

The Impact of Monetary and Fiscal Policies on Real Output: A Re-examination

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Abstract

Research continues to investigate the relative efficacy of monetary and fiscal policies for stabilizing the US economy, a debate that began with Anderson and Jordan's well-known study. This paper examines the contention of Senbet that monetary policy matters for stabilizing real economic activities; fiscal policy does not. We show that this claim is unfounded and apparently the outcome of prematurely dismissing fiscal policy from the cointegrating vector. In the context of a properly specified model, results we obtained from cointegration and error-correction tests using data and time period similar to Senbet's consistently suggest that only fiscal policy Granger-causes real output over the long-run. Moreover both monetary and fiscal actions Granger-cause significant short-run effects on the real side of the economy.

Keywords: Cointegration; Granger-causality; Real effects of Monetary and fiscal policies

Introduction

Empirical inquiry into the relative economic impact of monetary and fiscal policies remains an enduring topic in macroeconomics ever since the publication of Friedman and Meiselman [1] and Anderson and Jordan [2] pioneering work in support of the superiority of monetary over fiscal policy in the US economy. However, their results have been challenged on various grounds by several subsequent studies including Goldfeld and Blinder [3]; BM Friedman [4]; Darrat [5]; Fazzari [6]; Serletis and Koustas [7]; and Arestis and Sawyer [8,9], to name just a few (For more recent studies on the stabilization role of fiscal and monetary policies, see Charpe et al. [10] and Farmer and Plotnikov [11] among others).

In a recent article in this Journal, Senbet [12] participates in this debate using the U.S. time series data spanning the period from 1959:Q1 to 2010:Q2. A primary motivation for Senbet's paper is his focus on the relative efficacy of monetary and fiscal actions upon real, as opposed to nominal, economic activity. Such emphasis on policy's real effects is appropriate since stabilization policies are ultimately judged based on their ability to achieve key objectives like FX-targeting and separately combating unemployment (real output) and/or inflation (prices) rather than simply influencing the overall level of nominal GDP (Senbet [12] also repeatedly claims that his paper is the first attempt ever in the literature to analyze the relative efficacy of monetary and fiscal actions on real output. This claims is simply incorrect as some studies [6] have previously investigated this same issue for the US economy). Senbet reports results that led him to conclude, similar in spirit to Anderson and Jordan's [2], that only monetary actions represent a viable policy for stabilizing real economic activity.

In this paper we revisit Senbet's claim and argue that his results suffer from a serious model misspecification due to ignoring the cointegrating (long-run) relationship that links the policy variables with the real side of the economy beyond the short-run time span of

the average business cycle. Short-run real economic fluctuations of the business cycle are important, but significant gains in living standards require sustained longer-term economic growth. Correcting for this model misspecification, our empirical results clearly suggest that only fiscal actions matter for long-term economic growth. However, within the short-run business cycle horizon, our results are broadly consistent with Senbet's evidence that both monetary and fiscal policies Granger-cause significant changes in real economic activity.

Some Modeling Issues

Testing for cointegration among time series and properly controlling for its presence has become a standard practice in the contemporary econometric literature. Consequently, Senbet reported that he tested for cointegration and found none. However, he did so only within a bivariate model that contains real output and monetary policy. Such arbitrary omission of fiscal policy from the cointegration test is surprising given the emphasis Senbet placed on examining the relative efficacy of monetary and fiscal policy. Literature has well documented both theoretically and empirically, that non-cointegration found in a low dimensional sub-process could be misleading and possibly the outcome of omitting one or more relevant variables [13,14]. Moreover, as shown in Lutkepohl [15] and Cheng et al. [16], a similar omission-of-variables bias severely befouls Granger-causality tests. As the results below show, Senbet's claim of no cointegration is easily rejected when the bivariate monetary policy/output vector is properly expanded to include fiscal policy.

