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The National Income Between Monetary and Fiscal Actions

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Andersen and Jordan (1968) and Andersen (1971) argued that fiscal actions have a negligible effect on nominal income and can not sustain a stable and balanced economic growth. Also, they argued, along with other researchers who have embraced monetarism ideas from the Federal Reserve Bank of St. Louis, that the budget deficit presents negativeeffects in the economy that limit private investment. In this article, we analyzed the empirical relationship that is established between the tax actions and the long and short term national income in the U.S. economy and the economies of Eurozone.

***Keywords**: fiscal actions, budget deficit, money supply, national income*

***JEL Classification**: H30*

1. Introduction

The purpose of this research consists of determining, based on empirical data, the impact of fiscal and monetary actions on national income. The analysis of the impact of fiscal and monetary actions on national income has been the subject of study for many monetarists, including Andersen and Jordan (1968). The two researchers synthesized the monetarist ideas and following several discussions with Robert Basman, Karl Brunner, James Buchanan, Albert Burger, Keith Calrson, David Fand, Milton Friedman, Gary Fromm, Michael Levy, Thomas Mayer, A. James Meigs, David Meiselman, Allan Meltzer, Richard Pucket, David Rowan, James Tobin, Robert Weintraub and William Yohe, conducted a study based on empirical data that led them to assert that fiscal actions have little effect on national income, but can cause short-term changes production or employment. (Andersen and Jordan, 1968, pp.11-23)

Starting from this statement by Andersen and Jordan (1968, pp.11-23), the research subject of this paper will be to determine and analyze the relationship established between money supply, national income and budget deficit in two of the largest economies in the world, namely the U.S. economy and the European economy.

2. Research Methodology

To achieve purpose of the research, we use a methodology that involves conducting the following tests in order to determine the relationships between variables, i.e. to check the empirical validity of the assumption that fiscal actions have little effect on national income, but can cause short-term changes in output or employment:

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(i) Augmented Dickey-Fuller test and Phillips-Perron test to examine the stationarity of time series

The Dickey-Fuller test simply shows that under the null hypothesis of a stationary test, the test does not show a conventional distribution of the t- Student test, but derives asymptotic results and stimulates critical values for various tests and sample sizes. The standard Dickey-Fuller test has the following equation:

$$\Delta y_t = \alpha y_{t-1} + x'_t \delta + \varepsilon_t$$

The simple Dickey-Fuller test is only valid if the series represent an autoregressive process (1). (Quantitative Micro Software, 2007, pp.92-93)

Phillips and Perron (1988) proposed an alternative (nonparametric) control method for serial correlation when testing stationarity. The PP method estimates the non-augmented equation of the Dickey-Fuller test and modifies the ratio of the coefficient so that the serial correlation does not affect the asymptotic distribution of the statistic test. (Quantitative Micro Software, 2007, p.95)

(ii) The Granger test is used to test the causality between variables, more specifically whether an endogenous variable can be treated as an exogenous continuously variable. (Quantitative Micro Software, 2007, p.348)

(iii) The Johansen test is used for testing the cointegration relationship of variables, namely establishing the existence of a relationship and getting the relationship between the analyzed variables.

Given a group of nonstationary series, the question is whether these series are cointegrated, and if they are, what is the cointegration relationship (long term relationship). Thus, in order to test the co-integration relationship the Johansen test was used.

(a) "Vector Error Correction" for obtaining and testing short-term relationships

The "Vector Error Correction" (VEC) follows a smaller vector autoregression model, designed for nonstationary series that are known to be cointegrated.VEC has cointegration relationships, so that the model limits the long term behavior of the endogenous variables to converge to their cointegrating relationships, while allowing a dynamic short-term adjustment. The term of cointegration is known as the error correction because the deviation from the long term equilibrium is slowly corrected by a series of partial short-term adjustments. (Quantitative Micro Software, 2007, p.377)

This methodology will be applied by using the Eviews 6 software on empirical data to achieve the main objective of the research. Thus, for hypotheses testing we use macroeconomic data related to:

(i) The U.S. economy

(ii) The euro area economy

Regarding the application of the methodology, this is based on macroeconomic data from the following time series, extracted from the following databases: Federal Reserve of St. Louis, Eurostat and the European Central Bank, in accordance with the variables used in this research and presented in Table 1.

