granger (1987), to implement an error correction model on the variables in equation (1) above, it is important to guarantee that these variables have the same order of integration (higher than zero) and are cointegrated. Cointegration enables variables in the system to be used in an error correction model (Huang, 1994).

unit root tests, Johansen co integration test, and the error correction estimates. Finally, section V provides some concluding remarks.

II. Economic Literature:

The effectiveness of monetary and fiscal policies in the economy has a lot of debate among economists for a long time. Monetarists and Keynesians disagree about the relative effectiveness of both policies. The monetarists claim that monetary policy is the most powerful tool and will prefer an expansion in the growth rate of money, while the Keynesians believe the opposite and will prefer fiscal measures such as tax cut or an increase in government expenditures (Thomas, 1997). The IS/LM model predicts that both monetary and fiscal policy may be used to influence output. It is not clear, however, which policy is more effective at stabilizing output.

Paul Samuelson (Skousen, 1996), the Nobel-Prize-winning economist, stayed convinced for the efficacy of deficit spending and the importance of monetary policy for about fifty years, but in his latest writings, admitting defeat for his long-cherished belief that fiscal policy is an effective countercyclical tool. The results of empirical studies in developed countries support the monetarists' point of view (for example, Arestis and Sawyer 2000, Bruneau and De Bandt 2003). On the other hand, the situation in developing countries is different. In some of them monetary policy dominates fiscal policy, but in most of them fiscal policy dominates monetary policy. The contrary conclusions for developing economies might be accrued to two reasons; firstly, the lack of accurate monthly, quarterly or even yearly data. Secondly, the existence of imperfect or under-developed financial markets in developing economies comparing to the developed ones, where the existence of perfect financial markets is necessary to successful monetary policy (for example, Ansari 1996, Ubogu 1985, Al-Refai and Al-Wazani 1997, Shotar and Barghothi 2000). This paper explores these differing viewpoints.

III. Model:

The St. Louis equation, in its popular form, measures monetary actions by employing changes in money stock, whereas fiscal actions

I. Introduction:

Most of developing countries suffer from economic distortions, such as huge deficits in their balances of payments and public budgets, high employment and inflation rates, and external debt. The theoretical developments have enlarged the number of independent forces that are regarded as causing economic distortions. Fiscal and monetary policies are considered very important for correcting the situation. The central bank has the responsibility for monetary management, and the government units involved in fiscal actions. The most effective policy for eliminating these distortions is not obvious. Some countries confusedly count on monetary policy, fiscal policy, or a mix of both policies.

During the last fifteen years, Jordan has been experienced not easily solved economic problems. So, it looked to the International Monetary Fund (IMF) for help in order to attain economic stabilization and solve its economic problems, but it seems that the IMF's recipe does not have enough potency to overwhelm such chronic problems.

Over the period of study (1970-2003), the Jordanian national income grew at an average rate of (4.9%) per annum in real terms, with an accumulative external public debt for about (7) billion Dollars, unemployment rates hover around (15%), annual inflation rate at an average of (7.4%). For a small open economy, like the Jordanian one, that is vulnerable to external shocks, is not easy to make the proper selection for the most powerful policy in order to reduce the severity degree of its economic problems. Therefore, Jordan needs a lot of empirical research concerning the relative efficacy of different economic policies, and from this place, this study acquires its importance. So the main purpose of this paper is to clarify the output effects of both policies, monetary and fiscal, in Jordan over the period (1970-2003) by employing some time series techniques.

The rest of the paper is organized as follows. Section II goes over some economic literature related to monetary and fiscal policies. Section III describes the model. Section IV presents the results of

The Relative Effectiveness of Monetary and Fiscal Policies in Developing Countries: An Error Correction Mechanism (ECM)

Ahmad Ibrahim Malawi*

Abstract:

This paper investigates the relative importance of monetary and fiscal policies for Jordan. Unlike previous studies, a vector error correction model is applied on St. Louis-type reduced form equation. Analysis of the unit roots tests, Johansen cointegration test, and the Granger causality results based on the joint F-tests are utilized. The analysis is undertaken with annual data spanning over thirty four years in logarithms form from 1970 until 2003. It turns out, that fiscal policy has stronger effect than monetary policy has on economic activity, whence fiscal policy can be utilized as a stabilization policy in Jordan.

الملخص :

تهدف هذه الدراسة بشكل أساسي الى استقصاء الأهمية النسبية لكل من السياستين النقدية والمالية في الأردن. حيث تم تطبيق نموذج تصحيح الخطأ على معادلة سانت لويس بالشكل المختزل، كما تم استخدام الاختبارات التالية: اختبار جذر الوحدة للاستقرارية، اختبار جوهانسن للتكامل المشترك، واختبار جرينجر للسببية على بيانات سنوية تغطي الفترة (1970-2003). وتوصلت نتائج الدراسة الى أن السياسة المالية لها تأثير أكبر من السياسة النقدية على النشاط الاقتصادي، ولذلك يمكن للحكومة الأردنية الاستفادة من السياسة المالية كسياسة اقتصادية فعالة للمحافظة على استقرار الاقتصاد الأردني.

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