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ANALYSIS OF THE US MONETARY POLICY DURING THE POST-COVID CRISIS AND THE RUSSIAN-UKRAINIAN WAR

Abstract: This article delves into the efficacy of the Taylor rule as a guideline for US monetary policy, mainly focusing on its application in the post-COVID crisis and the Russian-Ukrainian war.

According to the principles of US monetary policy, the Federal Reserve is obliged to raise or lower the discount rate in response to a decline or increase in inflation. One of the most common tools for regulating inflation in the United States is changing the federal funds rate, as it affects stock market activity, which consequently causes a slowdown or revival of economic growth. To analyze the rules for setting the federal funds rate, we will use the Taylor rule, which embodies the basic principles of US monetary policy [1]. First, we will analyze the proposed rule and calculate the federal funds rate [2]. Then, we will conduct a regression analysis to estimate the coefficients and further analyze the Taylor rule's effectiveness in US monetary policy. The equation adjusts the federal funds rate according to the deviation of inflation from the target level and GDP gaps. In his work "Discretion versus policy rules in practice," John Taylor assumes that the equilibrium federal funds rate is 2% higher than the inflation rate [3].

Let us consider Taylor's equation [4]:

$$FFR_t = rtLR + \pi t + 0.5(\pi t - \pi*) + 0.5(yt - ytP), \quad (1)$$

where:

FFRt– is the federal funds rate in quarter t;

rtLR- is the equilibrium federal funds rate in the long run;

πt– is the inflation rate for the previous four quarters;

π∗- is the central bank's target inflation rate;

yt−ytP– is the deviation of real GDP from the forecasted one.

To analyze and find the federal funds rate, quarterly data for 1981-1922 was collected. Subsequently, the following indicators will be included in the equation:the value of real GDP in the United States; the value of potential GDP in the United States; the inflation rate calculated based on the implicit price-to-GDP deflator

The dependent variable is the federal funds rate, the independent variables are the deviation of real GDP from real potential GDP, and the inflation rate calculated as the average of the four previous periods. Since this paper analyzes US monetary policy in the context of the post-COVID crisis and the Russian-Ukrainian war, we add variables that will quantify the economic changes due to the above events. The most relevant indicators are the number of COVID-19 cases in the United States, the monetary base, and the price of crude oil, as the dynamics of these data have changed rapidly during the post-COVID crisis and the Russian-Ukrainian war. The independent variable list also includes the previous period's federal funds rate. We will analyze quarterly indicators from the first quarter of 1981 to the fourth quarter of 2022.

The influence of independent variables on the dependent variable is analyzed using the E-Views software package. The model was specified using a series in first differences for the qualitative time series analysis. Consider the obtained indicators in Figure 1.

After assessing the impact of the factors on the dependent variable, we can conclude that the regression equation has the following form:

$$D(FFR,1)=-0.001+0.001D(CCC,1)-0.001D(CPCO,1)+0.491D(FFRT1,1)+0.332D(GDPDeviation,1)+0.297D(Inflation)+0.002D(M0) \quad (2)$$

where:

D(FFR,1) is the federal funds rate, expressed as a percentage and converted to a first difference series;

D(CCC,1) is the change in the number of registered cases of COVID-19, expressed as a percentage and converted to a first-difference series;

D(CPCO,1) is the change in the price of oil expressed as a percentage and converted to a first difference series;

D(FFRT1,1) is the federal funds rate for the previous quarter, expressed as a percentage and converted to a first difference series;

D(GDPDeviation,1)is the deviation of real GDP from real potential GDP, expressed as a percentage and converted to a first-difference series;

D(Inflation,1)is the inflation rate calculated as the average value over the previous four quarters, expressed as a percentage and converted to a first-difference series;

D(M0,1)is the change in the monetary base, expressed as a percentage and converted to a first-difference series.

Dependent Variable: D(FFR,1)
Method: Least Squares
Date: 03/21/23 Time: 13:28
Sample (adjusted): 1981Q2 2022Q4
Included observations: 167 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000676	0.000383	-1.766403	0.0792
D(CCC,1)	0.001030	0.000279	3.694506	0.0003
D(CPCO,1)	-0.001183	0.002055	-0.575370	0.5658
D(FFR_T_1_,1)	0.490578	0.053769	9.123760	0.0000
D(GDP_DEVIATION,1)	0.331729	0.061649	5.380924	0.0000
D(INFLATION,1)	0.297153	0.081577	3.642614	0.0004
D(MO,1)	0.001587	0.005857	0.270929	0.7868

R-squared	0.456918	Mean dependent var	-0.000773
Adjusted R-squared	0.436553	S.D. dependent var	0.006573
S.E. of regression	0.004934	Akaike info criterion	-7.744220
Sum squared resid	0.003895	Schwarz criterion	-7.613525
Log likelihood	653.6423	Hannan-Quinn criter.	-7.691174
F-statistic	22.43583	Durbin-Watson stat	0.888475
Prob(F-statistic)	0.000000		

Figure 1. Results of the regression model on the impact of independent variables on the federal funds rate

Source: author's calculations based on data from [5-11]

Given the results, we will determine the degree of influence of the independent variables on the dependent variable. The change in registered COVID-19 cases positively correlates with the federal funds rate. If the cases increase by 1%, the dependent variable increases by 0.001%. The value of the federal funds rate decreases by 0.001% when crude oil prices rise by one percent. A direct correlation between the

dependent variable and such independent variables as the federal funds rate for the previous quarter, the deviation of real GDP from real potential GDP, inflation, and changes in the money supply. With a 1% increase in the above indicators, the federal funds rate increases by 0.491%, 0.332%, 0.297%, and 0.002%, respectively.