Table 1. *Variables and time series used in the empirical research*

Variables	US	Euro Area
Money (M)	1982-2011	1995q1-2011q4
National Income (Y)	1982-2011	1995q1-2011q4
Budgetary Deficit (BD)	1982-2011	1995q1-2011q4
Government Revenue (GR)	1982-2011	1995q1-2011q4
Government Expenditure (GE)	1982-2011	1995q1-2011q4

3. Analysis and Results

To analyze the existence of a long-term relationship between fiscal and monetary actions, on the one hand and national income, on the other hand, firstly, we test stationarity of the time series, given that the existence of non-stationarity of the series is the basic condition for the existence of cointegration. Regarding the testing of series'stationarity we have to apply the Augmented Dickey- Fuller test and the Phillips Perron test, as the number of lags used is chosen by the minimizing SC criterion (Schwartz criterion). After applying the stationary tests, the results obtained in Eviews are presented in Table 2.

Table 2. *Results for stationary tests*

Economic Area	Variables	ADF Test	PP Test
United States	ΔY	I(1)	I(0)
	ΔM	I(1)	I(1)
	ΔDB	I(0)	I(0)
Euro Area	ΔY	I(0)	I(0)
	ΔM	I(1)	I(0)
	ΔDB	I(0)	I(0)

Table 2 presented above suggests that the variables are integrated at a 0 or 1 level, thus fulfilling the conditions for a valid cointegration.

After obtaining the nonstationary behavior for the time series related to the variables of interest, we can proceed to the analysis of the cointegrating relationships specific to each economic zone. Thus, the series' non-stationarity motivates the use of the Johansen procedure in the analysis to identify the presence of a stationary long-term relationship (cointegration) between the non-stationary series. The advantage of the Johansen procedure is that it allows highlighting of the speed adjustment toward the long-term equilibrium of the variables.

The optimum number of lags that will be used in cointegration will be equal to $p - 1$, where p is the optimum number of lags, according to the Schwarz criteria, for a VAR estimated with the variables of interest in the research.

After identifying the optimal number of lags, by applying the Johansen test, we confirm the existence of cointegration and identify the number of cointegrating equations. Table 3 provides the results.

Table 3. Results of the Johansen cointegration tests

Economic Area	H_0	H_1	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.	Max-Eigen Statistic	0,05 Critical Value	Prob.	Inference
USA	r = 0	r ≥ 1	0,6689	36,1750	29,7971	0,0080	27,6333	21,1316	0,0053	R = 1
	r = 1	r ≥ 2	0,2851	8,5418	15,4947	0,4094	8,3902	14,2646	0,3404	
	r = 2	r ≥ 3	0,0060	0,1516	3,8415	0,6970	0,1516	3,8415	0,6970	
EURO	r = 0	r ≥ 1	0,4430	58,4603	29,7971	0,0000	36,2799	21,1316	0,0002	R = 1
	r = 1	r ≥ 2	0,1930	22,1805	15,4947	0,0042	13,2941	14,2646	0,0707	
	r = 2	r ≥ 3	0,1335	8,8864	3,8415	0,0029	8,8864	3,8415	0,0029	

From the above table (Table 3), it is noted that the four variables are in a long-term relationship, resulting in the possibility of analyzing the monetary hypothesis stated by Andersen and Jordan (1968).

After determining the number of cointegrating equations, the next step is to estimate the coefficients' values of the long term equations. The equations' coefficients and the adjustment coefficients are shown in Table 4 together with the values of the t-test.

Table 4. *Estimation of the relationship between long-term variables*

Economic Area		Cointegration Equation				Adjustment Coefficients		
		ΔY	ΔM	ΔB	Const,	D(ΔY)	D(ΔM)	D(ΔDB)
USA	Coef,	1,000	-0,048	2,054	-310,477	-1,365	0,415	-1,522
	SE		0,268	0,485		0,291	0,145	0,299
	t-Statistic		-0,181	4,237		-4,692	2,861	-5,088
EURO	Coef,	1,000	-0,088	0,571	-7183,254	-0,208	3,871	-0,938
	SE		0,026	0,220		0,287	0,786	0,321
	t-Statistic		-3,356	2,594		-0,724	4,926	-2,920

After having verified the existence of a long-term relationship, we proceed to check the short-term causality by applying the Granger causality test. The results obtained after the application of the Granger test are shown in Table 5.