For compatibility with Senbet [12], we use the same variables, the same data source and the same sample period as he did. Specifically, our sample spans the period 1959:Q1 to 2010:Q2; real GDP represents real output; government current expenditures represent fiscal policy; non-borrowed reserves represent monetary policy (We did not use Senbet's second measure of monetary policy (Federal funds rate, FFR) partly for brevity since Senbet obtained similar results from both measures. Moreover, several researchers like Christiano and Eichenbaum [17], Romer CD and Romer DH [18] and Laurent [19] have questioned the use of the FFR as an indicator of monetary policy)

and, like Senbet, our data are culled from the Federal Reserve Bank of St. Louis. Again, for comparability, we use the same notations as Senbet's. Thus, we denote real output by RY, monetary policy by NBR, and fiscal policy by G.

Alternative Empirical Results

Like Senbet [12], we begin by checking the stationarity of the three time series variables using the Augmented Dickey-Fuller (ADF) procedure. Consistent with Senbet's finding, our results in Table 1 suggest that the three variables are non-stationary in levels, but become stationary when converted to first-differences. Given the importance of the stationarity issue for the reliability of the consequent conclusions, we also subject the data to the Phillip-Perron procedure and it too confirms the stationarity of the three variables in their first-differences form.

	ADF(h)	PP(K)
A. Variable in Levels		
Real GDP (RY)	-1.87(2)	-2.17(6)
Government Spending (G)	-2.58(4)	-2.78(9)
Non-Borrowed Reserves (NBR)	-1.33(9)	2.70(5)
B. Variables in First-Difference (D)		
DRY	-6.96(1)**	-10.73(6)**
DG	-3.65(3)**	-12.68(9)**
DNBR	-5.48(8)**	-6.58(4)**

Table 1: Unit Root Test Results. Notes: The proper lags (h and K) are determined based on the AIC. An ** indicates rejection of the null hypothesis of non-stationarity at the 5 percent level of significance.

	Max Eigenvalue		Trace	
Null Hypotheses	Alternative Hypotheses	Test Statistics	Alternative Hypotheses	Test Statistics
A. Bivariate Vectors:				
Real Output and Monetary Policy (RY, NBR)				
r=0	r=1	12.76	r ≥ 1	13.87
r ≤ 1	r=2	1.1	r ≥ 2	1.1
Real Output and Fiscal Policy (RY, G)				
r=0	r=1	16.21**	r ≥ 1	20.31**
r ≤ 1	r=2	4.09	r ≥ 2	4.09
B. Trivariate Vector				
Real Output, Monetary Policy and Fiscal Policy (RY, NBR, G)				
r=0	r=1	24.45**	r ≥ 1	39.80**
r ≤ 1	r=2	10.2	r ≥ 2	15.35

r ≤ 2	r=3	5.15	r ≥ 3	5.14
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Table 2: Johansen Cointegration Test Results. Notes: lag profiles in the Johansen test are determined by the AIC. An ** indicate rejection of the null of no cointegration at the 5 percent level.

We now investigate possible cointegration between real output and the two policy variables. Following Senbet, we use the Johansen [20] efficient test. In Panel A of Table 2, we report results for both alternative bivariate vectors. The first bivariate vector mimics Senbet's which consists of real output and the monetary policy measure. The Johansen test results accord with Senbet's finding that monetary policy is not related to real output over the long run (the null hypothesis that r=0 is not rejected since both the max-eigenvalue test statistic=12.76 and the trace test statistic=13.87 are less than the 5 percent critical value). However, when fiscal policy replaces monetary policy in the second bivariate vector (which Senbet arbitrarily ignored), the results strongly suggest that there is a potent cointegrating (long-run) relation linking fiscal policy with the real side of the US economy. It is worth noting that this evidence is supported by both versions (the trace and the maximum-eigenvalue) of the Johansen test.

This strong cointegrating relationship between real output and fiscal policy persists when the bivariate vector is properly expanded to the trivariate system that includes the monetary policy variable. As Panel B of Table 2 shows, the trivariate system under the hypothesis of no Cointegration gives the Maximum Eigen value of 24.45 and Trace statistic value of 39.80 both of which are greater than their respective critical values at the 5% level. Therefore, both the trace and the maximum eigenvalue of the Johansen test continue to suggest the presence of significant cointegrating relationship among the three variables (As Bhattarai et al. [21] point out, such strong long-run relation among the three variables may partly reflect some interactions between fiscal and monetary and policies. We are grateful to an anonymous reviewer for alerting us to this and many other aspects of our analysis).