Let us diagnose the model and check its adequacy. Given the value of the t-statistic and the selected 10% confidence level, all model parameters, except for the change in the price of crude oil and the change in the money supply, are statistically significant. The coefficient of determination is 45.69%, which indicates that the selected variables do not explain the variance of the dependent variable well enough and that the latter is partially affected by errors.

Given Fisher's criterion value of 22.43583 and the Prob (F-statistics) value of 0.000, the model is adequate, and the hypothesis of the coefficients being equal to zero can be rejected with a 90% probability. The value of the Durbin-Watson criterion, which is 0.888, demonstrates the presence of first-order autocorrelation in the model. After conducting the Breusch-Godfrey Serial Correlation LM TEST, it was determined that the model shows first-order and second-order autocorrelation, which is often the case in data samples characterized by seasonal fluctuations. The test for heteroscedasticity showed that the scatter of random variable values is not stable. Modifying the regression model using a series of differences and logarithmization did not solve the problem of autocorrelation and heteroscedasticity.

The regression model results do not fully correlate with the theoretical foundations of monetary policy. However, we can still identify specific patterns that correspond to the principles of monetary policy regulation. As inflation rises and real GDP deviates from its potential level, the central bank raises the critical policy and federal funds rates to eliminate overheating and curb inflation. The model results show that the change in inflation and the deviation of real GDP from the potential level are statistically significant and directly impact the federal funds rate. Since the independent variables characterizing the change in the money supply and the change in the oil price are statistically insignificant, it can be concluded that, according to the regression model, the change in the monetary base and the change in the oil price do not affect the federal funds rate. The impact of the number of registered COVID-19

cases in the United States on the federal funds rate does not fully describe the actual situation in the country in 2020-2022. The increase in cases in 2020 led to a decline in economic activity and a drop in inflation, which forced the US Federal Reserve to use various monetary instruments, including a reduction in the federal funds rate, to stimulate economic development. The model shows a different trend, characterized by an increase in the federal funds rate in response to the rise in COVID-19 cases in 2020. However, the trends are the same in the first and second quarters of 2022.

Let us substitute the values of the independent variables into the resulting equation, draw a curve, and compare the actual value of the federal funds rate, converted to a series of first differences, and the value calculated using the parameters of the regression model in Figure 2.

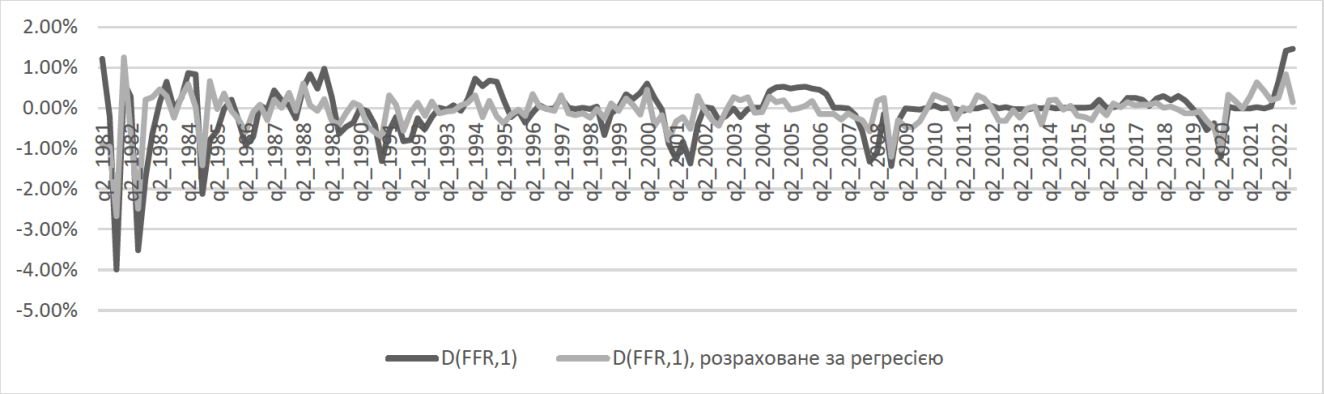

Figure 2. Dynamics of the federal funds rate converted to a series of first differences compared to the federal funds rate calculated from the regression model over 1981-2022

Source: author's calculations based on data from [5-11]

The real value of the federal funds rate converted to a series of first differences (D(FFR,1)-in Figure 1.2) and the estimated value of the federal funds rate (D(FFR,1), calculated by regression)-in Figure 1.2) is closest in the periods 1981-1982, 1986-1987, 1996-1999, 2016-2017, and 2020. According to the model, the federal funds rate differential should have been increased in the third and fourth quarters of 2020 by 1.38% and 0.01%, respectively. In 2021, the model also suggested that the federal funds rate should be raised by 0.26% on average over the year, which is higher than the actual value. In 2022, the US Federal Reserve began to raise the

federal funds rate gradually, but the value calculated by the regression equation, on the contrary, suggests a decrease. According to the regression equation, for example, in the fourth quarter of 2022, the federal funds rate should be reduced by 0.92%.

The described econometric model is not entirely consistent with reality, as it only considers some of the factors the US Federal Reserve considers when deciding on monetary policy regulation.

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