***Table 5**. The results of the short-term Granger causality*

	US			Euro Area		
Dependent Variable: D(ΔY)	**Chi-sq**	**df**	**Prob,**	**Chi-sq**	**df**	**Prob,**
D(ΔM)	8,8713	3	0,0311	5,8969	4	0,2070
D(ΔDB)	13,1297	3	0,0044	4,3434	4	0,3615
All	14,9802	6	0,0204	13,7311	8	0,0890
Dependent Variable: D(ΔM)	**Chi-sq**	**df**	**Prob,**	**Chi-sq**	**df**	**Prob,**
D(ΔY)	6,9470	3	0,0736	20,8460	4	0,0003
D(ΔDB)	1,4357	3	0,6972	21,1292	4	0,0003
All	7,5102	6	0,2762	50,0040	8	0,0000
Dependent Variable: D(ΔDB)	**Chi-sq**	**df**	**Prob,**	**Chi-sq**	**df**	**Prob,**
D(ΔY)	25,6205	3	0,0000	21,7650	4	0,0002
D(ΔM)	8,2685	3	0,0408	4,1331	4	0,3883
All	28,7194	6	0,0001	23,1074	8	0,0032

Given the results of previous estimates and the test procedure, the estimated cointegrating vectors can be used to estimate the VEC (Vector Error Correction) model in order to quantify the short-term elasticities.

The properties of the resulting model are checked using a set of tests:

(i) Lagrange multiplier test for serial correlation verification, namely the independence hypothesis of errors;

(ii) White test to check the hypothesis of homoskedasticity;

(iii) Jarque-Berra test to verify the hypothesis of normality.

The results for the estimation model and its verification are summarized in Table 6.

***Table 6.** VEC estimated for the relationship between income, monetary actions and fiscal actions*

Economic Area	VEC
USA	Δ(ΔY) = - 1,364*(ΔY(-1) - 0,048*ΔM(-1) + 2,053*ΔB(-1) - 310,477) + 1,562*Δ(ΔY(-1)) + 1,338*Δ(ΔY(-2)) + 0,267*Δ(ΔY(-3)) + 2,177*Δ(ΔM(-1)) + 1,241*Δ(ΔM(-2)) + 0,893*Δ(ΔM(-3)) + 2,160*Δ(ΔB(-1)) + 1,097*Δ(ΔB(-2)) + 1,822*Δ(ΔB(-3)) + 49,728
Euro	Δ(ΔY) = - 0,207*(ΔY(-1) - 0,088*ΔM(-1) + 0,570*ΔB(-1) - 7183,254) - 0,387*Δ(ΔY(-1)) - 0,297*Δ(ΔY(-2)) - 0,364*Δ(ΔY(-3)) + 0,452*Δ(ΔY(-4)) - 0,087*Δ(ΔM(-1)) - 0,072*Δ(ΔM(-2)) - 0,013*Δ(ΔM(-3)) - 0,031*Δ(ΔM(-4)) + 0,090*Δ(ΔB(-1)) + 0,043*Δ(ΔB(-2)) - 0,148*Δ(ΔB(-3)) - 0,158*Δ(ΔB(-4)) - 59,320

Economic Area	Error Analysis Tests									
	Lag intervals	Adj, R^2	LM(1)		LM(2)		White		Jarque-Berra	
			F-statistic	p-values	F-statistic	p-values	χ^2	p-values	χ^2	p-values
USA	3	0,643	5,355	0,802	11,416	0,248	23,936	0,245	4,198	0,123
Euro	4	0,972	8,342	0,500	8,482	0,486	35,68	0,098	2,67	0,263

	8	5

As shown in table 6, the relationship estimated in the first part of the table is validated by the tests regarding the properties of the model.

4. Conclusion

From Tables 4, 5 and 6 it is noted that fiscal actions have coefficients attached to an absolute value greater than the coefficients attached to monetary actions. In another line of ideas, the hypothesis stated by Andersen and Jordan (1968) is not valid, and fiscal actions seem to have a more significant impact on national income. It should also be noted that since the publication of the studies, the results obtained by Andersen and Jordan have attracted criticism because of the methodology they used. Further, after all the structural changes and mutations of the global economy, this assumption is not valid in the new context of economic realities.

5. References

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