The presence of such a strong cointegrating relationship does not identify which of the two policy variables is the main force driving the long-run relationship with real output. The case for the superiority of fiscal over monetary policy for stabilizing real output in the long-run receives further support from the evidence we obtained from the common long-memory test of Gonzalo and Granger [22]. Results in Table 3 show that for the null that fiscal policy is not the main force driving the long-run relation in the trivariate vector, the likelihood ratio test statistic is sufficiently large ($\chi^2=8.18$, d.f.=2) to reject the null hypothesis at the 5 percent level of significance. In contrast, the null hypothesis that monetary policy is not the main driving force cannot be rejected even at the weak 10% level of significance ($\chi^2=0.44$, d.f.=2).

	R	χ^2
Multivariate vectors (RY, NBR, G)		
RY	1	7.40**
NBR	1	0.44
G	1	8.18**

Table 3: The Gonzalo-Granger Driving Force Test Results. Notes: The driving force test is based on a likelihood ratio statistic distributed as with degrees of freedom equal to (=3-r, where r is the cointegration

rank). The null hypothesis is that the variable is not the main driving force of the cointegrating vector. ** And * indicate rejection of the null hypothesis at the 5% and 10% levels of significance.

These results Corroborate our earlier findings from the Johansen test and provide yet another testimony in support of the important role that fiscal policy plays in stabilizing the real side of the US economy beyond the short-run span of the business cycle.

Under cointegration, regressions that ignore the underlying significant long-run relation among the model variables, like those estimated in Senbet [12], are suspect and suffer from specification biases due to omitting the required error-correction term. To avoid this potential bias, we follow Granger's [23] Representation Theorem and estimate an error-correction model (ECM) (Since the core issue in this debate relates to whether monetary and/or fiscal policy Granger-cause real output, we limit our analysis to the policy effects on real output without discussing possible feedbacks). Although results from the Johansen test and the Gonzalo and Granger test suggest that monetary policy has no reliable long-run relation with the real side of the economy, it may still exert short-run effects on real output. To examine whether monetary and/or fiscal policy induces significant short-run effects on real output, we now turn our attention to estimating the following ECM model for real output:

$$DRY_t = \gamma_0 + \sum_{i=1}^{h1} \gamma_{1i} DRY_{t-i} + \sum_{i=1}^{h2} \gamma_{2i} DNR_{t-i} + \sum_{i=1}^{h3} \gamma_{3i} DG_{t-i} + \gamma_5 EC_{t-1} + v_t$$

Where the basic variables are defined as before; "D" denotes the first-difference operator as dictated by the results from the unit-root tests; EC is the error-correction term; h1, h2 and h3 are the optimal lag lengths as determined by the Schwartz Information Criterion; and v_t is a white-noise disturbance term. The estimated coefficient of the EC term (γ_5) reflects the speed at which the dependent variable (real output growth) adjusts in the short-run to its equilibrium after a deviation has occurred. The joint significance of the lagged coefficients of any policy variable reflects short-run Granger-causality flowing from the policy variable to real economic activities (The ECM estimates are free from autocorrelation according to results from the Bruesch-Godfrey test (for up to 10 lags) and the estimated model also proves structurally stable based on the CUSUM Squares test. Detailed test results are available upon request. Note further that the estimated ECM model includes a dummy variable to capture the recent global financial crisis, taking the value of one from 2008:Q3 onward and zero otherwise. The dummy coefficient is negative and statistically significant suggesting that the recent global financial crisis did adversely impact US real economic activity).

We assemble the ECM estimates in Table 4. The results there suggest that both monetary and fiscal policies exert significant short-run effects on real output growth.

Specifically, the lagged coefficients on the monetary policy variable ($\sum_{i=1}^{h2} \gamma_{2i}$) are statistically

Vector (RY, NBR, G)	
EC	-0.0023**
GFC	-0.0139**
Short run Granger-Causality Test Hypothesis	F-Statistics (d.f.)
NBR does not Granger-cause RY	2.69** (6, 178)

G does not Granger-cause RY	2.26** (6, 178)
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Table 4: Error Correction Model: Short-run Granger Causality Test Results. Notes: EC is the error correction term and GFC denotes the Global financial crisis which is represented by a dummy variable that takes the value one from 2008Q3 onward and zero otherwise. An ** indicates rejection of the null hypotheses at the 5% level of significance.

Significant as a group at the 5 percent level ($F=2.69$, $df=6,178$). A similar finding emerges for fiscal policy whereby the lagged coefficients on the fiscal policy measure ($\sum_{i=1}^{h3} \gamma_{3i}$) are also statistically significant as a group at the 5 percent level ($F=2.26$, $df=6,178$). Therefore, and contrary to Senbet's [12] conclusion, fiscal policy too matters for real output in the short-run (Senbet [2] calculates variance decompositions (VDCs) in the context of a VAR model. His results too suggest that both monetary and fiscal policies exert important short-run effects on the real economy, albeit monetary policy appears to have larger effects. We do not discuss VDCs in this paper for at least two reasons. First, the primary objective of this paper is to show, contrary to Senbet, that fiscal policy is the key policy for stabilizing real output in the long-run and, moreover, that fiscal policy should not be ignored for it proves a viable short-run stabilization policy. This last objective is actually supported by Senbet's VDCs results. Secondly, although VDCs estimations are common, they are not universally accepted for several prominent researchers remain skeptical. Particularly critical are Runkle [24] and Spencer [25] who demonstrates that VDCs estimates are highly arbitrary).

Perhaps equally important, the coefficient of the EC term (γ_5) is negative as expected and also proves statistically significant ($t=2.63$). This latter finding strengthens our earlier evidence for the presence of a potent cointegrating relation among the three variables and that overlooking such strong relation constitutes a serious specification bias. The econometric literature often interprets the significance of the EC term as reflective of long-run Granger-causality from the independent (policy) variables to the dependent (real output) variable. However, our results from both the Johansen and the Gonzalo-Granger tests suggest that fiscal (rather than monetary) policy is the source for such long-run Granger-causal effects on real output.

It should be noted that the policy variables in the above ECM equation are predetermined (enter with a lag) and, as such, may be assumed exogenous. However, predetermined variables are only weakly exogenous as they are independent of the contemporaneous and future error terms. To ensure that the estimated policy effects are unbiased and statistically consistent, the policy variables should also be strictly exogenous (independent of the contemporaneous, future and past error terms). We use the Hausman test to investigate if the policy variables in our ECM equation are strictly exogenous. Using lagged values of the policy variables as instruments, the calculated Hausman F-statistics for fiscal and monetary policy variables are too small to reject the null hypothesis of strict exogeneity of either variable at any conventional level of significance ($=0.05$ and $=0.01$, respectively).

Concluding Remarks

In this paper, we empirically examine the contention of some previous studies like Senbet [12] that monetary policy matters for stabilizing real economic activities; fiscal policy does not. The main message of this article is to show that Senbet's claim is unfounded and

the outcome of prematurely dismissing fiscal policy from the cointegrating vector.

When we expand the tested vector to properly include the fiscal policy measure, our results from the Johansen test both within bivariate and trivariate systems consistently support the presence of a potent cointegrating relationship binding fiscal (but not monetary) policy with real output over the long-run. Additional evidence from the Gonzalo-Granger common long-memory test lends further credence to this finding and suggests that fiscal policy clearly dominates monetary policy as the main force driving the long-run policy relationship with real output. Over the short-run horizon of the business cycle, our results from the implied error-correction model unambiguously indicate that both monetary and fiscal policies exert significant Granger-causal effects upon the real side of the economy. Overall, this article provides another piece of evidence in support of the posture of Fazzari [6] and Arestis and Sawyer [8,9], among others, that fiscal policy is alive and well and remains a powerful tool for fighting economic stagnation, and does so both in the long- and short-runs.

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